User's Manual

ToolBox for MOSCAD™
IP Gateway
Version 5.50

68P02958C00-B

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Contents

Introduction

Scope of the Manual

This manual provides instructions for IP Gateway installation and operation, as well as detailed instructions for the setup of its configuration. In addition, this manual provides the user with an overview of the MOSCAD system including a few examples that show SCADA control centers and NFM Manager which are integrated into the MOSCAD system via the IP Gateway.

Additional applicable manuals are:

- MOSCAD Programming Toolbox, System Overview Manual, 68P02956C45

- MOSCAD Programming Toolbox, System Setup and Diagnostics Tools Manual, 68P02956C50

- MOSCAD Programming Toolbox, Application Programmer Manual, 68P02956C55

- MDLC Gateway for TCP/IP Application Programming Interface – User's Manual, 68P02951C05

- MOSCAD NFM Manual, 68P02958C45

- MOSCAD RTU Service Manual, 68P02991G90

IP Gateway System and ToolBox Software Version Policy

The version numbers of the ToolBox and system software are updated according to additional features and improvements.

Compatibility (at source level) between the ToolBox and the IP Gateway is assured **only** if *the version number of the ToolBox Software is later than the version number of the Gateway system software.*

A version number is composed of two numbers, as in the following example: V1.61. The one-digit number to the left of the decimal point describes a major modification of the software, while the two-digit number to the right of the decimal point describes a minor modification.

In this manual, some headings of major subjects are marked by the following annotation: ≥ Va.b.

For example, ≥ V1.61 indicates that the marked subject is supported by a Gateway whose system software version number is at least 1.61.

Introducing the IP Gateway

The IP Gateway for SCADA and NFM systems is a smart unit, based on the Motorola 68360 microprocessor and includes on-board memory, communication channels, indicator LEDs and other circuits. It provides the SCADA and NFM software with access to the MOSCAD system, based on the seven layers of the MDLC protocol, in order to exchange data with the RTUs. A typical example of the IP Gateway is shown in Figure 1-1; a SCADA control center is connected via the IP Gateway to a radio link of the MOSCAD system.
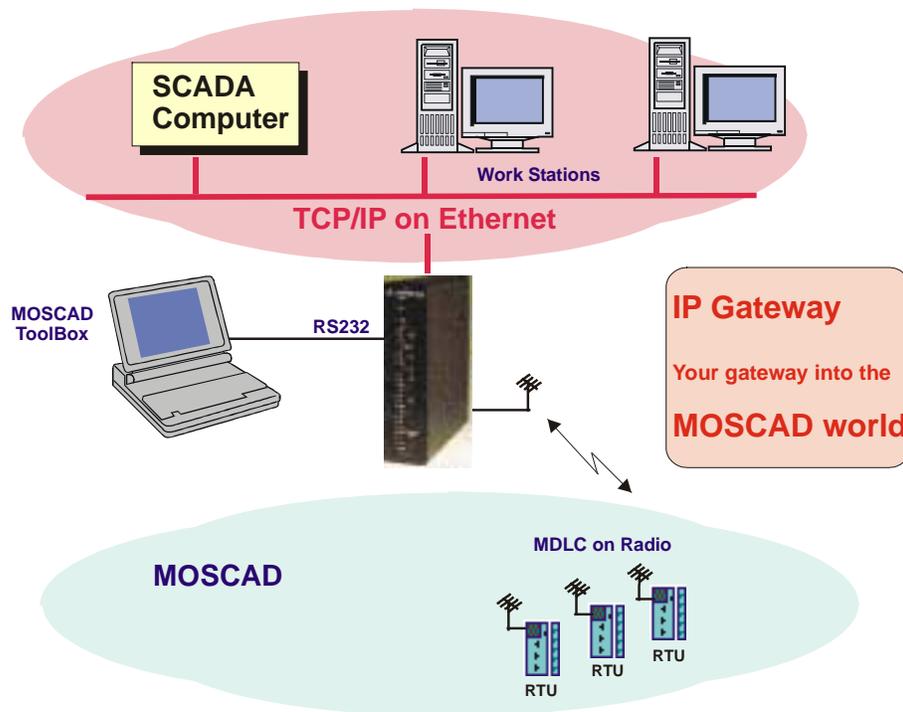
Figure 1-1: MOSCAD System with IP Gateway, General View

A system with multiple vendors SCADA control center is shown in Figure 1-2. The MDLC communicates with any SCADA computer which supports the TCP/IP network (UNIX, VMS, Windows/NT, Windows/95, OS/2 etc.).
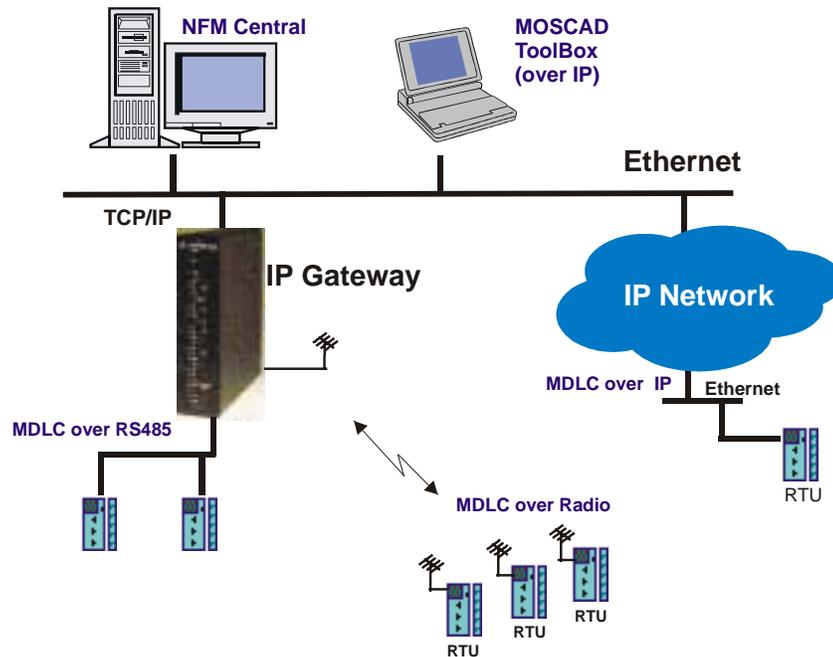
Figure 1-2: IP Gateway with Multiple Vendors SCADA Control Center

The SCADA control center, which includes workstations and a SCADA computer, exchanges data with the MOSCAD system via the IP Gateway, which serves as a Gateway from the TCP/IP world to the MDLC world. There are many SCADA packages which already have the Gateway Interface driver implemented, some as direct access to the IP Gateway, and some as OPC server.

IP Gateway Applications

The IP Gateway uses the TCP/IP LAN Protocol for exchanging data application messages with the SCADA software. The IP Gateway API (Application Programming Interface) source library allows SCADA developers to quickly and easily connect to the MOSCAD world. The IP Gateway API, which is part of the IP Gateway product line, allows SCADA driver developers to quickly and easily build the IP Gateway Interface (driver), which serves as a communication interface with the MOSCAD world.

Data exchange between the SCADA (client) and the IP Gateway (server) is carried out using "peer -to-peer" communication over the LAN. The IP Gateway can support multiple connections that are initiated from multiple SCADA computers.

The implementation of the IP Gateway interface in the SCADA software allows the SCADA to perform the following:

- Poll a MOSCAD RTU in order to get data and COS (Change-of-State) events from the RTU tables.

- Send commands to the MOSCAD RTU and download parameters to its local process.

- Send commands via broadcasts to any required group of RTUs.

- Download parameters (set-points) to the RTU local process.

- Receive spontaneous reports (by contention) from RTUs (both burst and event transmission).

- Receive time-tagged events logged in the RTUs (1 msec resolution).

- Adjust the RTU clocks (1 sec resolution).

- Synchronize the RTU clocks (1 msec resolution), using an external CPU with GPS.

- Support redundant IP Gateway configuration.

- Set the Gateway mode (Primary/Secondary).

- Retrieve Gateway status.

- Retrieve RTU links status.

MOSCAD NFM Overview

The MOSCAD NFM system provides communication providers with a solution for supervising and controlling the operation of conventional and trunked radio, analog and digital cellular, microwave radio and wireline telecommunication systems.

The MOSCAD NFM system provides the Network Management Center (NMC) with access to the communication and environmental devices and gives the operator and the system manager the tools needed to identify and fix faults within the communication system.

Figure 1-3 describes the general architecture of the MOSCAD NFM, which includes control center workstations and computers that exchange data with the IP Gateway, allowing the NMC to monitor and control non-SNMP devices at the communication sites.

Figure 1-3: General Architecture of the MOSCAD NFM System

The MOSCAD NFM via the IP Gateway allows the system to offer SNMP (Simple Network Management Protocol) connectivity, therefore providing a standard interface to a wide range of NMC platforms (such as HP/OpenView, SUN/Solstice, IBM/NetView etc.).

The MOSCAD Remote Terminal Unit (RTU) represents the Element Level of the network management model. It collects the various inputs, outputs and analog signals via a variety of input/output (I/O) modules. In addition, the MOSCAD RTU serially interfaces to communication devices (radio, cellular and telecommunication) and is able to emulate (speak) their ASCII based native protocol, allowing the MOSCAD to not only monitor alarms, but to configure and change parameters as well.

IP Gateway System Overview

SCADA System

The complete control system is comprised of the SCADA control center (or centers) communicating with MOSCAD RTUs over various communication links, such as:

- conventional radio
- trunked radio
- data radio, dial-up lines
- leased lines,
- microwave, fiber optic links
- combined networks

The communication system is used for transmitting alarms, status and telemetry, calculated data diagnostics and error logging information from the MOSCAD RTUs to the central facility computer and vice versa. It is also used for downloading, monitoring and debugging the application program at the sites.

The system may be relatively simple, comprising several RTUs and a single control center, or a more complicated hierarchical system, where several sub-control-centers communicate with lower, parallel and higher hierarchies. The RTUs may also communicate with each other and/or with any other hierarchy in the system.

The MOSCAD system uses the MDLC protocol, based on the seven layers of the OSI model published by ISO, and adapted for SCADA communications. It provides network support, multiple logical channels per physical port, allowing each RTU to simultaneously run several communication sessions, such as data exchange, on-line monitoring, diagnostics, etc.

The MOSCAD system is supplied with a Toolbox, which is a software package that runs on an IBM PC (or compatible). All RTU functions such as configuration, database and process definition, downloading, monitoring, hardware and software diagnostics, etc. are defined by means of the MOSCAD Programming Toolbox.

Figure 2-1 describes a typical MOSCAD radio system. The IP Gateway includes one Ethernet port for connection to the SCADA computer and 3 serial ports for communicating via MDLC protocol to the MOSCAD devices. In this particular case, one MDLC port is connected to the MOSCAD Programming Toolbox and the second MDLC port is connected to a radio for communicating with the RTUs.
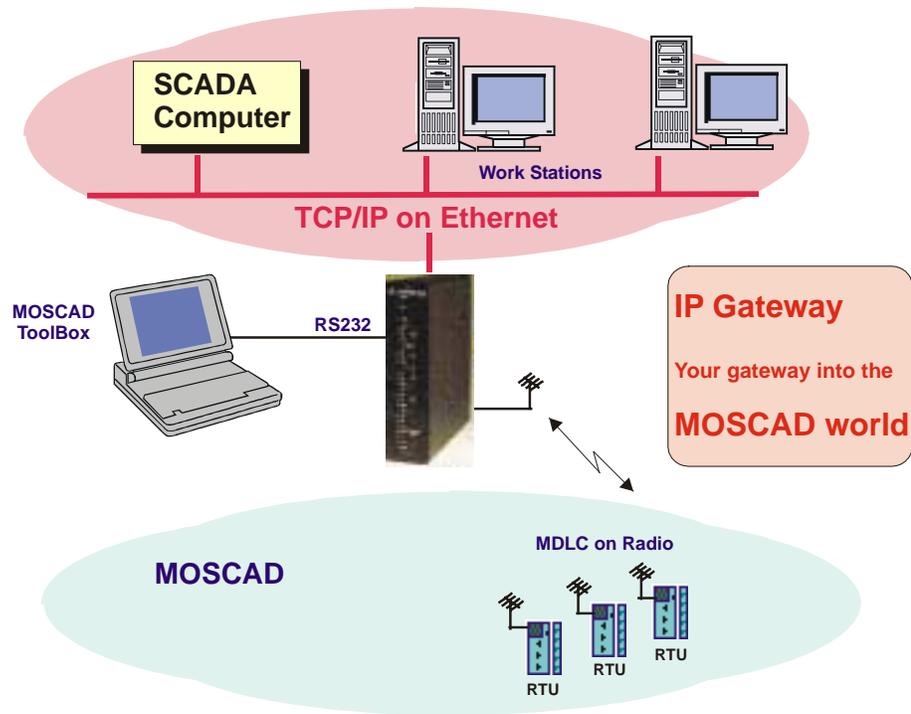
Figure 2-1: SCADA Control Center with Radio-Based MOSCAD System

The IP Gateway allows the SCADA center to conduct a large number of sessions via a large number of logical channels in spite of a <u>single</u> physical RS-232 port. The IP Gateway also serves as an MDLC router between the MOSCAD Programming Toolbox and RTUs.

The Toolbox may be connected either locally to an RTU or via the MDLC port of the IP Gateway to any RTU in the system. All programming and monitoring functions can be performed either locally or remotely.

Note: The MOSCAD Programming Toolbox that is connected locally to one of the RTUs in the system can service any other RTU in the system via the communication network.

Figure 2-2 describes multiple SCADA control centers which are connected to the IP Gateway via a 10 Mbps Ethernet LAN. In this case, multiple TCP/IP logical links are used for communicating with the IP Gateway, which is connected via multiple MOSCAD CPUs to multiple MDLC links (Radio link, Line link, Dial-up link etc.).

Multiple SCADA control centers can simultaneously perform multiple sessions with the IP Gateway in order to send commands and polling requests to the RTUs and to receive data and contention reports from the MOSCAD RTUs.
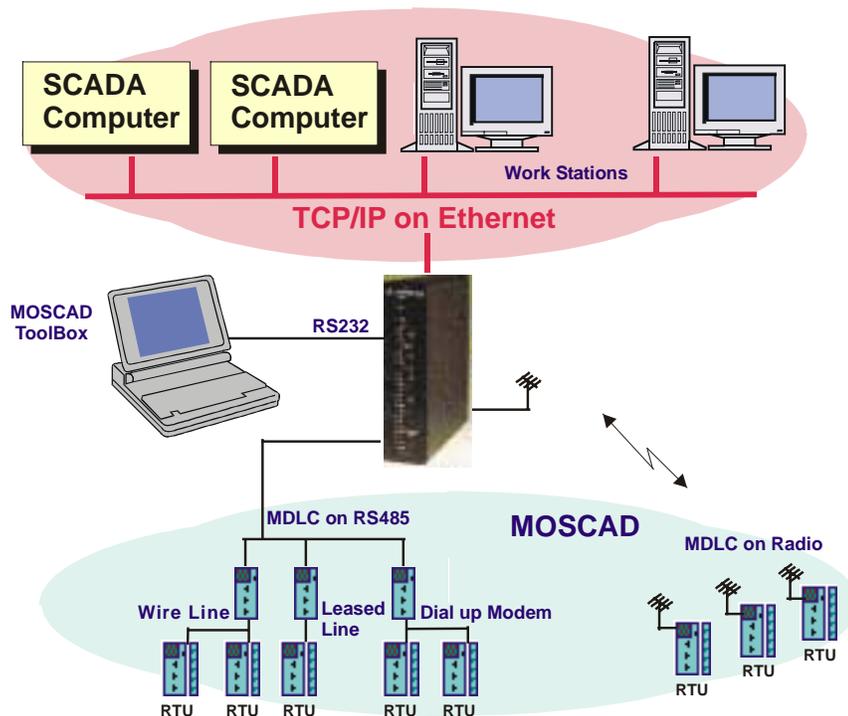
Figure 2-2: SCADA Control Center with Multiple Links-Based MOSCAD System

MDLC Over IP

MOSCAD RTUs and IP Gateways can use IP (Internet Protocol) technology to interface to advanced radio infrastructure (e.g. digital ASTRO IP conventional systems) and to standard private IP networks. Most benefits of the MDLC protocol are preserved. MDLC and IP networks can be integrated in the same system, as networking properties are preserved. MOSCAD MDLC applications need not be modified as the lower layers of the protocol support IP.

MDLC packets to be transmitted are enveloped inside IP datagrams and sent between remote RTUs or between an IP Gateway and an RTU.

An IP Gateway can act as a gateway between the field and the SCADA Central to extract the enveloped frames from the IP message. A ToolBox can be connected to one of the RTUs or to the IP Gateway, either locally or over IP network.

Each RTU/IP Gateway is assigned a Site ID. In addition, each RTU/IP Gateway with an IP interface is assigned an IP address. An IP conversion table which maps Site IDs to IP addresses is created in the ToolBox and downloaded to the RTUs and IP Gateway. This enables routing over the IP network to the proper destination.

Two variations of MDLC over IP exist, MDLC via Terminal Server and MDLC via Astro IP.

MDLC via Terminal Server

If the RTUs are on a Local Area Network (LAN), each can be connected to a Terminal Server attached to the Ethernet. The Terminal Server converts the RS232 to the Ethernet LAN and enables communication with an IP Gateway, or between RTUs.

In the diagram below, a typical configuration is shown, with RTUs attached via SLIP (Serial Line IP) port to a Terminal Server, which is in turn attached to Ethernet.
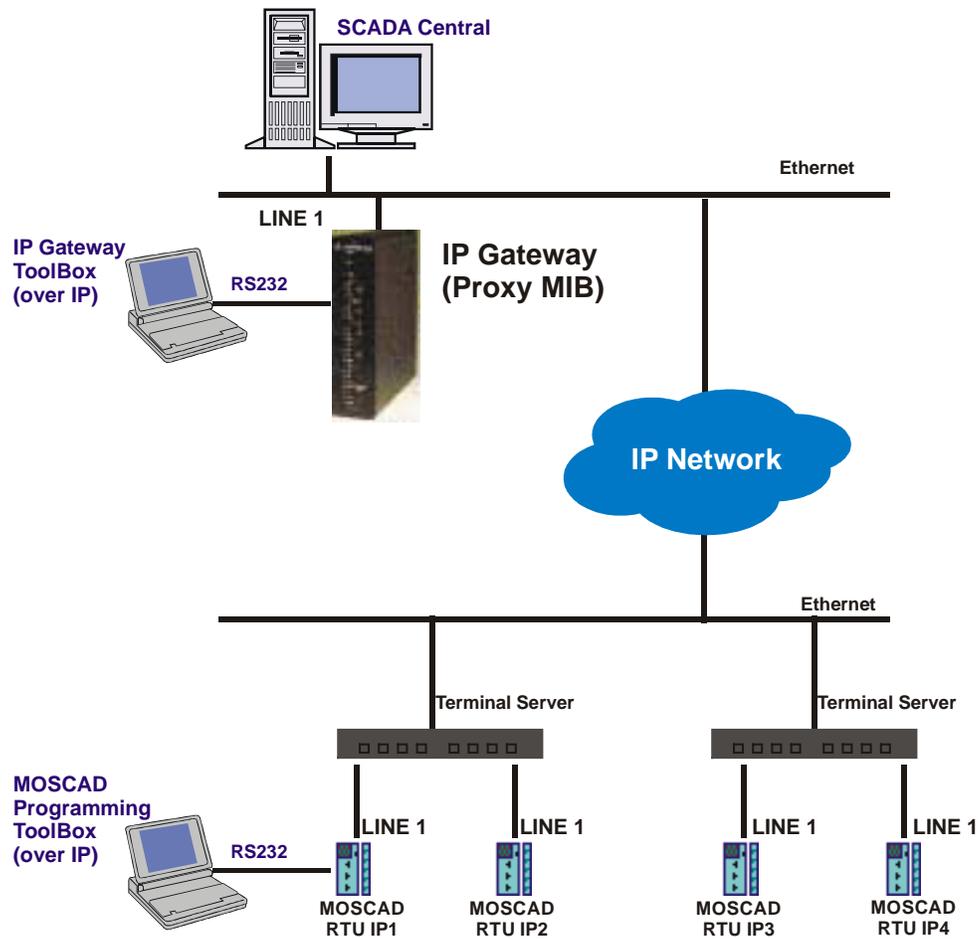
Figure 2-3: Typical Configuration, MDLC via Terminal Server

MDLC via Astro IP

RTUs can be connected via SLIP connection to an ASTRO radio, which is part of an IP network.

In the diagram below, a typical configuration is shown, with RTUs attached via SLIP over RS232-E to ASTRO SPECTRA radios which support IP data capability. A ToolBox is connected to one of the RTUs through either Port 2 or Port 3. The IP Gateway on Ethernet acts as a gateway, translating between the IP and MDLC protocols.
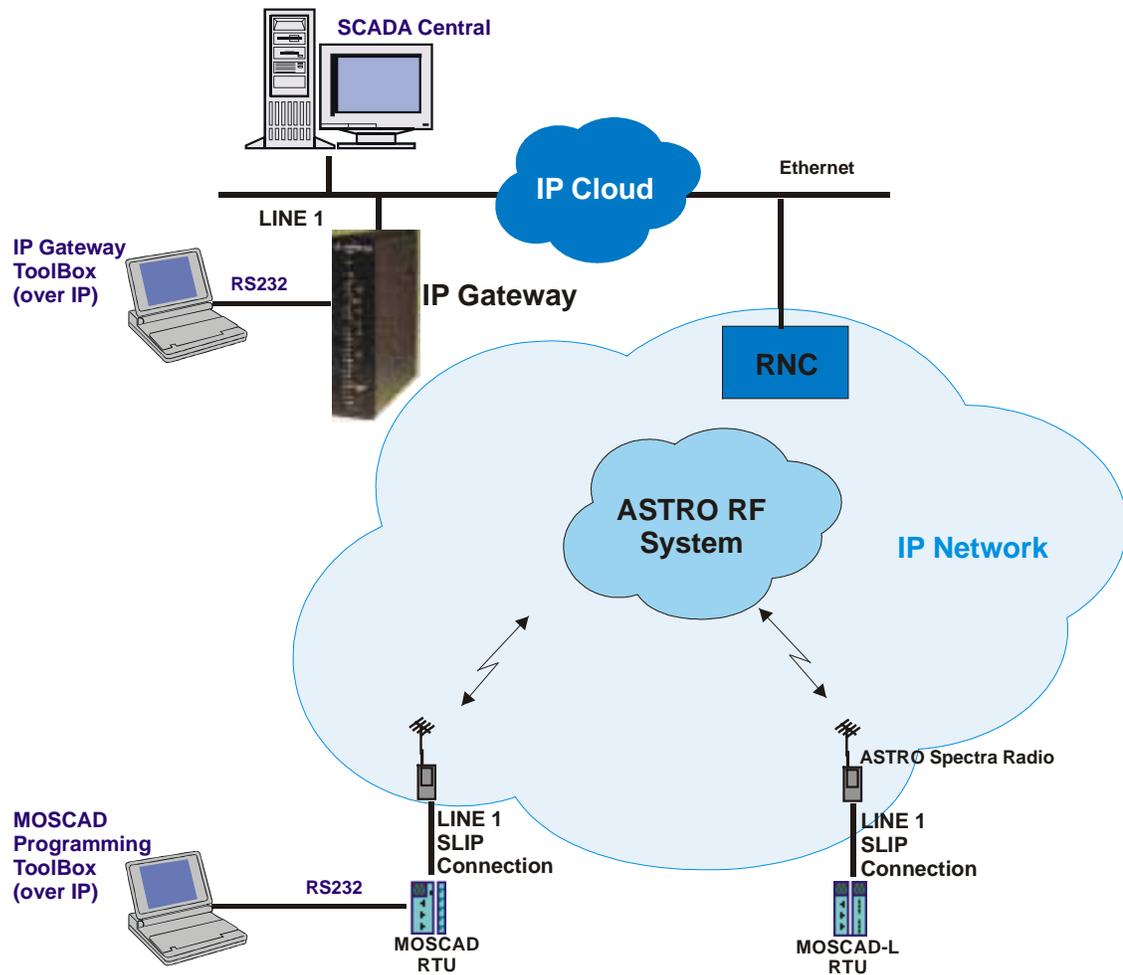
Figure 2-4: Typical Configuration, MDLC via Astro IP

MDLC Over Private DataTac

MOSCAD RTUs can communicate over Private DataTac systems (RDLAP) with SCADA centrals and with other RTUs. All MDLC features are preserved except for clock synchronization.

RTUs are connected to RDLAP (DataTac) radios (e.g. VRM 500, 600, 650, 660, and TRM 660) via RS232. An RTU sends a message (MDLC), through the radio to the Radio Network Controller (RNC). The RNC encapsulates the MDLC message and send it over IP to the IP Gateway. The IP Gateway then extracts the MDLC message from the IP envelope and transmits it to the appropriate destination. If the destination is another RTU over Private DataTac, the IP Gateway must support the reflector feature, which enables it to "reflect" the message back over RDLAP (DataTac).
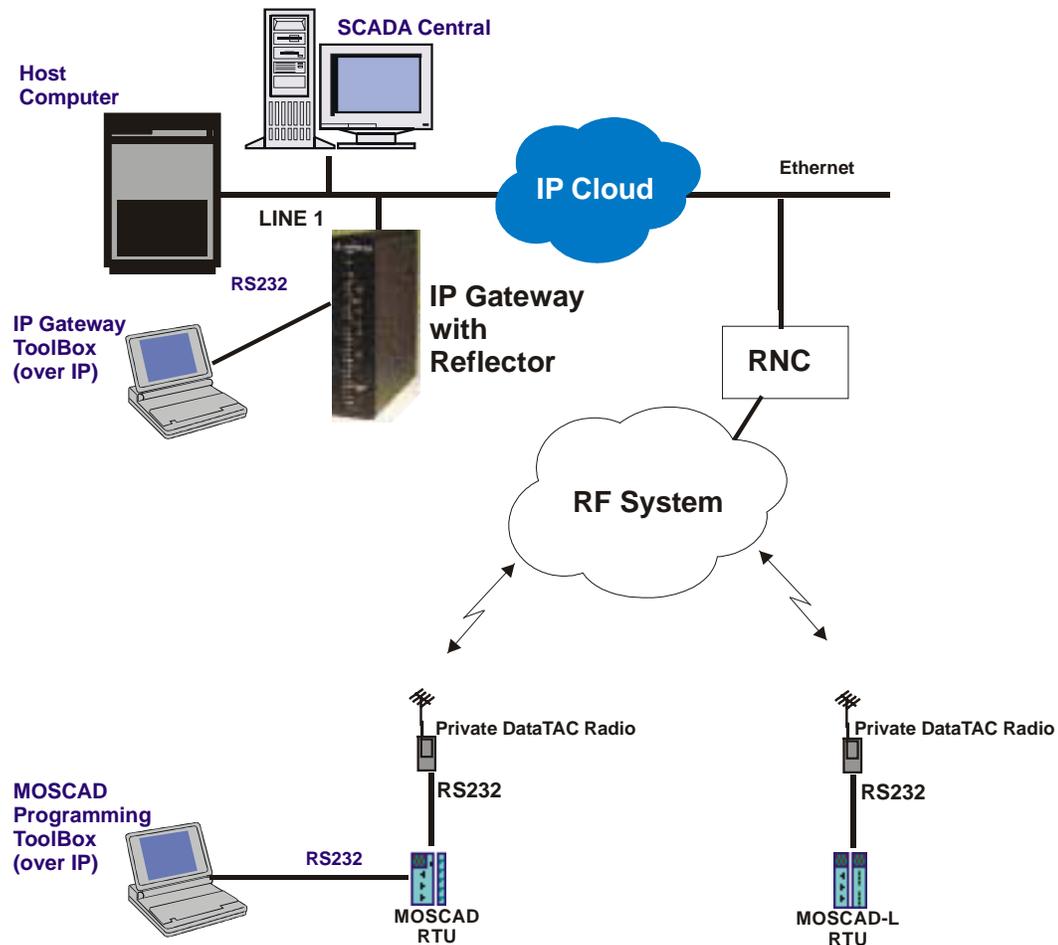
Figure 2-5: Typical Configuration, MDLC via Private DataTac radios.

The picture above shows a typical system which supports MDLC communication over RDLAP (DataTac) radios. Note that the IP Gateway is configured as RDLAP (DataTac) reflector. A host computer attached to the Ethernet can receive TCP/IP applications from non-MOSCAD terminals on existing RDLAP (DataTac) systems, if required. A MOSCAD Programming ToolBox can be connected to one of the RTUs, and can access another RTU by using its Site ID and Link ID. ToolBox can also be attached to one of the serial ports of the IP Gateway.

SCADA Interface

Client-Server environment

The SCADA application for the IP Gateway is based on a client-server approach.

The IP Gateway application acts as a server while the SCADA Interface acts as a client. In such a relationship, the SCADA Interface must establish the connections with the IP Gateway needed for communicating with the MOSCAD RTUs.

After the connections have been established, the SCADA Interface can send data, commands, and polling requests to the field RTUs. It can also establish a special connection that enables

receipt of data transmissions initiated by the field RTUs (so called burst/RTU event data, contention data or Change-Of-State [COS] messages).

A specialized routine, API CONNECT, allows the SCADA Interface to establish the most fitting mode of communication with the IP Gateway, based on the existing SCADA communication mode.

Channels and Channel types

The SCADA Interface must establish at least one connection toward the IP Gateway server. These connections are called channels and are used to transfer messages from the SCADA center toward both the Gateway and the RTUs in the field. The client application can open different types of channels to best serve its SCADA Interface process.

The two basic channel types are:

- Regular

- Spontaneous

A Regular channel enables asynchronous sending/receiving of data and requests. It uses amailbox mechanism for mapping the request messages to their replies.

A Spontaneous channel allows receiving burst data (Spontaneous COS messages) and RTU events - i.e. transmissions initiated by the field RTUs. This feature almost eliminates the need for the SCADA application to poll data since every change in one of the telemetry field variables can immediately be transmitted to the SCADA application.

MOSCAD System - RTU definitions

To make the MOSCAD field system definition transparent to the SCADA client application and to correctly parse the data received from the MOSCAD system, the API builds an internal data structure defining the types and numbers of the field RTUs. To do so, it uses two external system definition files (in ASCII format).

This automatic system definition done by the API routines hides the field system structure from the SCADA application and eliminates the need for any application modifications when working with different MOSCAD systems. Moreover, new RTUs can be added to the system at run time using the appropriate API routine.

Primary/Secondary Gateway Modes

The IP Gateway supports a redundant configuration. There are two modes of operation: Primary and Secondary. The initial mode of operation is defined by the startup process of the IP Gateway. At any other time, the SCADA can change the mode of operation flexibly by calling the appropriate API set mode routine. The API also supplies a routine for checking the current mode of operation. This functionality of the IP Gateway provides redundant gateway operation, which minimizes the risk of communication failure.

Communicating with the IP Gateway

Once a channel has been established with the IP Gateway, the SCADA interface can issue requests to the IP Gateway. The request categories are Send routines, Receive routines, Data Analysis routines and Management routines.

Typical API sequence calls are the following:

Connect   /* Establish Connection to Gateway. */

Poll   /* Send a polling request. */

Receive   /* Receive MDLC communication (answer) buffer. */

Get_next_message   /* Extract one message from the MDLC communication buffer. */

Get_next_data_entity /* Get one data entity from the message buffer. */

Troubleshooting

The IP Gateway handles the communication with the SCADA in the REQMNG device. Diagnostics on this device can help when troubleshooting the SCADA connectivity.

For more information on the REQMNG device, see the *Software Diagnostics Output* section.

MOSCAD NFM System

A typical network management system can be divided into three main levels:

- Network Management Level
- Element Manager Level
- Element Level

The following section provides a brief description of the MOSCAD NFM components that allow managing and supporting these network management levels.

Figure 2-6 shows a typical MOSCAD NFM configuration including all network management levels. It describes the MOSCAD NFM architecture that includes NMC computers and workstations that monitor and control - via the IP Gateway and the NFM RTUs - non-SNMP devices at the communication sites.

In this configuration, the end devices at the communication sites serve as a NE (Network Element) and the NFM RTU serves as an Element Manager that monitors and controls multi-communication and environmental devices at the site. The IP Gateway allows monitoring and controlling devices - via the NFM RTU - that are installed at multiple communication sites. The NMC allows monitoring and controlling of all devices in the network via multiple IP Gateways.

The NMC application can use the SNMP protocol and the IP Gateway MIB to *Auto-discover* the IP Gateway, the communication sites as well as the devices and their objects.

By using this MIB, the NMC application can poll the devices and their objects (NEs and their objects) in order to refresh its database and to display unsolicited events (Traps) in the Alarm Manager application. By using the TELNET application in the host, the operator can access via the IP Gateway and the NM RTU any communication devices that have an RS-232 port with interactive interface.

The MOSCAD NFM product can be integrated either with the Motorola PRN (Private Radio Network) architecture or with a third party communication/telecommunication system via an IP Gateway that gives the NMC applications access to the equipment and environmental devices at the sites.
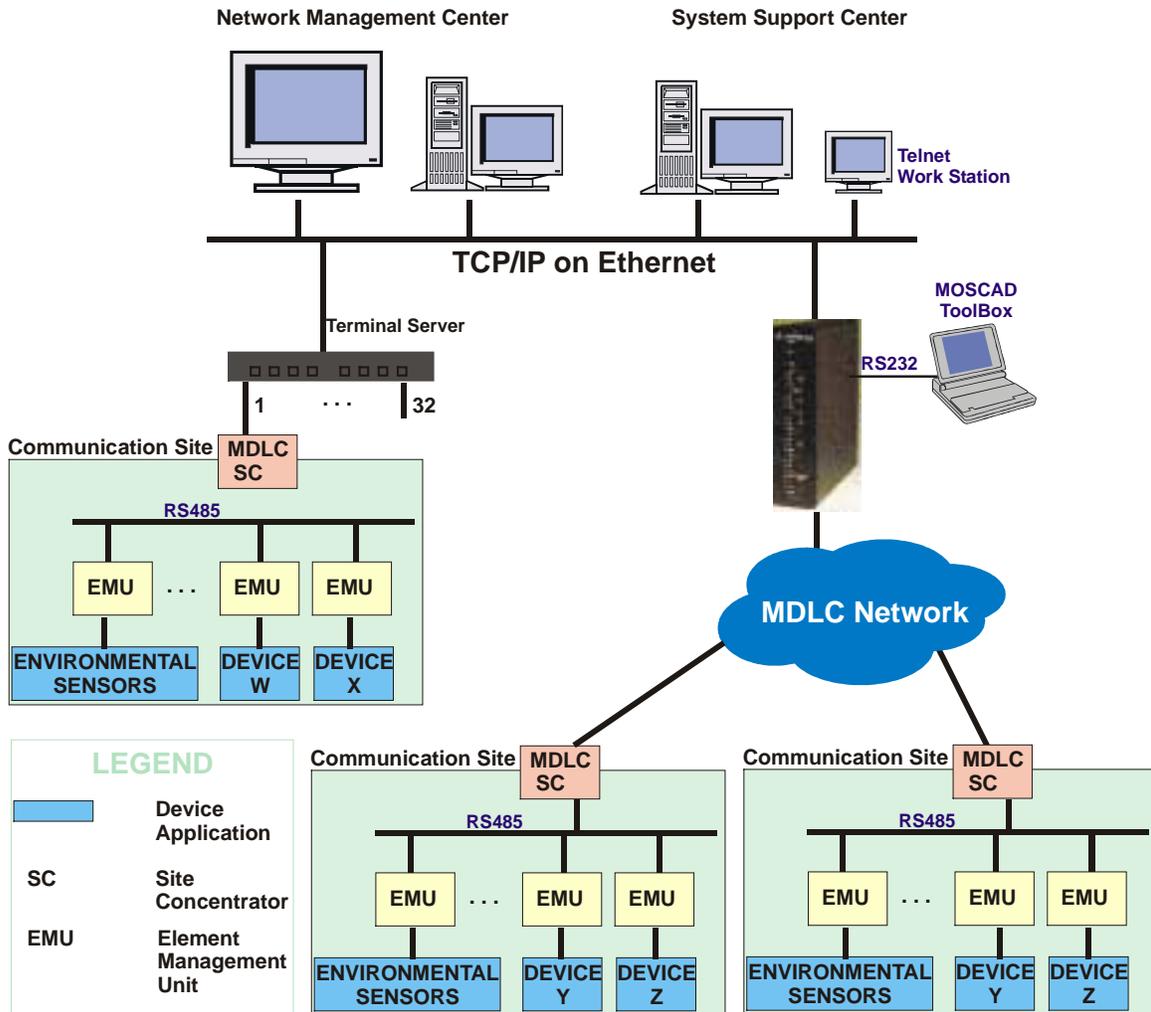
Figure 2-6: MOSCAD NFM System Architecture with TELNET Application

MOSCAD RTU

The MOSCAD RTU is a smart modular unit designed to operate as a stand-alone controller or as part of a system having any number of RTUs, control centers and sub-centers connected through a communication network with any number of links and nodes.

The MOSCAD RTU must be configured and loaded with the appropriate application using the MOSCAD Programming Toolbox.

The MOSCAD RTU is a microprocessor-based unit, which basically consists of a CPU module and various I/O and communication modules. A wide range of I/O and communication modules makes the MOSCAD system flexible to meet most application requirements.

For further details on the MOSCAD RTU, refer to the MOSCAD Owner's Manual and the MOSCAD Service Manual.

MOSCAD Toolbox

The MOSCAD Programming Toolbox software package allows the system engineer to define and maintain the MOSCAD system according to user needs and requirements. The following main functions may be performed by means of the MOSCAD Programming Toolbox:

1. Editing the RTU user program including the following:

    - Site Configuration according to hardware and port configuration

    - Network Configuration according to network configuration

    - Application database

    - Application process

2. Preparing project documentation for the user

3. Automatically creating a central file to be used later during RTU database creation in the SCADA control center

4. Downloading Site Configuration to the MOSCAD RTU via the RS-232 port of the unit

5. Performing the following functions on any MOSCAD RTU either via local connection or via the communication network:

    - Uploading Site Configuration and related data

    - Downloading Application Program and Network Configuration

    - Real-time symbolic (graphic) monitoring and debugging of the application (both database and process)

    - Updating time and date at RTU sites

- Testing all hardware modules, including software calibration of analog inputs and outputs

- Retrieving time-tagged events (of down to 1mSec resolution) logged in the RTUs

- Synchronizing the RTU real-time clock

- Retrieving errors logged in the RTUs (hardware or software malfunctions)

- Capturing the data packets on the communication links and analyzing the protocol seven layer

- System software diagnostics by object entity names

The definition of the RTU application program allows the system engineer to build the RTU's database in a tabular form as a set of tables. The same tables used for the RTU database definition are the basis for process programming, I/O link definition, automatic central database definition, real-time monitoring of RTU operation, etc.

Once the database is built, the RTU programming process is carried out by using the symbolic Motorola Advanced Ladder Diagram Language.

IP Gateway for TCP/IP

The IP Gateway hardware is based on the 68360 Motorola microprocessor, which is a smart CPU with Ethernet and an I/O controller. It includes support for TCP/IP over an Ethernet port (10Base-T and AUI connectors) for communication with the SCADA, and three serial ports for communication with the Toolbox and with the MOSCAD RTUs.

The IP Gateway includes 22 LEDs, located on its front panel which indicate hardware status and communication port activity. In case of a malfunction, see the Indication LEDs section in the Hardware Installation section of this manual.

Two Ethernet connectors give support for connection to either a Twisted-Pair Ethernet cable (via 8-pin RJ45 connector) or a Thick-Wire Ethernet cable (via 15-pin AUI connector). To connect a Thin-Wire coaxial cable to the IP Gateway, a Thin-Wire to AUI connector unit which allows connecting the coaxial cable to the AUI port, should be used (not supplied).

The IP Gateway software provides MDLC services to the SCADA control center applications. The MDLC application layer is used for receiving events, status and telemetry calculated data from the MOSCAD RTUs to the SCADA central applications. It is also used to send controls and process parameters from the SCADA central to the MOSCAD RTUs. The IP Gateway software includes the TCP/IP driver for communicating with the SCADA computers and the MDLC driver for communicating with the MOSCAD RTUs as well as with the MOSCAD Programming Toolbox.

IP Gateway Toolbox

The IP Gateway Toolbox is a software package, which runs on an IBM PC (or compatible), and allows the user to build the configuration for the MDLC and TCP/IP drivers. It also enables the user to download it to the IP Gateway hardware.

The IP Gateway Toolbox features the following:

- Microsoft Windows Man Machine Interface (MMI).

- Graphical User Interface (GUI). Each Toolbox module is represented by an icon, enabling friendly user access.

- Receiving errors logged in the system from the IP Gateway and the RTUs.

- Receiving communication diagnostics from the RTUs and operation diagnostics from the IP Gateway.

- Setting IP Gateway or RTU time and date.

- Downloading of user selected definitions/configurations to the IP Gateway.

- Erase Flash and System Download – enables the user to erase and download specific system partitions.

- Links Configurator – enables the user to change the number of links assigned to each medium.

The IP Gateway Toolbox allows the user to set, modify and download the following four basic groups of parameters:

- TCP/IP driver (IP address)

- IP Gateway configuration (IP Gateway Site ID and Link ID)

- MDLC Network configuration (system-wide MDLC routers)

- MDLC Sites Table (system-wide Site ID and Link IDs)

IP Gateway Web Server

The IP Gateway, version 4.0 and higher, includes a built-in Web Server. The Web server enables users to perform certain Toolbox operations and to convey site information to and from the technicians, regardless of where they are located, over the World Wide Web.

The IP Gateway Toolbox utilities available through the Web Server enable the user to remotely perform the following operations:

- Provide reports on the status of each device in the current IP Interface or Gateway, as well as historical and statistical data on the device activities.

- Remotely define SNMP and Motorola SSC parameters.

- Erase the IP Interface/Gateway Flash memory and downloads a new system.

IP Gateway Redundancy

To minimize the risk of a SCADA control center single point of failure and to ensure high availability for its applications, a redundant IP Gateway can be configured. When one IP Gateway is not available, a second, redundant IP Gateway can be used. To increase the availability of the LAN network, dual Ethernet segments can be used, and each IP Gateway can be connected to a different segment.

In a redundant IP Gateway system configuration, one IP Gateway acts as the primary unit. The primary IP Gateway communicates properly over MDLC communication and over the SCADA channels. There is bi-directional transfer of both SCADA application messages and IP Gateway management messages. The secondary IP Gateway transfers IP Gateway management messages only. (It does not send or receive any MDLC messages, since it is logically disconnected from the link.)

HealthCheck Mechanism

The IP Gateway system includes a HealthCheck mechanism which manages the MDLC connectivity to the sites. Associated with each site are two links, through which the site can be reached. A background mechanism in both the IP Gateway and the MOSCAD units constantly verifies which links are available.

The HealthCheck mechanism uses the site table as the basis for its operations. As the IP Gateway identifies which links are available, it can reduce communication overhead by routing frames destined to sites through their operational links.

Hardware Installation

Hardware description

The IP Gateway hardware is based on the 68360 Motorola processor, which is a dedicated smart CPU with Ethernet and I/O controller. In addition to the communication capabilities, the IP Gateway has powerful processing capabilities, using 32 Mbytes (8 Mbytes X 32 bit) of DRAM and 1 Mbyte (256 Kbyte X 32 bit) of FLASH memory.

A simplified block diagram of the IP Gateway hardware is provided in Figure 3-1.
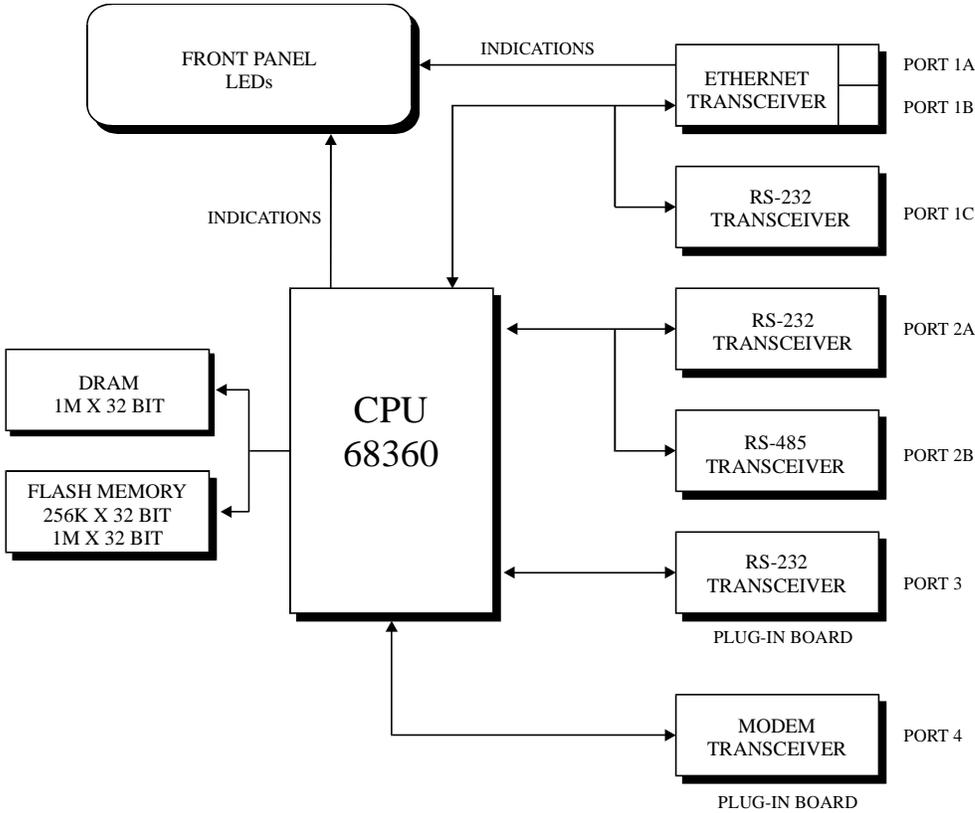
Figure 3-1: IP Gateway, Simplified Block Diagram

Communication Ports

The IP Gateway includes support for TCP/IP over 10 Mbits/sec Ethernet LANs for communication with the SCADA, and three serial ports for MDLC over various links (radio, dialup and dedicated lines, multidrop wireline, serial RS-232 or RS-485) for communication with the MOSCAD RTUs.

The IP Gateway supports multiple logical channels running the TCP/IP protocol over Ethernet, thus allowing multiple processes running on the SCADA computer, to simultaneously access a number of functions in the IP Gateway.

The IP Gateway software supports four communication channels that can be configured to support the following links:

Port 1 A   -   Ethernet - 8-pin RJ45 connector, twisted-pair (TP)

Port 1 B   -   Ethernet - 15-pin AUI connector

Port 1 C   -   RS-232

Port 2 A   -   RS-485

Port 2 B   -   RS-232

Port 3   -   According to the plug-in board (see table below)

Port 4   -   According to the plug-in board (see table below)

Ports 3 and 4 are available with one of the following options:

For ...	Plug-in	Model/Option Board	
		Factory Installed	Field Installed
VHF/UHF Conventional	FSK	V356	FRN 5614
VHF/UHF Conventional	DFM	V390	FRN 5546
UHF + Single-site trunking Multi-site UHF/860MHz trunking radio	DPSK	V370	FRN 5708
Serial Port	RS-232	V345	FRN5724
Line Modem 2400 bps	Dial-up/Dedicated	V226 V404	FRN 5639
Line Modem 1200 bps	Dial-up/Dedicated	V219 V285	FRN 5669

Note: The same plug-in boards that are used for the MOSCAD are used in the IP Gateway.

The third and fourth channels can be connected via plug-in board to various communication media:

Radio: VHF or UHF, conventional or trunked radio, that support the following characteristics:

- FSK up to 2.4 kbps

- DPSK @ 1.2 kbps

- DFM @ up to 4.8 kbps

Wireline: Supports the following modem and their characteristics:

- Leased 2 or 4 wire, up to 2.4 kbps, Sync and Async

- V.22, V.22 bis, Bell 212, Bell 102

- Multidrop 2-wire, up to 1.2 kbps, Sync

- Dial-up, up to 2.4 kbps, Async, V.22, V.22 bis, Bell 212

- RS-232 Async, up to 57.6 kbps

Mechanical Installation

The IP Gateway unit can be supplied with the following two configurations:

Gateway with communication interface

In this configuration, the Gateway is mounted in an NEMA4 housing, suitable for wall mounting and composed of the following:

- Stand-alone Gateway unit

- Radio unit applicable for the required frequency range and power, or alternatively, line unit applicable for interfacing to dedicated or dial-up lines.

- A 110V AC power supply + charger (produces +12V DC for the Gateway's logic board and charges the battery); a 220V AC power supply is available as an option.

- 12V DC battery rated for 5 Ah operation (10Ah battery is available as an option).
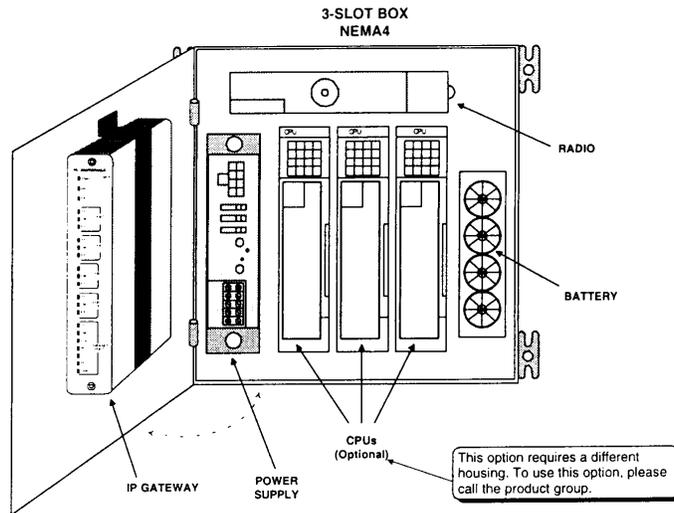
Figure 3-2: IP Gateway with Communication Interface

Stand-alone Gateway unit

The IP Gateway desk-top unit without radio, PS/Charger and box, to be placed on a desk or installed in the central facility by the user. The user must supply 12V DC.
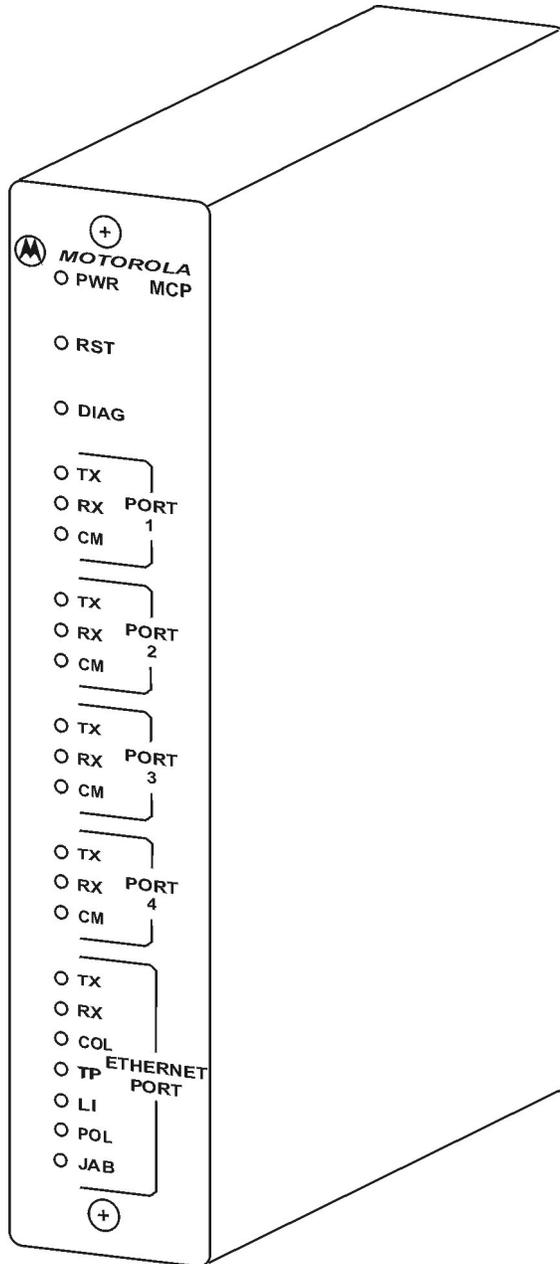
Figure 3-3: Stand-alone IP Gateway

Connectors

Connector Locations

Eight connectors are located on the IP Gateway rear panel as shown in Figure 3-4 below:
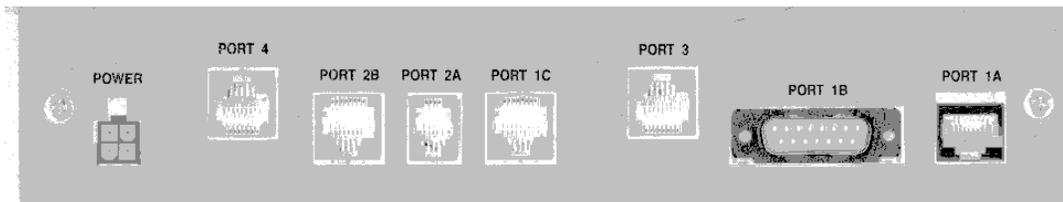
Figure 3-4: IP Gateway Rear Panel

Connector Description

The following table lists the IP Gateway's connectors and their connection points:

Connector	Type/Usage	Pin No.	Signal Name
Power	4 pin Male Connector/ AC Power	1	Relay
		2	Vin
		3	P.GND
		4	GND
Port 2B	RS-232	1	TXD
		2	RXD
		3	CTS
		4	P.GND
		5	CD
		6	RTS
		7	CNTRL
		8	DTR
Port 2A	RS-485	1	+12V
		2	DO_/rI_
		3	DO / RI
		4	P.GND
Port 1C	RS-232	1	TXD
		2	RXD
		3	CTS
		4	P.GND

		5	CD
		6	RTS
		7	CNTRL
		8	DTR
Port 1B	AUI / Ethernet	1	GND
		2	COL+
		3	DO+
		4	GND
		5	DI+
		6	GND
		7	N.C
		8	GND
		9	COL-
		10	DO-
		11	GND
		12	DI-
		13	+12V
		14	GND
		15	N.C
Port 1A	RJ45 / Ethernet	1	TD+
		2	TD-
		3	RD+
		4	N.C
		5	N.C
		6	RD-
		7	N.C
		8	N.C

For connection of Port 3 and 4, refer to the J4 connector in the MOSCAD CPU Module in the MOSCAD RTU Service Manual.

Port Specifications

Ethernet Port

Ethernet is a local area network (LAN) that allows the IP Gateway to communicate with various computers and workstations at 10 Mbps. The connectivity of the IP Gateway to the LAN infrastructure can be either twisted-pair, thick or thin-wire (coaxial) cable.

The IP Gateway includes two types of connectors for connection with the Ethernet port: AUI and 10BaseT. Use either an RJ45 or AUI connector to connect your IP Gateway via either port 1A or port 1B, to Ethernet LAN.

Use the "Thin-Wire to AUI" unit for connecting the IP Gateway to "Thin-Wire LAN" (coaxial media.

A unique Ethernet port address is assigned by Motorola at the factory. This address is on a sticker, placed on the Gateway main board (but you don't need to know it to run the Gateway).

The IP address for the IP Gateway should be assigned by the network administrator and has to be set via the IP Gateway Toolbox. Like the Ethernet address, the IP address should be a unique number.

IP Gateway Toolbox Port

Connect Port 2B of the IP Gateway to the IP Gateway Toolbox. Use the FLN6457 adapter to connect the PC serial ports (COM1 or COM2) to the Gateway.
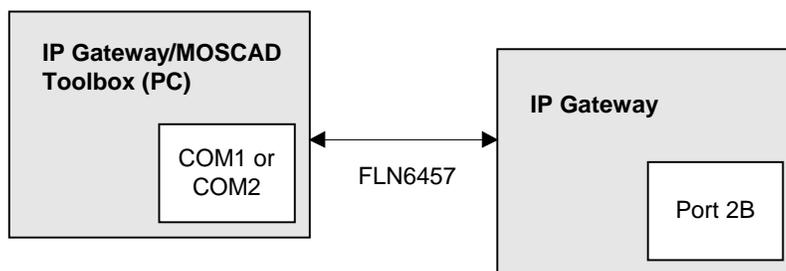
Figure 3-5: IP Gateway Toolbox Connection

If the RS-485 port (Port 2A) is required for communication with the field, use Port 3 for the connection with the IP Gateway Toolbox. To introduce this change, connect the IP Gateway Toolbox to Port 2B and use the Site Configuration program to change the default configuration. Port 2A will now serve for communication over RS-485 with the field, and Port 3 will serve for communication over RS-232 with the PC.

After downloading the new configuration, you can use the IP Gateway Port 3 for connection to the IP Gateway Toolbox (PC Port, COM1/COM2).

Always use Port 2B in order to erase and download a new Gateway software version (CODE) or to erase and download the default configuration (CON) via your PC. Use this port also to download a new Gateway configuration to your updated Gateway software, via your IP Gateway Toolbox.

RS-232/RS-485 Communication Ports

For various radio or line communication configurations, first install the designated plug-in board on Port 4 and run the Site Configuration program from your IP Gateway Toolbox in order to configure the proper plug-in board.

Use an RS-232 MOSCAD cable, FLN6457A, to connect the IP Gateway (Port 2B or Ports 3 or 4) to the MOSCAD CPU.

Use an RS-485 MOSCAD Cable, FKN4400A, to connect the IP Gateway via Port 2A to the MOSCAD CPUs for communication with the MOSCAD environment.

Power Supply

The IP Gateway with connection interface is powered by the MOSCAD 12V power supply (10.8 ÷ 15.1V DC). Connect a four-wire power cable - FKN4411A - from this power supply to POWER on the rear panel.

The stand-alone Gateway is powered from an external +12V DC power supply.

Indication LEDs

There are 22 indication LEDs located on the IP Gateway's front panel. These LEDs provide an indication of the board status and communication ports activity. Table 3-4 below describes each indication. The front panel and LEDs are shown in Figure 3-6 below.

Indication	Port	Description
PWR		The IP Gateway is DC powered.
RST		A hardware or software reset is being executed.
DIAG		An ERROR Message is pending in the Error-Logger.
TX	Port 1	
CM	Port 1	RS-232 - Not supported
RX	Port 1	
TX	Port 2	Data Transmission
CM	Port 2	Busy Channel
RX	Port 2	Data Reception
TX	Port 3	Data Transmission
CM	Port 3	Busy Channel
RX	Port 3	Data Reception
TX	Port 4	Data Transmission on port 4
CM	Port 4	Busy Channel - port4
RX	Port 4	Data Reception
TX	Ethernet	Data Transmission on Ethernet port
RX		Data Reception on Ethernet port
COL		A collision is sensed on the Ethernet lines.
TP		The twisted pair port is selected (J6).
LI		Link integrity is ok.
POL		A reverse polarity is sensed on the reception line.
JAB		A jabber condition is sensed on the twisted pair lines.

Table 3-4: List of Indications

Note: When reverse polarity is detected on the reception lines (High and Low), the indication POL is lit, but the reception is not disabled.
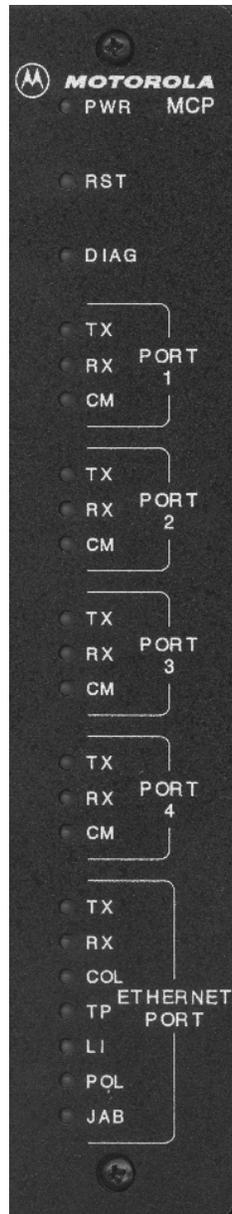
Figure 3-6: IP Gateway Indication Panel

LEDs Combinations

A combination of lighted LEDs indicates a malfunction in the CPU. The nature of the malfunction is indicated by the LEDs which light simultaneously with the DIAG LED, as detailed below:

(DIAG LED is on):

- (1) CM LED is on: RAM test has failed.

3-11

- (2) RX LED of Port 4 is on: ROM test has failed.

- (3) CM and RX LEDs are on: FLASH memory test has failed.

- (4) TX4 LED is on: Create software module has failed.

- (5) CM4 and TX3 LEDs are on: Real time clock has failed.

- (6) RX3 and TX3 LEDs are on: Internal clock has failed.

- (7) CM3, RX3, and TX3 LEDs are on: Hardware breakpoint has failed.

- (8) MON LED is on: XTAL rate change has failed.

- (9) CM3 and MON LEDs are on: User request has failed.

- (10) RX3, CM3, and MON LEDs are on: The current site configuration was downloaded by a previous version of the Programming Toolbox.

- (11) TX and CM LEDs of Port 4 are on: Creating of Heap failed.

Software Installation

Introduction

The IP Gateway Toolbox software which is delivered with the IP Gateway unit, allows the system engineer to define and maintain the MDLC and TCP/IP parameters according to system requirements and user needs. It runs on a PC, under the Windows environment and provides the user with access to the following programs:

- Site Configuration
- Sites Table Configuration
- Network Config
- MDLC Links Configurator
- Host Table
- SW Diagnostics & Loggers
- Phone Book
- Dial Up
- DataTac Modem ID Table
- SNMP Configuration
- IP Conversion Table
- Site Date and Time
- Downloader

Each of these programs may be selected from the IP Gateway Toolbox Main Menu:
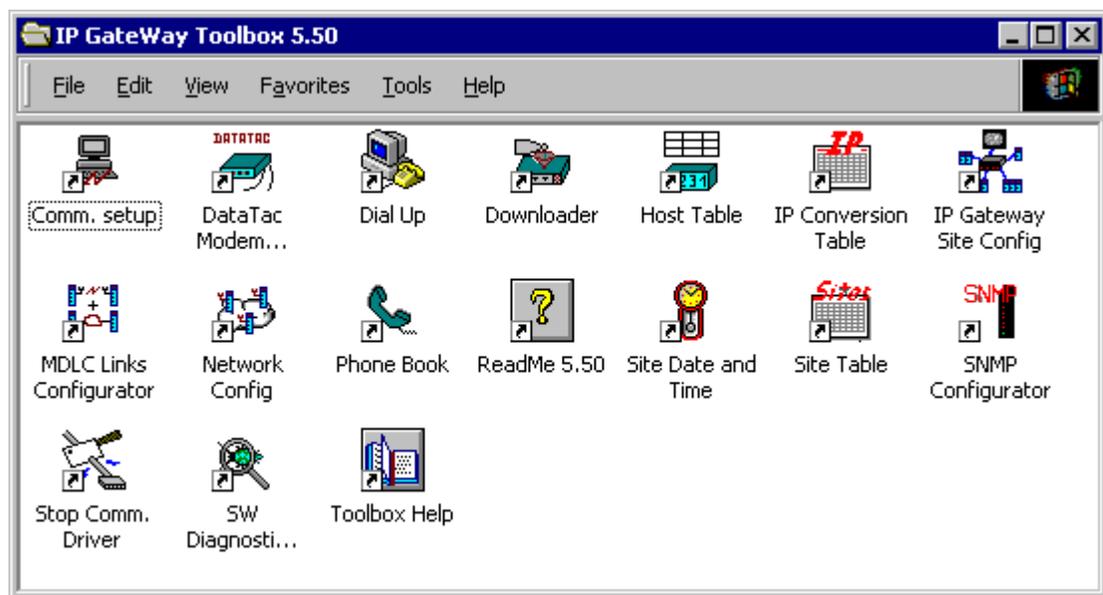
IP Gateway Toolbox - Functions and Features

a.   The following configurations for the MDLC and TCP/IP can be edited:

- IP Gateway Site Configuration, according to hardware and port configuration
- MDLC Network Configuration, according to system-wide network configuration
- MDLC Sites Table (system-wide Site IDs and Link IDs)
- Host Table for manager registration
- Phone Book for dial-up modem support
- Data Tac (RNC) Modem ID Table
- IP Conversion Table
- SNMP Configuration

b.   Downloading Site Configuration, Network Configuration, MDLC Site Tables, IP Gateway Configuration and TCP/IP Driver Configuration to the IP Gateway via the RS-232 port.

c.   Retrieving errors logged in the IP Gateway (hardware or software malfunctions)

d.   IP Gateway or MOSCAD RTU software diagnostics by object entity names

Prerequisites

Before installing the IP Gateway Toolbox application, make sure that your computer (IBM PC or compatible) has the following minimum configuration:

Hardware

- Pentium 100 or better
- CD-ROM drive
- Hard disk - the IP Gateway Toolbox requires at least 20 Mbytes on your disk
- 32 Mbytes RAM

Software

- Microsoft Windows Operating System

Installation Procedures

This document outlines the instructions for installing the IP Gateway Toolbox Application software. An installation CD-ROM is supplied with the IP Gateway Toolbox.

Follow the instructions on the screen.

To install the IP Gateway Toolbox software, proceed as follows:

1. Insert the installation CD-ROM in the CD drive.

2. Select Install IP Gateway Toolbox V5.50.

3. The Install Wizard displays the product's Splash Logo (see Figure 4-1) and the setup program prepares the InstallShield(r) for installation.
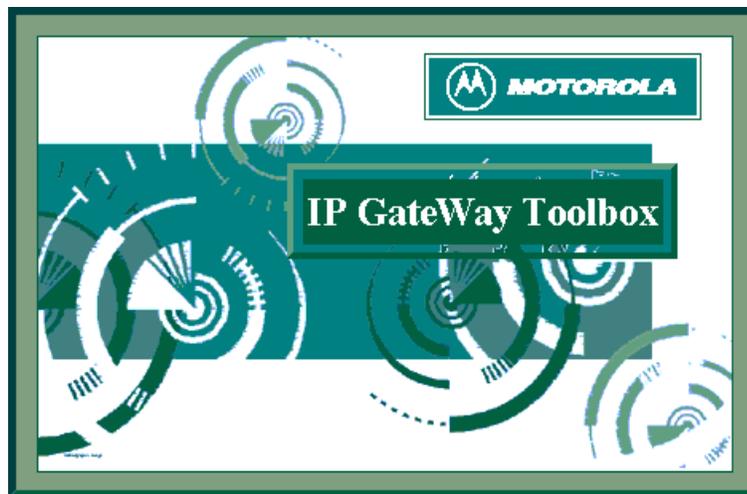
Figure 4-1: IP Gateway Toolbox Application Splash Logo

4. The Install Wizard starts with the Welcome Dialog screen (see Figure 4-2). Make sure to exit all Windows applications before continuing with the setup. If you have other Toolbox applications running, be sure to stop the communications driver after you quit all applications. After reviewing the instructions, click **NEXT**.

Figure 4-2: Welcome Dialog screen

5. The Install Wizard displays the Software License Agreement (see Figure 4-3). Please read the text in this screen carefully, then click **YES** if you want to accept the license agreement and continue with the installation.
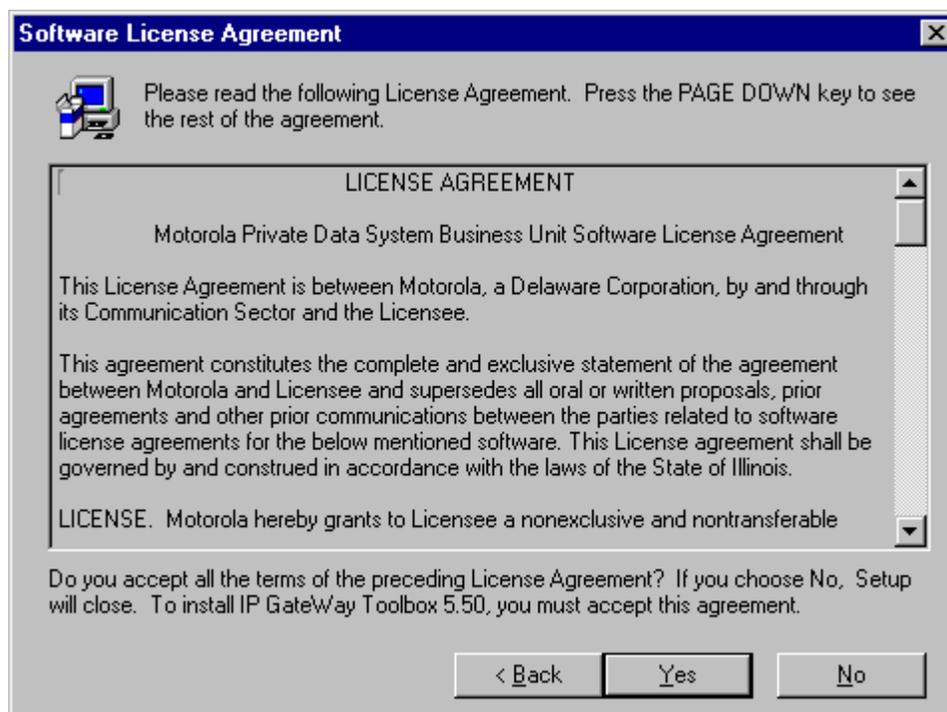
Figure 4-3: Software License Agreement screen

6. The Install Wizard displays the *Choose Destination Location* screen with the default directory path **C:\Itbox550** (see Figure 4-4). If the default directory is acceptable, click **NEXT**. To install the software in a different directory, click **BROWSE** and then specify the pathname of a different folder.
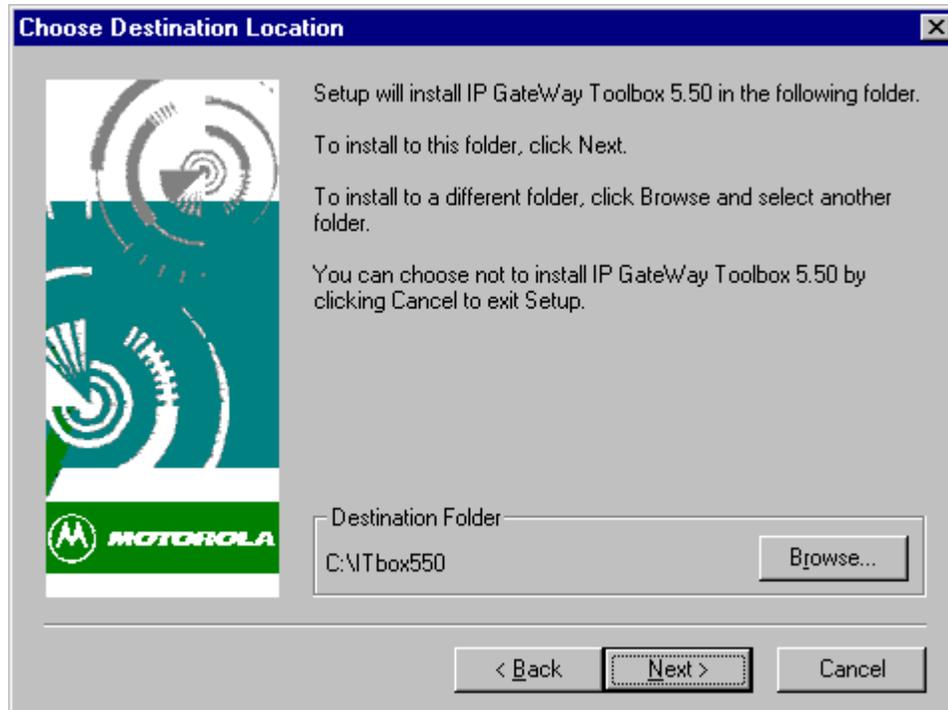
Figure 4-4: Destination Drive and Directory Dialog screen

If you clicked the **BROWSE** button, the Installation Wizard displays the *Choose Folder* screen (see Figure 4-5). Click on the desired directory, then click **OK**.

Figure 4-5: Choose Folder screen

If you specified a non-existing destination directory, the Install Wizard inquires if you want to create this directory (see Figure 4-6). If you answer **Yes**, the Wizard creates a new directory. If you answer **No**, you are prompted to specify a new destination path.
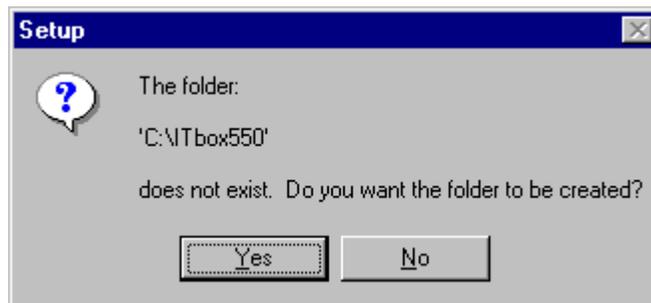
Figure 4-6: Create New Destination Directory screen

7. The *Select Program Folder* screen suggests that you install the Toolbox icons in the IP Gateway Toolbox folder (see Figure 4-7). If you wish to install the Toolbox icons in a different folder, select a program folder from the Folders list, or, if you wish to create a new folder, type a new program folder name. Click **NEXT**.
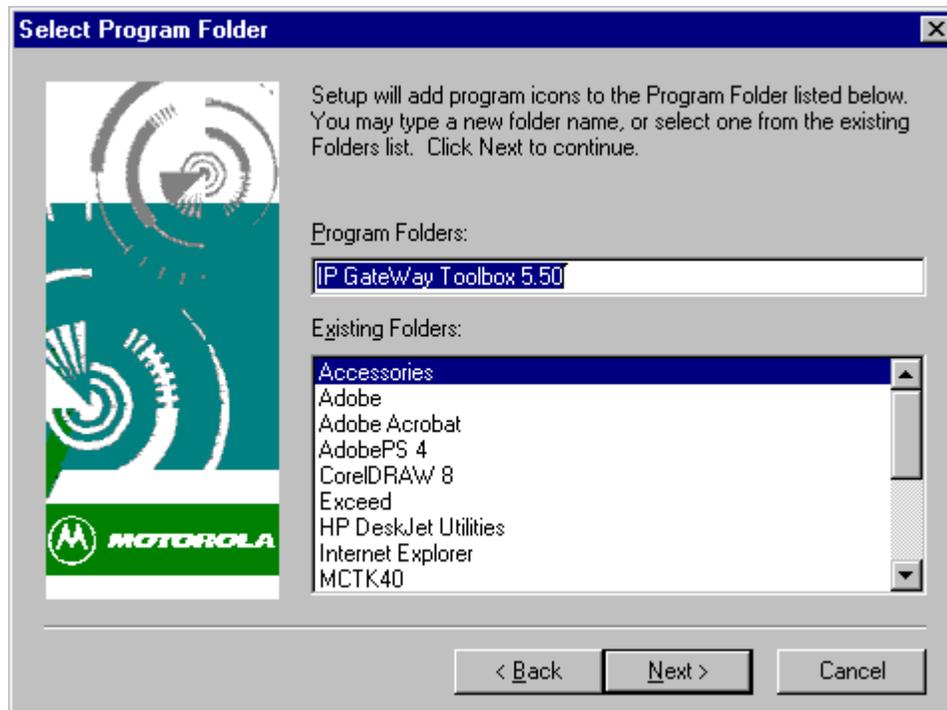
Figure 4-7: Select Program Folder screen

8. The Installation Wizard displays the *Confirm Your Settings* screen (see Figure 4-8). Verify that your settings are correct. If your settings are incorrect, click **BACK** to make the necessary changes. If your settings are correct, click **NEXT** to start the installation.
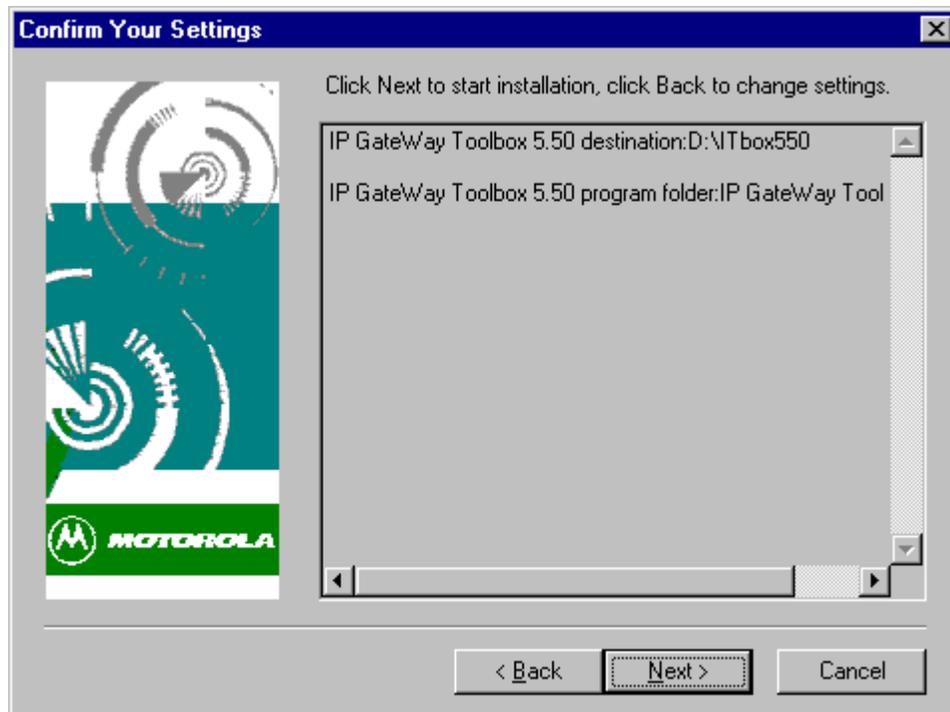
Figure 4-8*:* Confirm Your Settings screen

9. While the Setup program copies the IP Gateway Toolbox software files, a program indicator displays the progress of the file transfer progress (see Figure 4-9).
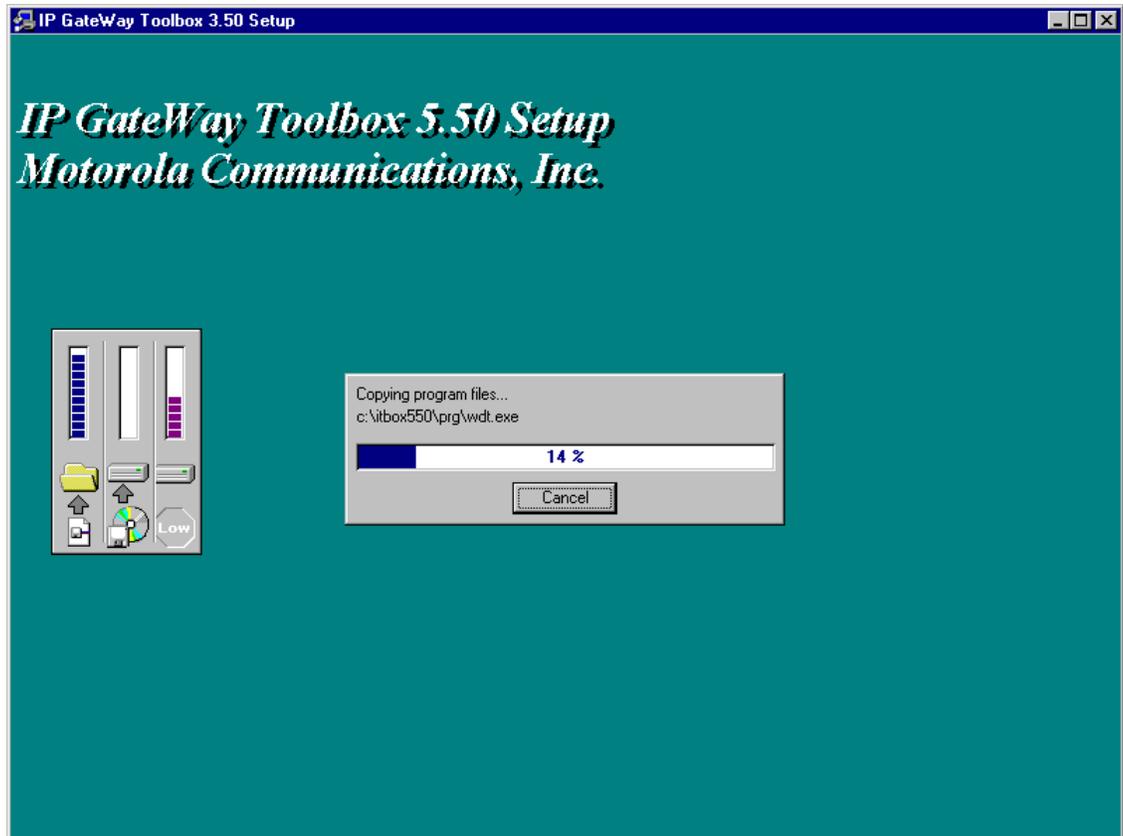
Figure 4-9: File Transfer Progress screen

10. When the last installation diskette is copied, setup displays a confirmation message indicating that the installation was successful (see Figure 4-10). After completion of the installation process, specify whether you want to view the Readme file, then click **FINISH** to complete the setup.

Figure 4-10: Setup Complete screen

Starting a Toolbox Application

In Windows, the IP Gateway Toolbox folder is located in the **Start** menu. To select the folder:

- Open the **IP Gateway Toolbox 5.50** icon created automatically on the desktop during installation.

  OR

- Press the **Start** button
- Select **Programs**
- Find the **IP Gateway Toolbox 5.50** folder (or any other name you may have specified during installation).
- Select the desired tool from the Toolbox.

IP Gateway Toolbox

General Concept

The Windows-based IP Gateway Toolbox software which is delivered with the IP Gateway unit, allows the system engineer to define and maintain the IP Gateway parameters. For communication over the IP network, the IP Gateway requires that a unique Gateway IP address be set, as well as other optional TCP/IP parameters. For communication with the MOSCAD RTUs, the IP Gateway requires that the type of the communication links be selected, as well as the routing topology and other optional MDLC configuration parameters.

When you start the IP Gateway Toolbox, the main IP Gateway Toolbox screen appears with the following icons:
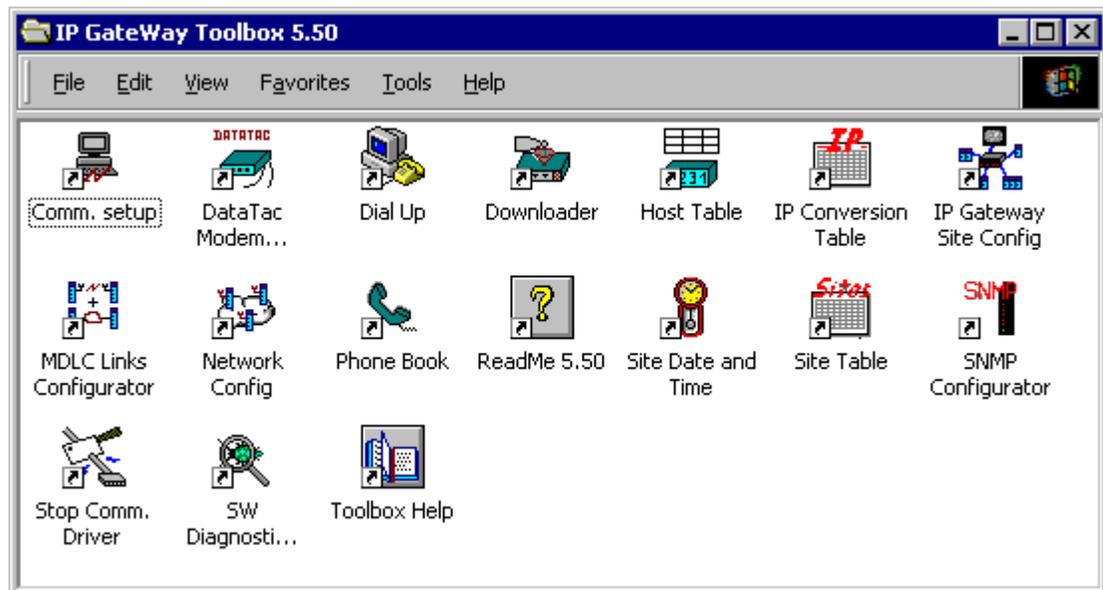
Each icon represents a program that allows you to define, modify and save the sub-configuration or to retrieve diagnostics reports from the Gateway.

Site Configuration

The IP Gateway system operates with a very wide range of communication boards which satisfy most application requirements. To make the system operation more efficient, the configuration of the IP Gateway unit should be defined. Site configuration involves the following:

- The ports of the IP Gateway and their parameters.
- Site ID (logical address) and system address.
- The IP Address of the IP Gateway

Once the configuration is downloaded to the site, it is ready to communicate with the devices connected to its ports (Computer, RTU, Terminal Server, etc.).

Note: CPU modules received from the factory are configured to the default configuration.

Site Configuration Window

The Site Configuration window allows you to define, modify, and save the IP Gateway ports and their parameters. To start the Site Configuration tool, double-click the Site Configuration icon in the IP Gateway Toolbox folder. The following will appear:
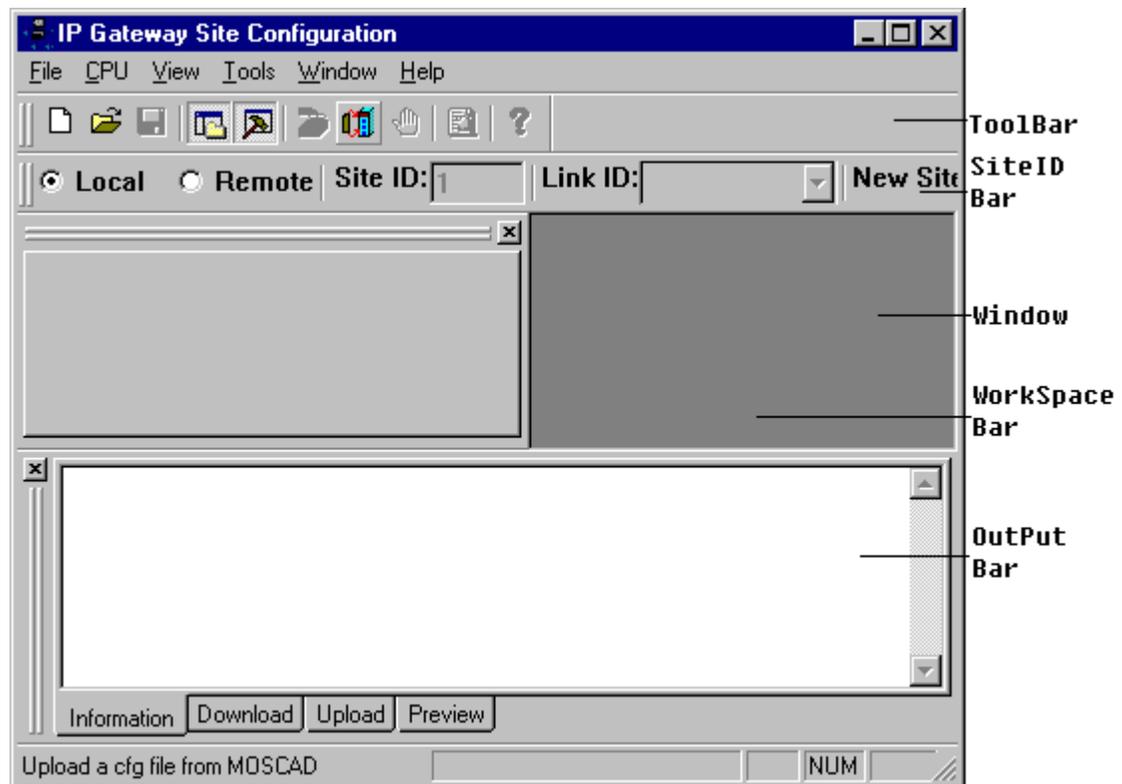
ToolBar

The Toolbar displays the icons described under *Icons*.

SiteIDBar

| ○ Local ○ Remote | Site ID: 1 | Link ID: ▼ | New Site ID: 1 | System Address: 0 |

The SiteIDBar is used to specify the IP Gateway to which the site configuration will be downloaded and from which a site configuration can be uploaded. For SiteIDBar parameters, see the *Download* and *Upload* commands.

WorkSpaceBar

The WorkSpaceBar becomes available when you create a new site configuration file, open an existing file, or upload a configuration from the IP Gateway. The WorkSpaceBar provides an index into the various parameters of the site configuration and enables you to view or modify their values.

Port Tab

```
□ def1
  └ def1
     ├ Port 2
     │   ├ Type : RS-232, Async, Local computer
     │   ├ User
     │   ├ Advanced Physical Layer
     │   └ Advanced Link Layer
     ├ Port 3
     │   ├ Type : RS-232, Async, Local computer
     │   ├ User
     │   ├ Advanced Physical Layer
     │   └ Advanced Link Layer
     └ Port 4
         ├ Type : Radio, Conventional, MTS-2000, No repeater, DPSK
         ├ User
         ├ Advanced Physical Layer
         └ Advanced Link Layer
```

| Port | IP Port | Advanced | SCADA |
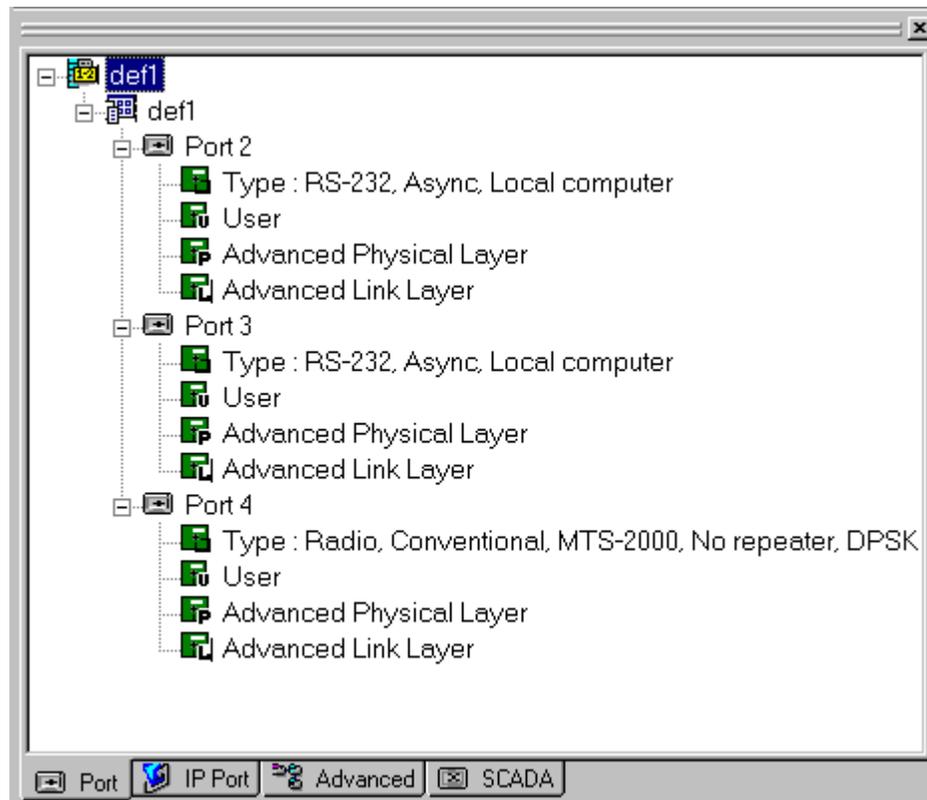
The WorkSpaceBar Port tab contains a treeview of the three IP Gateway ports. The items in this treeview provide access to screens and parameters which define how each of the ports is connected to the communication network and which devices are connected to each port.

The highest level item in the treeview is the workspace name and below that is the project name. The third level contains the three ports – Port 2, Port 3, and Port 4.

A '+' sign before an item indicates that it contains other levels and can be expanded. Single-click the '+' (or double-click the item name) to expand it and access the next level. A '-' sign before an item indicates that it is fully expanded. Single-click the '-' (or double-click the item) to collapse it and hide its sublevels.

For each port, four screens can be opened: Type, User, Advanced Physical Layer, and Advanced Link Layer. Double-click on a screen name to open the screen in the client area. For more information about the port parameters and their settings, see *Port Parameters* below.

IP Port Tab
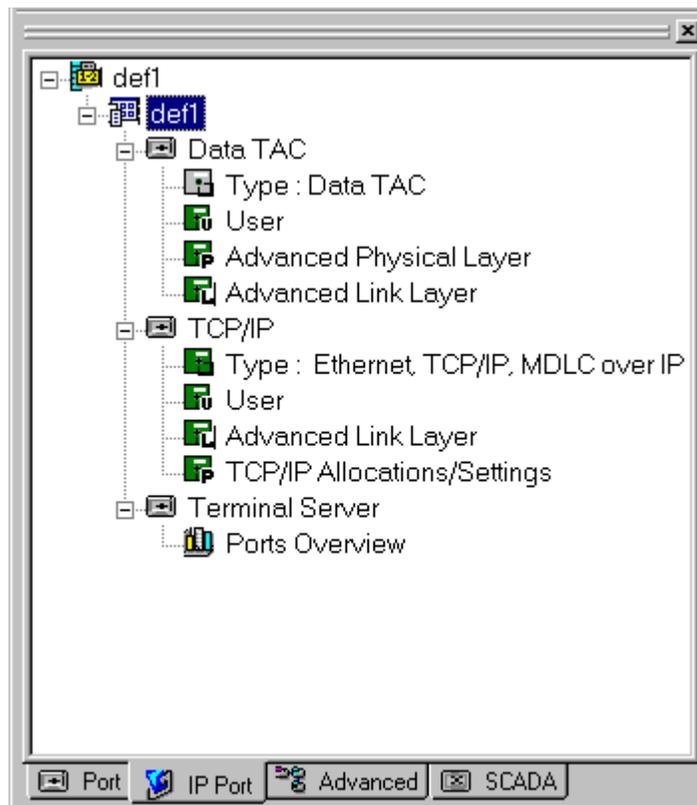
The IP Port tab contains a treeview of the Application Definition for the IP Port and the parameters for Port 1 and Terminal Server ports. As with the Port tab, the highest level item in the treeview is the workspace name and below that is the project name. The third level contains the definitions for DataTac, TCP/IP, and Terminal Server. By default, only the TCP/IP item can be defined. To define the DataTac and Terminal Server settings, right-click on the item and select Define from the right-click menu.

The IP Port tab treeview can be collapsed or expanded the same as the Port tab.

For more information, on configuring the IP Port, see *IP Port* below.

Advanced Tab
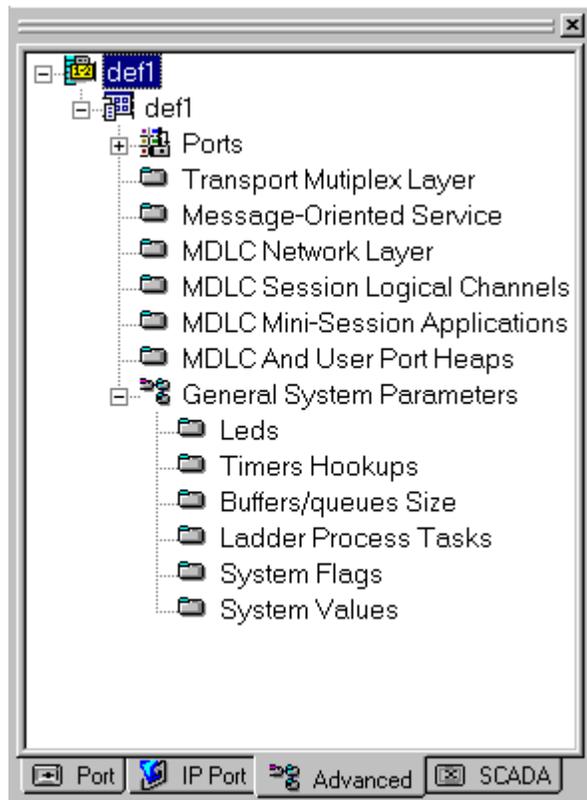
The WorkSpaceBar Advanced tab contains a treeview of the port parameters and the advanced parameters of the site configuration. As with the other tabs, the highest level item in the treeview is the workspace name and below that is the project name. The next level in the treeview contains a variety of parameters.

The items under the project are displayed according to context.

Items preceded by a '+' or '-' sign can be collapsed, expanded and opened, as described under the Port tab. Items not preceded by a '+' or '-' sign can be opened by double-clicking on the item name.

For more information, see *Advanced Parameters* below.

SCADA Tab

The WorkSpaceBar SCADA tab contains a treeview of the SCADA system parameters.

As with the other tabs, the highest level item in the treeview is the workspace name and below that is the project name. Items preceded by a '+' or '-' sign can be collapsed, expanded and opened, as described under the Port tab.

The next level in the treeview contains SCADA system parameters. Two screens of General and Gateway parameters can be opened. Double-click on a screen name to open the screen in the client area.

For more information about the SCADA system parameters and their settings, see *System Parameters* below.

OutPutBar

The OutPutBar displays information about the site configuration file and the download/upload process. The OutPutBar appears on the Site Configuration by default, but can be closed by clicking on the 'x' in the upper left-hand corner. To redisplay, check OutPutBar on the View menu.

Information Tab
This tab lists the version of the IP Gateway Toolbox version under which the configuration was created (e.g. V5.50), and the corresponding unit type (IP Gateway).

Download Tab
This tab is used to display information about the download of the site configuration to the IP Gateway. For more information, see the *Download* command below. (File menu)

Upload Tab
This tab is used to display information about the upload of the site configuration from the IP Gateway. For more information, see the *Upload* command below. (File menu)

Preview Tab
A summary of the current site configuration file will be displayed in this tab, when the *Preview Current File* command is executed. (File menu)

Icons

The following is the list of the available command icons in the toolbar.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	View menu, WorkSpaceBar command
	View Menu, OutPutBar command
	File menu, Download command
	File menu, Upload command
	File Menu, Abort Upload/Download command

🔳	File Menu, Preview Current File command
🔑	Help Menu, About Site Configuration command

File Menu

The commands in the File menu are mainly designed to handle configuration files.

New

The New command (Site Configuration, File menu) opens a new site configuration file. After this command is activated, the following dialog box is shown. Enter a project name and hit OK.
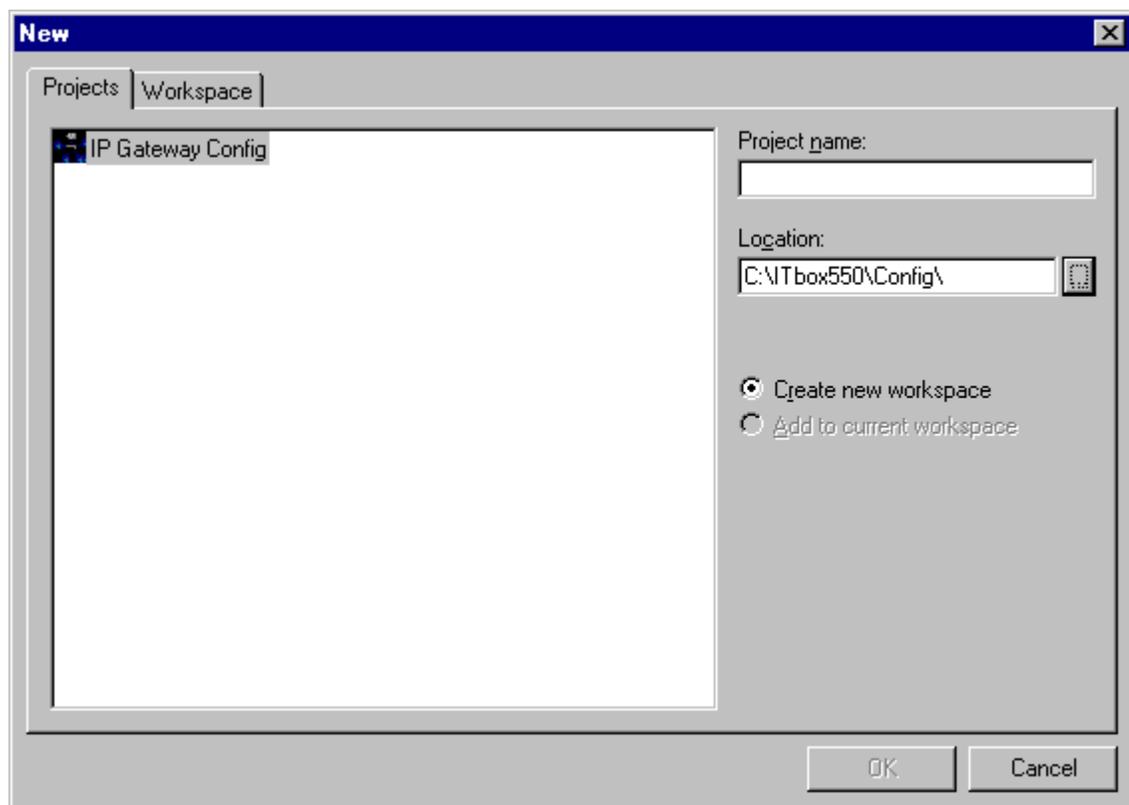
🔲 **Dialog box parameters**

Project Name
The name of the site configuration file.

Location
The folder in which the site configuration file will be created. By default, site configuration files are stored under C:\Itbox550\config.

Open

The Open command (Site Configuration, File menu) opens an existing site configuration file. After the command is activated, the ToolBox displays the Open dialog box, as shown below.
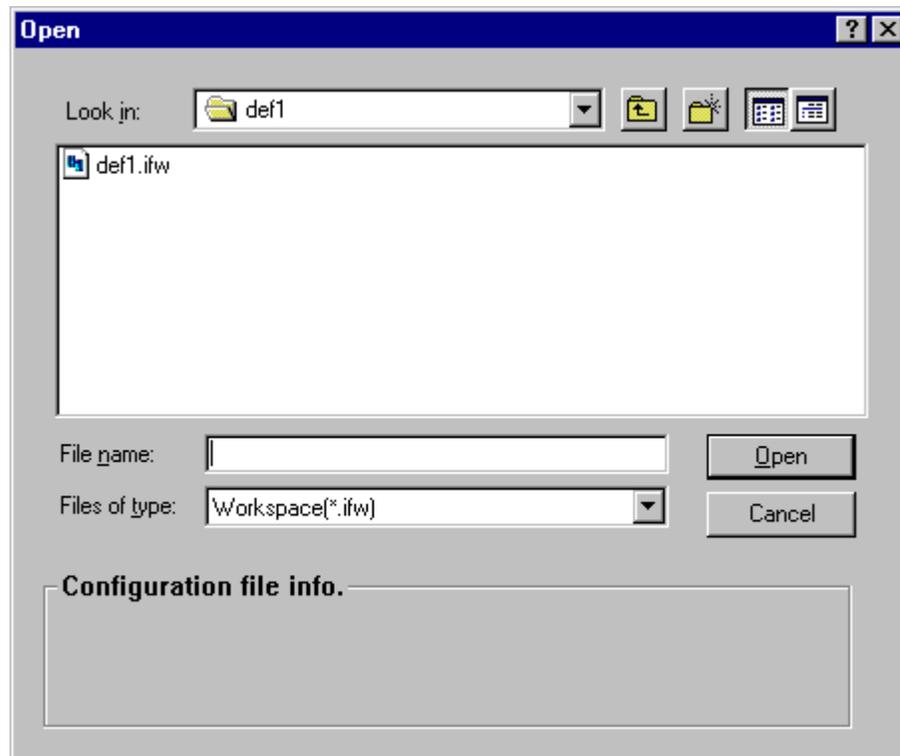
Initially, the Open dialog box defaults to the config sub-directory of the ToolBox directory (e.g., C:\Itbox550\config), where the ToolBox stores configuration files by default. After the first execution of the Site Configuration utility, the Open dialog box defaults to the directory of the last opened configuration file.

Select the configuration file (see parameters below) and click OK to load it.

Dialog box parameters

Use the parameters in the order specified below.

Look in
If the currently displayed directory is not the correct one, open the Look in list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the configuration file. Site Configuration automatically adds the extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. There are three file types in the drop-down list: Workspace (.ifw), Project (.ifp), and Config File (.cfg).

The IP Gateway Toolbox recognizes and opens configuration files saved with previous ToolBox versions. If you open an older configuration file, a message box, like the one illustrated below, is displayed:

```
┌─────────────────────────────────────────────────────────┐
│ Open Format                                          [×]  │
├─────────────────────────────────────────────────────────┤
│                                                           │
│   The Configuation has been created by Toobox version = V3.50 │
│                                                           │
│          Edit and Save configuation as in format of:      │
│                                                           │
│   ┌─────────┐   ┌─────────┐   ┌─────────┐   ┌─────────┐  │
│   │  V5.50  │   │  V3.50  │   │ Cancel  │   │  Help   │  │
│   └─────────┘   └─────────┘   └─────────┘   └─────────┘  │
└─────────────────────────────────────────────────────────┘
```
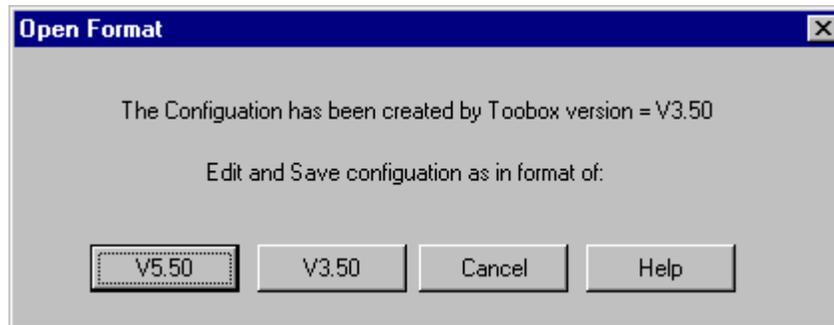
- To keep the older format, click the V3.50 button. In the Site Configuration menus, new features will appear dimmed, but the configuration can be changed using the enabled features (those are the features that exist in the older version of the ToolBox). After saving the updated file, you can still open and modify it using the older version of the ToolBox.

- To upgrade the configuration file to take advantage of the new ToolBox features, click the V5.50 button.

!   IMPORTANT

If you click V5.50, you will not be able to load the file with an older version of ToolBox.

Save WorkSpace

The Save WorkSpace command stores the current configuration.

Save as

The Save as command saves the current configuration under another name.

After activating this command, ToolBox displays the Save As dialog box, as shown below.

⬛**Dialog box parameters**

Use the parameters in the order specified below.

Save in
If the currently displayed directory is not the correct one, open the Look in list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the configuration file. Site Configuration automatically adds the extension. Alternatively, locate the file name in the file list.

Save as Type
This box shows the type (extension) of the files currently displayed in the File Name list. There is only one file type in the drop-down list. Config File (.cfg).

Close WorkSpace

The Close WorkSpace command clears the current configuration data from the screen and workspacebar.

Download

The Download command is used to download a site configuration file to the IP Gateway (to be stored in the FLASH memory). You can download to the IP Gateway directly connected to the ToolBox computer, or to a remote IP Gateway.

This command also enables you to change the Site ID and system address of the IP Gateway unit.

Before activating the Download command:

- Make sure that you have opened the correct configuration file - the one that contains the configuration for the IP Gateway you are communicating with. Use the Open command to open a configuration file.

- Ensure that the OutPutBar is displayed.

- Ensure that the SiteIDBar is displayed and the address is configured properly.

- Ensure that the ToolBox computer is ready to communicate.

Use the SiteIDBar to specify the IP Gateway to which the site configuration file is to be downloaded.

SiteIDBar parameters

Local
If the ToolBox computer is locally connected to the IP Gateway, make sure that this parameter is selected. Note: New site ID (default=1) will be used.

Remote
If you want to configure a remote site, click this parameter.

Site ID, Link ID
If you want to configure a remote site, specify its Site ID, open the Link ID drop-down list and select the appropriate link ID.

New Site ID
To specify a new site, change the site ID and the system address of the IP Gateway. Enter the appropriate values in the Site ID field. The default is 1.

The site ID defines the unit's logical address, and it may range from 1 to 65,287.

System Address
To specify a new site, change the site ID and the system address of the IP Gateway. Enter the appropriate value in the System Address field. The default is 0.

The system address is the physical base address assigned to the whole system, and may range from 0 to 65,535. The base address is used in broadcast transmissions.

The physical address of each IP Gateway is automatically allocated by ToolBox and by the control center in the form of <system address> + k where k is the logical address (Site ID) of the unit. For example, if the system address is 100, then the IP Gateway addresses may be 101, 102, …, 100+n. If two systems share the same communication radio (over one frequency) and the first system contains N sites, then the system address of the second system must be defined as N+50 (50 addresses reserved).

After specifying the IP Gateway in the SiteIDBar, click on the Download icon or select Download from the File menu. The ToolBox will ask you to specify the communication password. After the correct password is entered, ToolBox will begin downloading the configuration file. The download information and status will be displayed in the OutPutBar Download Tab. At the end of the download operation, the IP Gateway will perform a cold restart and build the software object entities according to the user's definitions. Once a unit has been reconfigured and restarted, the port used for configuration may no longer be defined as RS232 Local Computer port. In this case, connect the ToolBox to another port, defined as Computer port, in order to proceed with your work. For a local connection to the ToolBox, there must be at least one port defined as RS232 Local Computer port.

If none of the ports is defined as RS232 Local Computer, ToolBox access will be permitted through any port, provided it is defined as MDLC. If there is no such port, access will be denied. You may reset the configuration of the IP Gateway using the 'Erase Configuration' operation in the Downloader application.

Upload

The Upload command is used to read the site configuration from the IP Gateway into the ToolBox. You can upload from the IP Gateway directly connected to the ToolBox computer, or from a remote IP Gateway.

Before you activating the Upload command:

- Make sure that the OutPutBar is displayed.

- Make sure that the SiteIDBar is displayed and the address is configured properly.

- Make sure that the ToolBox computer is ready to communicate.

Use the SiteIDBar to specify the IP Gateway to which the site configuration file is to be uploaded.

SiteIDBar parameters

Local
If the ToolBox computer is locally connected to the IP Gateway, make sure that this parameter is selected.

Remote
If you want to upload the configuration of a remote site, click this parameter.

Site ID, Link ID
If you want to upload the configuration of a remote site, specify its Site ID, open the Link ID drop-down list and select the appropriate link ID. If a configuration created with an earlier version of ToolBox is uploaded, a message box appears which is similar to the one that displays when you activate the Open command for an older configuration. See details in Open, earlier in this chapter.

After specifying the IP Gateway in the SiteIDBar, click on the Upload icon or select Upload from the File menu. The ToolBox will ask you to specify the communication password. After the correct password is entered, ToolBox will begin uploading the configuration file. The upload information will be displayed in the OutPutBar Upload Tab. After the upload operation ends successfully, the ToolBox displays useful status information in the Upload Information dialog box, as illustrated below.

The information includes details such as the number of times the FLASH memory of that specific IP Gateway has been burnt (the FLASH memory may be burnt 10,000 times). The version numbers of the IP Gateway and ToolBox are also displayed. Another important piece of information displayed in this window is about the configuration of the specific IP Gateway - the version number of ToolBox that was used when programming the configuration.

The version numbers of ToolBox and IP Gateway system software are updated when additional features and improvements are added.

Compatibility between ToolBox and the IP Gateway is assured only if the version number of ToolBox software is higher than the version number of the IP Gateway system software.

The version number is composed of two numbers, as follows: Va.b. Note that *a* is a one-digit number and *b* is a two-digit number (for example, V1.34).

The number to the left of the decimal point describes a major modification of the software, while the number to the right of the decimal point describes a minor modification.

Abort Upload/Download

The Abort Upload/Download command stops the upload or download process.

View Last Upload Information

The View Last Upload Information command displays information about the most recent upload. See Upload above.

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Preview Current File

The Preview Current File command displays the main settings of the current configuration file. The current file information is displayed in the OutPutBar Preview tab.

Print

The Print command prints the contents of the current configuration file to your standard system printer, as defined in Print Setup.

To print the contents of the current configuration file to a postscript (.prn) or text file, check the Print to File box in the Print dialog. The following dialog box will appear, as shown below.
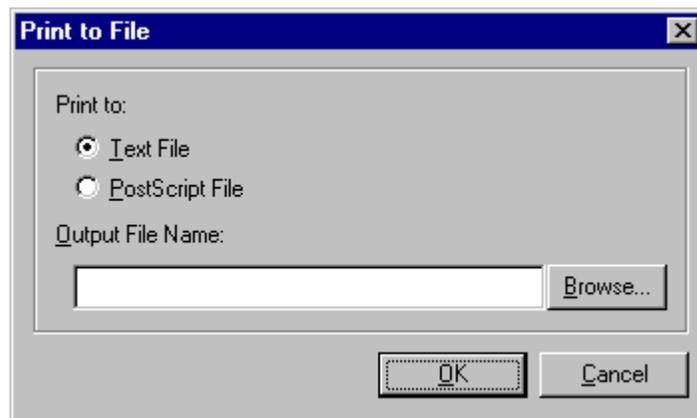
To select the desired output format, click on Text File or Postscript File.

To specify the output file name, type in the name (.e.g gwcfg.txt, gwcfg.prn) or browse using the Browse button.

To print the file, click OK. To cancel, click Cancel.

Print Setup

The Print Setup command enables the user to define or modify the page setup and printer to be used. If no printer is set up, see Windows Help or your system administrator.

Recent Workspaces

The Recent Workspaces command enables the user to easily access the five most recently used configuration files. Select the desired file name from the Recent Workspaces sub menu and Site Configuration will open this configuration file.

Exit

The Exit command (Site Configuration, File menu) closes Site Configuration. If you have made changes in the currently loaded configuration file and have not saved it yet, ToolBox displays a message box where you can decide to save the latest changes (Yes) or to close the file without retaining the changes (No).

CPU Menu

The CPU menu displays the IP Gateway type. It cannot be modified by the user.

View Menu

The commands in the View menu are mainly designed to handle the display of the control bars. The following views are available to the user. Click on an entry to select it, and a check mark will appear on the menu. The associated view is then displayed.

ToolBar

When checked, this command displays the ToolBar of icons, usually at the top of the screen.

WorkSpaceBar

When checked, this command displays the WorkSpaceBar with its treeview and tabs, usually on the left side of the screen.

OutPutBar

When checked, this command displays the OutPutBar, usually towards the bottom of the screen.

StatusBar

When checked, this command displays the StatusBar, at the bottom of the screen.

SiteIDBar

When checked, this command displays the SiteIDBar, usually towards the top of the screen.

Tools Menu

The command in the Tools menu is designed to handle the settings of the program.

Options

This command is used to set the fonts and colors of the texts displayed in the program. After activating this command, the dialog box looks as shown below.
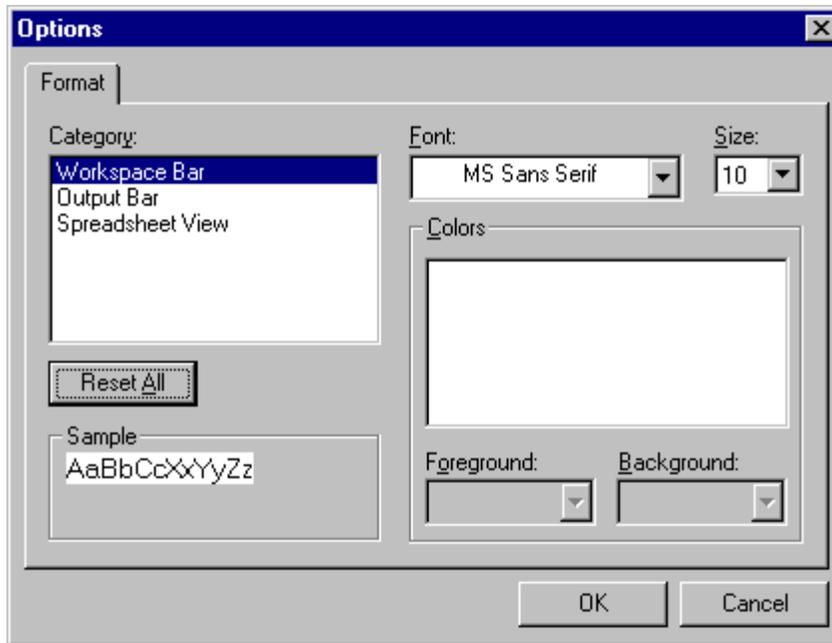
Window Menu

The commands in the Window menu are designed to handle the display of the windows and the style of these windows.

Close

This command closes the current active window. If you have made changes in the currently active window and have not yet saved the workspace, Site Configuration asks if you want to save the changes. To save the changes, click on Yes. To close the window without applying the changes, click on No.

Close All

This command closes all the open windows. If you have made changes in any active windows and have not yet saved the workspace, Site Configuration asks for each window if you want to save the changes. To save the changes, click on Yes. To close the window without applying the changes, click on No.

Cascade

This command arranges the various screens in cascade style.

Tile Vertically

This command arranges the various screens in vertically tiled style.

Tile Horizontally

This command arranges the various screens in horizontally tiled style.

Help Menu

The Help menu enables the user to view the version information and help files which relate to the Site Configuration tool.

Help Topics

This command opens the help files which describe the Site Configuration tool and other IP Gateway Toolbox utilities.

About Site Configuration

This command displays the version information for the Site Configuration tool.

Port Parameters

The Port parameters define the communications ports of the site, regarding their connection to the communication network and the devices connected to them. The ports parameters windows can be opened from the Port tab or Advanced Tab of the WorkSpaceBar. For information on opening the windows, see *WorkSpaceBar*.

Port 2

Port 2 can be configured as RS232 or RS485.

Port 2 parameters are grouped as follows:

- **Port Type.** The Port Type window displays the type of communication used by the port. The communication type is established by means of a set of parameters. Double-click the Type item in the WorkSpaceBar Port tab to display the Port Type parameters window.

- **User parameters.** Double-click the User item in the WorkSpaceBar Port tab to display the User parameters window.

- **Advanced Physical Layer parameters.** Double-click the Advanced Physical Layer item in the WorkSpaceBar Port tab to display the Advanced Physical Layer parameters window.

- **Advanced Link Layer parameters.** Double-click the Advanced Link Layer item in the WorkSpaceBar Port tab to display the Advanced Link Layer parameters window.

Port Type for Port 2

The Port Type parameters window is displayed with the default setting. To change the Port Type, select an option in the first box. Other parameters become available as you select options in subsequent boxes. You have reached the last parameter when the message "Port Type selection is completed" is displayed, as shown below:
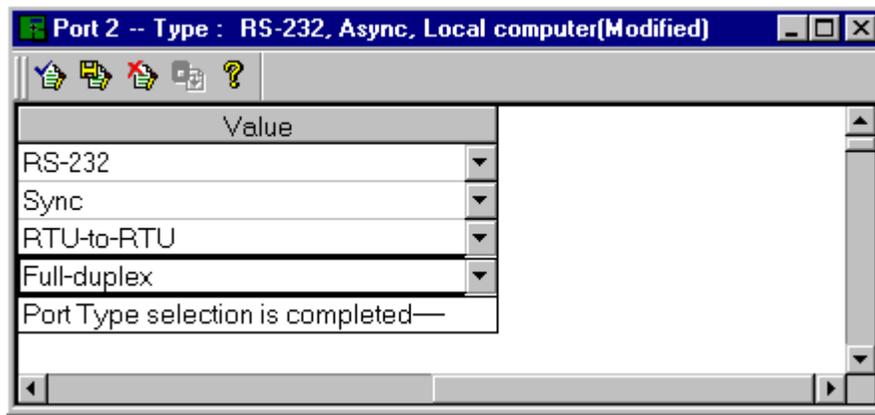
ToolBox requires you to select a value for each parameter. After selecting the required values, click on the OK ⚑ or Apply ⚑ icon to save the selection. Until the changes are applied, the screen header will reflect the previous values, but will be marked as "(Modified)". Until the changes are applied, all other related screens will use the previous Port Type values. If you try to apply the changes or save the WorkSpace without selecting a value in a drop-down list, an appropriate message is displayed which tells you to complete the entries. To exit the screen without applying the changes, click on the Cancel ⚑ icon. To revert to the default values, click the on the Default ⚑ icon.

When you finish setting the Port Type parameters, the parameters you have selected will appear beside Port 2 in the WorkSpaceBar Port tab.

> ### ! IMPORTANT
>
> If you change the Port Type parameter setting, all parameter values that have been previously modified return to their default.

The following is a description of the different combinations.

Not Used
Means that the specific port is not used. This definition saves RAM memory (about 2Kb) that can be used by the application.

RS232, Async, Local Computer (MDLC)
For connection to ToolBox or central, using the MDLC protocol.

RS232, Async, RTU-to-RTU (MDLC)
For local connection to another RTU in asynchronous mode, via RS232, using the MDLC protocol (it can also be used for communicating with the ToolBox).

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RS232, Sync, RTU-to-RTU (MDLC)

For local connection to another RTU in synchronous mode, via RS232.

RS485, RTU Multi-drop (MDLC)

For local connection between two or more RTUs in asynchronous mode, via RS485.

User Parameters for Port 2

A description of the User parameters follows.

Link name

Contains the logical name of the link that the port is connected to. The link name is automatically selected according to the Port Type parameters. For example, if the connection type is Local Computer, then ToolBox automatically selects COMPUTER1 as link name. If relevant, you can open the drop down list and select another name.

Data speed

If data speed is applicable to the port type parameters selected earlier, this parameter defines the communication data speed of the selected media. The default is 9600. The IP Gateway supports baud rates of up to 57,600.

Description

Enter your own description of the communications link (up to 40 characters).

Default Routing

Ensures RTU "mobility". The Default Routing parameter allows you to define the IP Gateway as one that can be switched from one base station to the other by changing the radio frequency (RadioX) or switching physical lines (LineX), but **without changing the Link ID and the MDLC network settings**.

The choices are:

Choice	Description
None	This feature is not used.
To Slave(s)	1) If the IP Gateway serves as base station to a central connected to it, then one of the ports must be defined as To Master/Cntrl. All others must be set to None.
	2) If the base station is the one that handles the data sent by the IP Gateways, then one of its ports must be defined as To Slave(s). This is the port through which the IP Gateway communicates with the slaves.
To Master/Cntrl	If the IP Gateway is used as "slave", then one of the ports should be defined as To Master/Cntrl, and its Link ID must be RadioX or LineX.

Advanced Physical and Link Layer Parameters for Port 2

When one of the advanced parameters windows is displayed, you can use the following functions:

- After changing a parameter, you can restore all changes to their default, by clicking the Default ⬚ icon.

- Modified parameters appear against red background the next time you access the parameter list.

For more details, see *Advanced Parameters* in this chapter.

Port 3

Port 3 is a plug-in port designed for various radio or line communications, for example:

- Radio
- Line
- RS-232
- Microwave
- Not used

For details on the selection method and options, see *Port 2*.

Port Type for Port 3

For details on the selection method, options, and possible combinations, see Port 2. The following is a description of the **additional combinations** that apply to Port 3 and Port 4 only.

Radio, Conventional, radio type, max. number of repeaters, modem
Direct FM modulation for conventional radio. For all parameters that appear *italicized* above, open the drop-down list and select the corresponding value. If you cannot find the requested value on the list (like a radio type), select the "General" parameter (for example, General Radio).

Radio, Trunking, radio type, trunk system, modem
Trunked radio. For all parameters that appear *italicized* above, open the drop-down list and select the corresponding value. If you cannot find the requested value on the list (like a radio type or trunk system), select the "General" parameter (for example, General Radio).

Line, Multi-Drop Half-Duplex
For multi-drop half-duplex wire line communication, using the Line Modem board.

Line, Full Duplex (2w/4w), Sync
For full-duplex (2w/4w), synchronous wire line communication, using the Line Modem board.

Line, Full Duplex (2w/4w), Async
For full-duplex (2w/4w), asynchronous wire line communication, using the Line Modem board.

Line, Dial-up, Async
For asynchronous wire line communication using the dial-up Line Modem board.

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Microwave, Full-Duplex, Sync

For full-duplex, synchronous microwave communication, using the Line Modem board.

Microwave, Full-Duplex, Async

For full-duplex, asynchronous microwave communication, using the Line Modem board.

Microwave, Half-Duplex

For half-duplex microwave communication, using the Line Modem board.

User Parameters for Port 3

A description of the User parameters follows.

Link name

Contains the logical name of the link that the port is connected to. The link name is automatically selected according to the Port Type parameters. For example, if the medium is Radio, then ToolBox automatically selects RADIO1 as link name. If relevant, you can open the drop down list and select another name.

Data Speed

If data speed is applicable to the port type parameters selected earlier, this parameter defines the communication data speed of the selected media. The default is 9600. The IP Gateway supports baud rates of up to 57,600.

Modulation

Defines the type of modulation, the data speed, and the communication standard. The various available options for the three types of line interfaces are detailed in the following table.

Type of Modem → ↓ Modulation	Full-Duplex 2W/4W	Multi-Drop Half-Duplex	Dial-Up	Microwave Full-Duplex	Microwave Half-Duplex
FSK 300 bps, CCITT V.21	√	-	-	√	-
FSK 300 bps, BELL 103	√	-	-	√	-
DPSK 600 bps, CCITT V.22 ASYNC 10 bits	√	-	√	√	-
DPSK 600 bps, CCITT V.22 SYNC	√	√	-	√	√
DPSK 1200 bps, CCITT V.22 & BELL 212, ASYNC 10 bits	√	-	√	√	-
DPSK 1200 bps, CCITT V.22 & BELL 212, SYNC	√	√	-	√	√
QAM 2400 bps, V.22 bis ASYNC 10 bits	√	-	√	√	-

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Type of Modem → ↓ Modulation	Full-Duplex 2W/4W	Multi-Drop Half-Duplex	Dial-Up	Microwave Full-Duplex	Microwave Half-Duplex
QAM 2400 bps, V.22 bis, SYNC	√	-	-	√	-

Default Routing

Ensures IP Gateway "mobility". The Default Routing parameter allows you to define the IP Gateway as one that can be switched from one base station to the other by changing the radio frequency (RadioX) or switching physical lines (LineX), but **without changing the Link ID and the MDLC network settings**.

The choices are:

Choice	Description
None	This feature is not used.
To Slave(s)	1) If the IP Gateway serves as base station to a central connected to it, then one of the ports must be defined as To Master/Cntrl. All others must be set to None.
	2) If the base station is the one that handles the data sent by the IP Gateways, then one of its ports must be defined as To Slave(s). This is the port through which the IP Gateway communicates with the slaves.
To Master/Cntrl	If the IP Gateway is used as "slave", then one of the ports should be defined as To Master/Cntrl, and its Link ID must be RadioX or LineX.

Description

Enter your own description of the communications link (up to 40 characters).

Advanced Physical and Link Layer Parameters for Port 3

After clicking one of the advanced parameters tabs, you can use the following functions:

- After changing a parameter, you can restore all changes to their default, by clicking the Default icon.
- Modified parameters appear against red background the next time you access the parameter list.

Parameters are reviewed in *Advanced Parameters* in this chapter.

Zones in Port 3

For details about zones, see the MOSCAD Programming ToolBox System Overview manual.

The Zones button appears in the Definition of Port 3 Parameters dialog box when the selected port type parameters involve zone definitions. Click the Zones button to open the Define Zones dialog box, shown below.
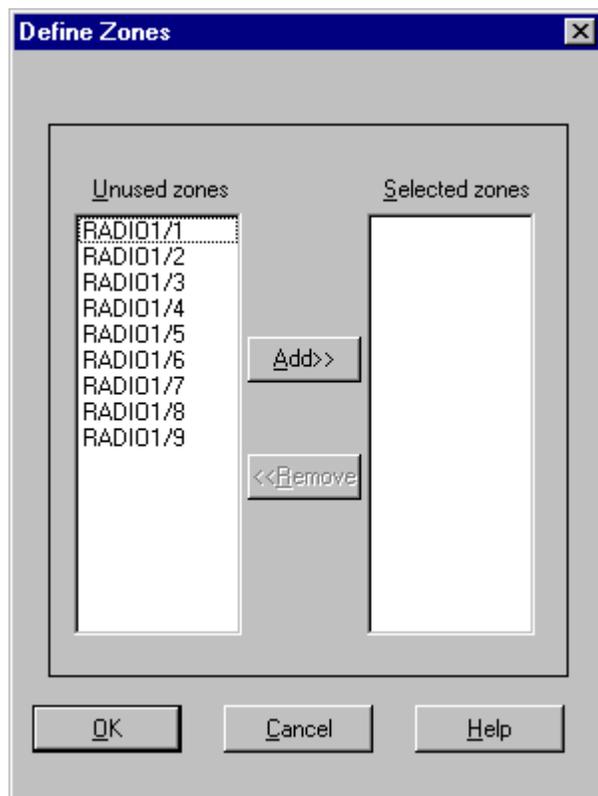
Dialog box parameters

Unused zones
Click the zone(s) on the left list that you want to select.

Selected zones
Click the zone(s) you want to remove from the current definition.

Add
Click this button to select the zone marked on the left list. The zone name moves to the right list.

To mark zones non-sequentially, hold CTRL down and click the zones you want. To mark successive zones, click the first, hold down SHIFT and click the last.

Remove
Click this button to remove a zone from the selected zones (right list).

For details about the marking method, see Add.

Port 4

Port 4 is also a plug-in port like Port 3, designed for various radio or line communications, for example:

- Radio
- Line
- RS-232
- Microwave
- Not used

For details on the selection method and options, see *Port 3*.

Port Type for Port 4

For details on the selection method, options, and possible combinations, see Port 3. The following is a description of the **additional combinations** that apply to Port 3 and Port 4 only.

Radio, Conventional, radio type, max. number of repeaters, modem
Direct FM modulation for conventional radio. For all parameters that appear *italicized* above, open the drop-down list and select the corresponding value. If you cannot find the requested value on the list (like a radio type), select the "General" parameter (for example, General Radio).

Radio, Trunking, radio type, trunk system, modem
Trunked radio. For all parameters that appear *italicized* above, open the drop-down list and select the corresponding value. If you cannot find the requested value on the list (like a radio type or trunk system), select the "General" parameter (for example, General Radio).

Line, Multi-Drop Half-Duplex
For multi-drop half-duplex wire line communication, using the Line Modem board.

Line, Full Duplex (2w/4w), Sync
For full-duplex (2w/4w), synchronous wire line communication, using the Line Modem board.

Line, Full Duplex (2w/4w), Async
For full-duplex (2w/4w), asynchronous wire line communication, using the Line Modem board.

Line, Dial-up, Async
For asynchronous wire line communication using the dial-up Line Modem board.

Microwave, Full-Duplex, Sync
For full-duplex, synchronous microwave communication, using the Line Modem board.

Microwave, Full-Duplex, Async
For full-duplex, asynchronous microwave communication, using the Line Modem board.

Microwave, Half-Duplex
For half-duplex microwave communication, using the Line Modem board.

User Parameters for Port 4

See *User Parameters for Port 3*.

Advanced Physical and Link Layer Parameters for Port 4

After clicking one of the advanced parameters tabs, you can use the following functions:

- After changing a parameter, you can restore all changes to their default, by clicking the Default icon.
- Modified parameters appear against red background the next time you access the parameter list.

Parameters are reviewed in *Advanced Parameters* in this chapter.

Zones in Port 4

For details about zones, see the *Zones in Port 3* section above.

IP Port

The IP Port (Port 1) supports the following applications:

- DataTAC
- TCP/IP
- Terminal Server

One or more applications can be defined. By default, only TCP/IP is selected, as shown below. To define either DataTac or Terminal Server, right click on the item in the treeview and select Define from the right-click menu.

Note: The TCP/IP option cannot be removed from the Selected applications. However, the Media in the TCP/IP Port Type can be set to Not Used.

Port Type for TCP/IP Port 1

Currently the only option for TCP/IP Port 1 besides NOT USED is:

Ethernet, TCP/IP, MDLC Over IP

User Parameters for TCP/IP Port 1

A description of the User parameters follows.

IP Gateway IP Address

IP address of the IP Gateway. For information on this and other IP Addresses in the configuration, see your network administrator.

Default Router IP Address

Range: 000.000.000.001-255.255.255.254

Net Mask Address

Range: 000.000.000.001-255.255.255.255

Link Layer Parameters for TCP/IP Port 1

The following parameters relate to the MDLC Over IP technology. The range of possible is specified in $<>$ symbols. The default is specified in square brackets (for example: [80]). You can change this default.

Link name <LINE 1-LINE 29>   [LINE 1]

All RTUs and IP Gateways use the same line.

IP port number <1-65535>   [2002]

This number is common to all RTUs and IP Gateways connected to the link. This number identifies the MDLC.

It is important that this number not be in use as specified by the TCP/IP standard RFC0960.

Maximum rows in conversion table <0-255>   [255]

Maximum number of sites with which the RTU can communicate.

TX to failed RTU every <> min <0-30>   [0]

0 is DISABLE.

Periodic check of failed RTU   [Disable]

This option cannot be enabled in MDLC Over IP. Not applicable for IP Gateway.

TCP/IP Allocations/Settings

To tune the advanced TCP/IP and Gateway parameters, one must be familiar with the TCP/IP drivers, and the internal mechanism of the Gateway. Therefore, it is recommended not to change these parameters unless it is necessary, and you are aware of the consequences. If you enter an incorrect range, Toolbox displays a dialog box with the valid parameter range.

Clock service interval (MS) <30-100>   [30]

Time in ms between clock service.

Boot Delay (Sec) <0-255>   [255]

Boot time

Max Sockets <0-100>   [50]

Maximum number of sockets

Max UDP TX Packets <2-20>   [4]

Maximum number of packets on UDP sending queue

Max UDP RX Packets <2-20>   [4]

Maximum number of packets on UDP receive queue

Max TCP TX Packets <2-30>   [10]

Maximum number of packets on TCP sending queue

Max TCP RX Packets   [2048]

Possible values: 2048, 4096

Maximum number of packets on TCP receive queue

TCP connect retries <5-20>   [6]
Maximum number of retries to create TCP connection

Max waiting connections on socket <1-100>   [5]
Maximum number of waiting connections

TCP RX window size <2-16>   [2]
Initial size in MSS for TCP receive window

Max packets for row sockets <5-20>   [10]
Maximum number of incoming Ethernet packets

ARP cache entries <8-200>   [8]
The number of ARP cache entries

ARP cache lifetime (Min) <5-200>   [15]
The ARP cache time to live value in minutes

ARP ask timeout (Sec) <10-500>   [250]
The ARP ask timeout interval in seconds

Router ask timeout (Sec) <10-2000>   [1000]
Router ASK timeout interval in seconds

Default cache lifetime (Sec) <10-600>   [60]
Time to live for router cache entries

Socket close-up delay (Sec) <10-1000>   [240]
Time to wait before closing socket

ICMP heap threshold <500-16000>   [2048]
Minimum heap size

Use of router daemon   [No]
Values: No

Work as a router. Only "No" is currently available.

Allow router auto-learn   [No]
Possible values: No, Yes

Allow IP router to learn Gateway.

Max TCP/IP threads <50-250>   [50]
Minimum number of threads using TCP/IP

Heap size (KB) <64-4096>   [2048]
Heap size in Kbytes

Printout buffer size (KB) <1-1024>   [10]
Length of buffer for debug printouts

Printout format buffer size (Bytes) <256-1024>   [524]
Length of buffer for debug sprint (C++ function)

Port Type for DataTAC Port 1

Currently the only option for DataTAC Port 1 is:

DataTAC

User Parameters for DataTAC Port 1

A description of the User parameters follows.

Link name

The logical name of the link that the port is connected to. The link name is automatically
selected according to the port type parameters. If relevant, you can open the drop-down list
and select another name.

RNC IP address

IP Address of the RNC box. Default: 000.000.000.001-255.255.255.254

Group ID <0xEF000000-0xEFFFFFFF>   [0xEF (11111)]

No. of retries to declare RNC failure <0-8>   [2]

Default routing

See Default Routing under *User Parameters for Port 2* for the choices.

Physical Parameters for DataTAC Port 1

Idle interval between RX frames and end reception <200-3000>   [200]
The interval of time after RX frames have been received to wait for an end frame.

Interval to wait for a frame to be received <5000-10000>   [8000]
The interval of time to wait for a frame.

Link Layer Parameters for DataTAC Port 1

This section reviews the parameters through which you can control the functioning of the Link
Layer.

Link type   [Standard]:

Not supported yet. Select the Standard link type to establish a link that requires ACKs.
Otherwise select Fast Link (no ACK).

TX queue size <2^3-2^9>   [2^6]:

This is the maximum number of MDLC frames that can be placed in the transmission queue before a transmission process starts.

Number of ACK buffers <5-50>   [40]:

The reception process of the Data Link layer prepares an ACK for each received data frame, and is capable of issuing, in a single ACK message, up to 57 ACKs for data frames that arrived in uninterrupted sequence. This parameter determines the number of ACK buffers in which ACKs are prepared and moved to transmission before the "Cannot get ACK buffers" message is issued to the Error Logger. This message means that the acknowledging side is unable to move to ACK transmission because of heavy reception traffic, or because it cannot access a channel for transmission.

Number of TX retries <0-9>   [2]:

The number of times the Data Link layer retransmits a data frame for which ACK was not received.

Number of TX retries upon BUSY ACK <0-9>   [2]:

The number of times the Data Link layer retransmits a data frame for which BUSY ACK was received (BUSY ACK is issued when all Data Link layer boxes of the switching node on are full).

Interval between TX retries upon BUSY ACK <10-100> *100mSec.....   [40]:

The interval of time that should elapse before a data frame for which BUSY ACK was received, is retransmitted.

Number of TX broadcast (Group call) retries <0-9>   [0]:

The number of retries for broadcast frames. Since broadcast frames are not acknowledged, specify a value greater than 0 to increase the chances of the frames reaching their destination.

A broadcast that activates a momentary operation (not latch!) is likely to reactivate the operation if the number of TX broadcasts is greater than 0.

Interval between broadcast (Group call) retries <10-100>*100mSec   [40]:

The period of time that should elapse between retries of broadcast frames (if the previous parameter is not 0).

Force 'Local response'   [Force]:

It is possible to conduct a session based on Site ID/Link ID using Local if the port is of Computer/Rslink type. Normally the port is defined for Local Response if the medium is not "multidrop". In any case, "local response" can be forced on a port if it is not "multidrop". The default value is based on the port type. It is recommended to leave the default as is.

Clock synchronization delay <0-250> mSec   [100]:

The delay (applied to the channel) between the end of a transmission and the beginning of reception, for clock synchronization purposes. The default depends on the selected medium. However, the user can change it.

Max. number of addressable sites in a transmission <1-4>   [4]:

Maximum number of units the Data Link layer is capable of addressing in a single transmission. For "private conversation", specify 1.

TX to failed RTU <0:DISABLE 0-30> Min   [5]:

A period of time after which a failed link will be considered as being back in order, provided the value of the next parameter ("Periodic check...") is Disable. Or, the period of time after which the Network layer issues a control frame to check the link, if the value of the next parameter is Enable.

Periodic check of failed RTU   [Disable]:

The valid values are:

Enable Network will send a control frame in order to check whether the link is still in "failed" status. The frame is issued if the link has been in "failed" status for the period of time specified in the previous parameter.

Disable The link is considered to be back in order after the period of time specified in the previous parameter.

Interval between FULL DUPLEX TX retries <10-100> *100mSec   [80]:

The period of time that should elapse before a retry takes place in Full Duplex. New data frames cannot be sent to the retried unit.

Terminal Server

The Ports Overview displays the total number of ports defined in the system and allows you to add new ports, and to modify or delete existing ports.

By default, the Terminal Server item in the workspace treeview has no items beneath it. To open the Ports Overview screen, first select Define from the right-click menu on the Terminal Server item. The Ports Overview item will appear under Terminal Server.

Double-click on the Ports Overview item. The Ports Overview screen will appear.

New terminal server ports can be added. See *Insert One Port* and *Insert Group of Ports* below. Once the ports have been added, click on OK or Apply. New Terminal Server Port items will appear in the workspace under the Terminal Server item. User, advanced physical layer and advanced link layer parameters can be set for the new ports.

To delete items defined under the Terminal Server node, select Delete from the right-click menu on the Terminal Server. All servers will be deleted.

Ports Overview

To modify the parameters of a particular Terminal Server Port in the Ports Overview screen, click in the field and enter the changes.
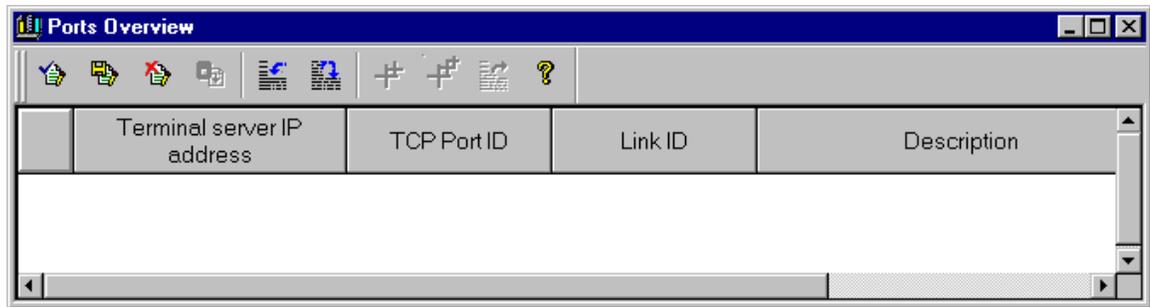
Terminal Server IP address
This column displays the 32-bit IP address parameter of the Terminal Server connected to the current port.

Range: 000.000.000.001-255.255.255.254

TCP Port ID
This column displays the TCP Port ID of the current port.

Link ID
This column displays the Link Name (ID) of the current port.

Description
This column is used to enter free format text in user application terminology.

Five icons appear at the top of the Ports Overview screen in addition to the standard icons.

Insert One Port

Use the Insert One Port button to define a new port which will be connected to a Terminal Server. Click Insert One Port. Toolbox adds a blank row below the insertion point, with default values for:

Terminal Server IP Address   default value 000. 000. 000. 000

TCP PORT ID   default value 2001

LINK ID   defaults to the first free (unused) Link ID

After the port is inserted, the default value for the Terminal Server IP Address must be modified.

The TCP PORT ID must be modified only if the Terminal Server IP Address to which it will be defined already has a TCP PORT ID with the same value.

To save the changes, click on OK or Apply. A new Terminal Server Port item will appear in the workspace under the Terminal Server item. User, advanced physical layer and advanced link layer parameters can be set for the new port.

Terminal Server IP address
Double-click this cell to change the default address to the IP address of the Terminal Server that the specific port is connected to.

5-33

Range: 000.000.000.001-255.255.255.254

If you accidentally type an IP address which has already been assigned to an existing Port, the following message appears when you try to Save or enter Advanced parameters:
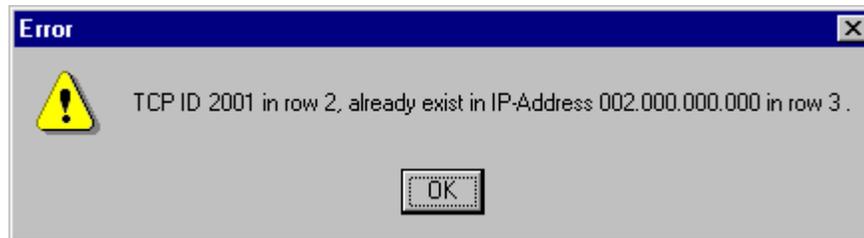
If you accidentally type an invalid address or don't change the default address, the following message appears:

TCP Port ID
Double-click this cell to change the default value to the corresponding four-digit TCP Port ID. The TCP Port IDs must be unique in the same Terminal Server IP address. Default value is 2001.

Link ID
This column is used to assign a communications link to the port. Select the appropriate Link ID from the drop-down list box. Possible values are RSlink(x) and LINE(x), where (x) is a specific RSlink number or a LINE number.

The total number of items listed, reflects the configuration in the MDLC Links Configurator utility.

This field defaults to the first available (unused) Link ID in the drop-down list box.

Description
Double-click this column to enter a description of the port (up to 40 characters).

Insert Group of Ports

Use the Insert Group of Ports button to insert a group of ports linked to the same IP address group. The following screen is displayed:

For Terminal with Server IP address
Range: 000.000.000.001-255.255.255.254

User Free Link-IDs starting from
This field defaults to the first available Link ID and generates consecutive, unique Link IDs.

Use Free Port-IDs starting from
This field defaults to Port ID 2001 and generates a Port ID for each inserted port in sequential order.

Number of Ports to insert (up to xx)
where xx = total number of available ports

Click to enter the number of ports you want to insert.

Minimum: 1

Maximum: total number of available ports

Default: 5

Click OK to accept the values and to return to the Terminal Server Ports screen.

Toolbox inserts the newly created ports after the insertion point with specified values for the TCP Port ID and the Link ID.

To save the changes, click on OK or Apply. A new Terminal Server Port item will appear in the workspace under the Terminal Server item for each port. User, advanced physical layer and advanced link layer parameters can be set for the new ports.

Terminal Server IP address
As defined in the Insert group of Terminal Server Ports screen.

TCP Port ID
The TCP Port ID defaults to the next available TCP Port ID.

Link ID
The Link ID defaults to the next available Link ID.

Description
Defaults to a blank field. You may enter an up to 40-character port description.

Copy One Port

Use the Copy One Port button to create a new Terminal Server Port with the same properties to belong to the same group of Terminal Server IP addresses as the existing Port and to retain the same Advanced Parameters as the existing Terminal Server Port.

From the Terminal Server Ports screen, select an existing port with properties similar to the one you want to create. Click Copy One Port.

Toolbox copies the new port after the insertion point. The copied Port is identical to the source Port, except for the TCP Port ID and Link ID. To save the changes, click on OK or Apply. A new Terminal Server Port item will appear in the workspace under the Terminal Server item. User, advanced physical layer and advanced link layer parameters can be set for the new port.

Terminal Server IP address
Same as the source port.

TCP Port ID
The TCP Port ID is not copied since Toolbox automatically assigns the next available TCP Port ID.

Link ID
The Link ID is not copied since Toolbox automatically assigns the next available Link ID.

Description
Same as the source port. Can be modified.

Copy Group of Ports

Use the Copy Group of Ports button to create a new Terminal Server Port with the same properties (belong to the same group of IP addresses (Terminal Server) as the existing Port and to retain the same Advanced Parameters) as the existing Terminal Server Port. From the Terminal Server Ports screen select an existing port with properties similar to the one you want to create. Click Copy Group of Ports. The following screen appears:
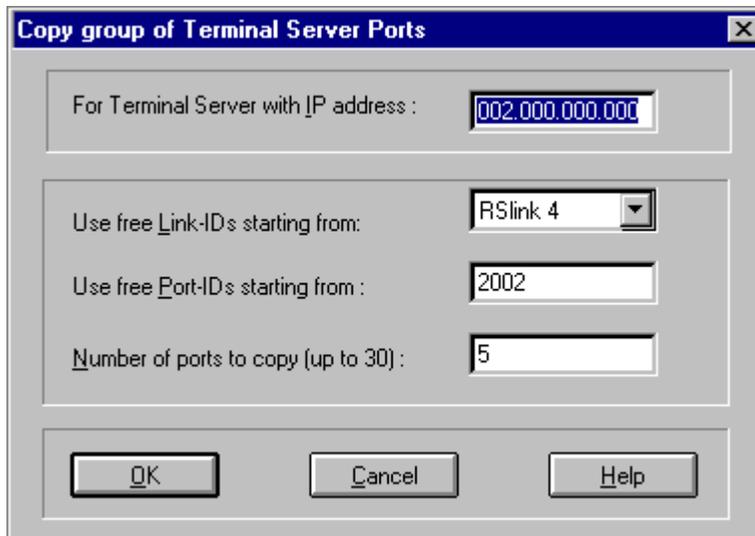
For Terminal with Server IP address
Uses the IP address of the Terminal Server Port selected in the Terminal Server Ports screen.

Range: 000.000.000.001-255.255.255.254

User Free Link-IDs starting from
This field defaults to the first available Link ID and generates consecutive, unique Link IDs.

Use Free Port-IDs starting from
This field defaults to Port ID 2001 and generates a Port ID for each inserted port in sequential order.

Number of Ports to insert (up to xx)
where xx = total number of available ports

Click to enter the number of ports you want to insert.

Range: 1- Maximum (total number of available ports)

Default: 5

Click OK to accept the values and to return to the Terminal Server Ports screen.

Toolbox copies the new ports after the insertion point. The copied Ports are identical to the source Port, except for the TCP Port ID and Link ID. To save the changes, click on OK or Apply. A new Terminal Server Port item will appear in the workspace under the Terminal Server item for each new port. User, advanced physical layer and advanced link layer parameters can be set for the new ports.

TCP Port ID
The TCP Port ID is not copied since Toolbox automatically assigns the next available TCP Port ID.

Link ID
The Link ID is not copied since Toolbox automatically assigns the next available Link ID.

Description

Same as the source port. Can be modified.

Toolbox copies the new ports after the insertion point. The copied ports are identical to the source port, except for the TCP Port ID and Link ID.

Delete Ports

Use the Delete Ports button [icon] to delete one or more of the Terminal Server Ports.

Select the Terminal Server Port to be deleted from the Terminal Server Ports screen and click the Delete Ports button.

To select successive Terminal Server Ports, click the first Terminal Server Port address and press the SHIFT key while you click the last Terminal Server Port address, or click-hold-and-drag.

To delete all ports, defined under the Terminal Server node, select Delete from the right-click menu on the Terminal Server. All servers will be deleted.

User Parameters for Terminal Server Port 1

A description of the User parameters follows.

Terminal Server IP address

This column displays the 32-bit IP address parameter of the Terminal Server connected to the current port.

Range: 000.000.000.001-255.255.255.254

TCP ID of Port

This column displays the TCP Port ID of the current port.

Link Name

This column displays the Link Name (ID) of the current port.

Description

This column is used to enter free format text in user application terminology.

Advanced Physical Parameters for Terminal Server Port 1

For a description of the Advanced Physical parameters, see *Physical Parameters for DataTAC Port 1* above.

Advanced Link Parameters for Terminal Server Port 1

For a description of the Advanced Link parameters, see *Link Layer Parameters for DataTAC Port 1* above.

Advanced Parameters

This section reviews all of the ToolBox advanced configuration parameters. Throughout the ToolBox, advanced parameters are displayed according to context. For example, when you click the Advanced tab in the WorkSpaceBar in Site Configuration, ToolBox shows only those parameters that are applicable to the selected configuration. For details on opening the Advanced parameters windows, see WorkSpaceBar Advanced Tab.

Some of the parameters listed here are applicable to the new version only. If you open an older configuration file and decide not to change the version, ToolBox grays (hides) those parameters that cannot be used in that version.

For each parameter, ToolBox dialog boxes provide three values: the minimum, the maximum and the default. The range is specified between < > symbols. For example, <1-200> means that the value can be a number between 1 through 200. You can specify a value greater than the maximum value, in which case the system only issues a warning message. Exceeding the range may consume additional memory and may cause unexpected or incorrect behavior in the RTU.

The default is automatically entered in the parameter field and appears between square brackets (for example: [80]). You can change this value.

The default value provided in the parameter specifications below, is one of the possible values. The default changes according to Port Type.

Physical layer

This section reviews the parameters through which you can control the functioning of the Physical Layer.

Number of idles to announce 'End of RX' <1-200>   [80]:
                  and NOT more than <10-2000> mSec   [500]:

In UART communications without a channel access mechanism, a period of silence notifies all layers above Physical that reception has ended. This period is calculated in terms of idles which are converted to time as a function of the data speed. The system uses this value or the value specified in the second field (and NOT more...), whichever is the smallest.

The value is equivalent to the time required to receive 1.5 frames (as defined in the MDLC advanced parameter Unformatted adapter buffer size). The system uses this value or the value specified in the second field, whichever is the greatest.

The parameter has no meaning when a channel access mechanism is used (such as RS-485 and Darcom radio).

Interval between Link TX retries <100-6000>   [500]:

The interval of time that should elapse before a data frame for which no ACK was received, is retransmitted.

Number of bits for staggering <2-8>   [4]:

This parameter is related to the slotted access mechanism used by the channel access sub-layer of MDLC. A value of n means that an RTU will wait at most 2^n free slots before transmitting.

Max. time waiting for TX-grant <100-900000> mSec   [900000]:

The period of time the system will wait for channel access, from the time it requests a channel.

Max. TX-data duration <1000-60000> mSec   [30000]:

The maximum time during which data can be transmitted. After this period of time transmission stops even if it has not yet ended.

Channel-holding tail <0-1000> mSec   [0]:

The period of time during which the PTT should be held pressed at the end of data transmission or between frames. Enter 0 to ignore this feature.

Busy-channel TX-override delay <0-30000> mSec   [0]:

The maximum waiting time for a channel. After this time-out, the system accesses a channel whether or not it is free.

TX-warm-up time <10-1000> mSec   [200]:

The period of time during which the PTT should be held pressed before a predetermined preamble is transmitted and before data transmission begins.

Disconnect time <100-500> mSec   [200]:

In a trunked system, the period of time that should elapse between releasing the PTT and until the radio is ready for reception.

Channel request PTT active time <500-1000> mSec   [500]:

In a trunked system, the maximum period of time during which the PTT should be held pressed in order to access a channel.

Channel request cycle time <5000-10000> mSec   [5000]:

In a trunked system, the PTT pressing time cycle until a channel is accessed.

Channel monitor time resolution <10-1000> mSec   [0]:

The size of a time slot in the slotted channel access mechanism of MDLC.

TX-holdoff time <0-30000> mSec   [0]:

This is the minimum period of time during which a channel must be free before transmission can resume. If another unit transmitted during this time, the current unit does not have to hold transmission.

Minimum time to retry Time <0-30000> mSec   [0]:

The minimum period of time that should elapse between the end of a transmission and its first retry, and between retries.

Pulse Dialing 'break' time <60-70> mSec   [61]:

In pulse dialing, the ON ("make") and OFF ("break") times should be defined. This parameter defines the OFF time.

61   US standard

67   European standard

Hanging up an unused line by INITIATOR after <1-60> Sec   [20]:
A period of quiet time at the end of which the initiator of the conversation hangs up the phone.

Hanging up an unused line by RESPONDER after <1-120> Sec   [120]:
A period of quiet time at the end of which the responder hangs up the phone.

Number of dial retries <1-10>   [3]:
The number of times the number will be redialed (in addition to the first time) in order to establish communications with a unit.

Interval between retries <1-30> Sec   [7]:
Interval of time between a failure to establish communications (BUSY, NO ANSWER) and the next dialing. However, if a line is busy and another line is available, the attempt is renewed through the other line without delay.

Number of rings for answer <1-255>   [2]:
Number of rings to wait for the called party to answer.

Wait for data carrier <1-255> *100mSec   [250]:
A waiting period between the end of dialing and the reception of the connection signal from the answering modem. After this period, the attempt is considered to be a failure.

Lost carrier to hang-up delay <1-255> *100mSec   [20]:
The period of time during which disconnection is delayed after the carrier is lost.

Wait for dial tone <1-255> *100mSec   [50]:
The amount of time the calling device should wait until it gets the dial tone.

Wait time after hang-up <1-255> *100mSec   [35]:
The minimum time that should elapse between two attempts to obtain a line.

Number of dial tone retry <1-20>   [3]:
Number of retries to obtain a line.

Blind dialing   [NO]:
The valid values are:

NO   Wait for the dial tone

YES   Dial after a pre-defined period of time (blind dialing).

HDLC 'RTS' control   [AUTO]:
The valid values are:

AUTO   RTS runs automatically before the transmission and terminates after the
          transmission

ON   RTS is always ON.

This parameter is for old boards that do not react fast enough to RTS.

Minimum number of flags between HDLC frames <0-15>   [0]:

Number of HDLC flags between frame transmissions. For old OEM equipment, specify a large value.

Minimum TX time <0-2000> mSec   [1000)]:

Minimum transmission time. If the actual data transmission takes less than the specified value, the unit will continue to transmit until this time elapses. Smartzone trunked systems work more efficiently with a minimum TX time of 1000 mSec. Specify 0 to ignore this parameter.

Time before long warm-up <0-3000> mSec   [1600]:

In Smartzone trunked systems, this parameter specifies on channel/free channel condition which, if exceeded, requires a longer warm-up. Specify 0 to ignore this parameter.

Long warm-up <0-2500> mSec   [1000)]:

If a positive value was specified in the previous parameter, specify here the long warm-up time. 1000 is advisable in Smartzone.

Time resolution in control channel <50-1000> mSec   [50]:

In a trunked system, this parameter specifies the size of a time slot when the radio is on the control channel.

First warm-up delay <10-2500>   [350]:

This field defines the delay (in msec) from the moment that PTT has been pressed until data transmission starts on the first time in a session.

Tx Hold off time <0-10000>   [0]:

The minimum interval between two consecutive transmissions of data (not relevant for acknowledgment messages).

Consequent warm-up delay <10-2500> mSec   [350]:

This field defines the delay (in msec) from the moment that PTT has been pressed until data transmission starts, on subsequent sessions (after the first; see previous parameter). The value should be greater than the First Warm-up Delay, because the first time the Trunking system perfoms part of the warm-up by itself.

Channel monitor time resolution <10-2500> mSec   [200]:

Defines the interval from the moment PTT has been pressed in an RTU until the other RTUs sense it. This interval depends on the type of the radio used – the quicker the channel monitor's response, the shorter this interval. The RTU uses this parameter to prevent collisions on the channel when several RTUs have messages to transmit by contention.

This interval is used (automatically) as follows: each RTU is assigned a priority level as a function of the data message it wants to transmit (new data, acknowledgment, retry, etc.) and in some cases, as a function of its address. When the RTU wants to transmit that message, it first checks whether the communications channel is free or not. If the channel is free, the RTU

will start transmitting only after a delay that is equal to this parameter multiplied by the RTU's priority level. If in the meantime the channel has been taken by a higher-priority RTU, the whole process is repeated when the channel is free again.

For example, let's assign the time resolution T. When the RTU accesses the channel, it starts transmitting only after a delay that is a factor of T. When the RTU accesses the channel for the first time, the delay is (n+4)×T, where *n* represents the 4 less significant bits in the address. When an RTU sends an acknowledgment to another RTU, it will start transmitting only after a delay of 0 to 3T. If a collision occurs because two RTUs have been addressed with the same 4 less significant bits, then the address bits are shifted automatically, and the RTU starts transmitting after a different delay.

Channel monitor override delay: <0-3200> 100 mSec   [0]:

Defines the delay after which the RTU will transmit its message even if the communications channel is busy. The default value of 0 means that this feature is **disabled** (i.e., the RTU will not transmit if the channel is busy).

Data repeat mode: <Yes / No>   [No]:

Not used.

For future use. To implement the store and forward feature by hardware. It is applicable in case the piggyback modem is DFM, FSK, or COS.

Minimum time to retry: <0-2500> mSec   [0]:

The minimum time (in msec) that the RTU will wait before retransmitting an unacknowledged message.

Link Layer

This section reviews the parameters through which you can control the functioning of the Link Layer.

Link type   [Standard]:

Not supported yet. Select the Standard link type to establish a link that requires ACKs. Otherwise select Fast Link (no ACK).

TX queue size <2^3-2^9>   [2^6]:

This is the maximum number of MDLC frames that can be placed in the transmission queue before a transmission process starts.

Number of ACK buffers <5-50>   [8]:

The reception process of the Data Link layer prepares an ACK for each received data frame, and is capable of issuing, in a single ACK message, up to 57 ACKs for data frames that arrived in uninterrupted sequence. This parameter determines the number of ACK buffers in which ACKs are prepared and moved to transmission before the "Cannot get ACK buffers" message is issued to the Error Logger. This message means that the acknowledging side is unable to move to ACK transmission because of heavy reception traffic, or because it cannot access a channel for transmission.

Number of TX retries <0-9>   [2]:

The number of times the Data Link layer retransmits a data frame for which ACK was not received.

Number of TX retries upon BUSY ACK <0-9>   [2]:

The number of times the Data Link layer retransmits a data frame for which BUSY ACK was received (BUSY ACK is issued when all Data Link layer boxes of the switching node on are full).

Interval between TX retries upon BUSY ACK <10-100> *100mSec...   [40]:

The interval of time that should elapse before a data frame for which BUSY ACK was received, is retransmitted.

Number of TX broadcast (Group call) retries <0-9>   [0]:

The number of retries for broadcast frames. Since broadcast frames are not acknowledged, specify a value greater than 0 to increase the chances of the frames reaching their destination.

A broadcast that activates a momentary operation (not latch!) is likely to reactivate the operation if the number of TX broadcasts is greater than 0.

Interval between broadcast (Group call) retries <10-100>*100mSec   [40]:

The period of time that should elapse between retries of broadcast frames (if the previous parameter is not 0).

Force 'Local response' (1 to 1, NO address)   [Force]:

It is possible to conduct a session based on Site ID/Link ID using Local if the port is of Computer/Rslink type. Normally the port is defined for Local Response if the medium is not "multidrop". In any case, "local response" can be forced on a port if it is not "multidrop". The default value is based on the port type. It is recommended to leave the default as is.

Clock synchronization delay <0-50> mSec   [0]:

The delay (applied to the channel) between the end of a transmission and the beginning of reception, for clock synchronization purposes. The default depends on the selected medium. However, the user can change it.

Max. number of addressable sites in a transmission <1-4>   [4]:

Maximum number of units the Data Link layer is capable of addressing in a single transmission. For "private conversation", specify 1.

TX to failed RTU <0:DISABLE 0-30> Min   [0]:

A period of time after which a failed link will be considered as being back in order, provided the value of the next parameter ("Periodic check...") is Disable. Or, the period of time after which the Network layer issues a control frame to check the link, if the value of the next parameter is Enable.

Periodic check of failed RTU   [Disable]:

The valid values are:

Enable   Network will send a control frame in order to check whether the link is still in "failed" status. The frame is issued if the link has been in "failed" status for the period of time specified in the previous parameter.

Disable   The link is considered to be back in order after the period of time specified in the previous parameter.

Interval between FULL DUPLEX TX retries <10-100> *100mSec   [50]:

The period of time that should elapse before a retry takes place in Full Duplex. New data frames cannot be sent to the retried unit.

Transport Multiplex Layer

Number of MASTER logical channels <64-64>   [64]:

Number of logical channels in the MDLC protocol capable of initiating communication via a session oriented channel. Do not change this value.

Number of SLAVE logical channels - <0-7>   [4]:

Number of MDLC logical channels that can be accessed through one or more masters simultaneously.

Message-Oriented Service (Frame Sequence)

Stop transmitting 'Reset ack' after <5-10000> Sec   [100]:

The period of time during which a Reset ACK should be transmitted to a unit that is expected to return a void frame at Transport Multiplex level for each Reset ACK. After the period of time specified here, the unit stops sending Reset ACKs in order to identify another reset situation, should it occur.

Max. allowed delay for a duplicate frame <5-200> Sec   [30]:

A frame that is received again during this period of time is considered a duplicate, and discarded. If it arrives after this time, it is considered to be a new frame.

'Hole declaration' time out <1-30000> Sec   [30]:

The period of time during which frames that failed to arrive as part of a chain are allowed to be retried at Data Link level. This timeout is calculated as a function of the number of retries and the data speed.

Allowed reception range from 'Expected frame' <4-128>   [16]:

The gap that will cause the unit to move to synchronization at Transport Multiplex level. For example if the value is 16 and frame x+16 arrives while x was expected, synchronization will take place.

Max. range to declare 'Duplicate frame' <4-128>   [16]:

The allowed interval between retried frames. For example, if the value is 16 and x-16 arrived while x is expected, the unit moves to perform synchronization as in the previous parameter.

Send broadcast reset after restart <YES/NO>   [YES]:

Specify YES to broadcast to all units defined after Reset Load in order to synchronize at Transport Multiplex level.

Restart declaration time out <5-200> Sec   [30]:

Time interval between two Restart control frames at Transport Multiplex level.

Time out for URGE transmission after hole detection <0-3000> Sec.   [15]:

The period of time after which an "urge" frame will be issued if a gap formed at Transport Multiplex level. A response to the urge frame means that the gap will never be filled since all Data Link layer retries have already been exhausted.

Size of TX queue <30-200>   [160]:

Since Transport Multiplex consumes buffers for transmission, the number of buffers is limited via this parameter in order to prevent HP-Tx from being emptied completely.

No. of retries for 'URGE frame' <0-9>   [0]:

The number of times an urge frame will be retransmitted.

Terminal emulation (application) support   [Yes]:

Support for terminal emulation within the application. The valid values are Yes/No.

Health-check (application) support   [Yes]:

Support for health check within the application. The valid values are Yes/No.

MDLC Network Layer

Network Layer

System configuration stock size <1-50>   [1]:

Number of paths the Network layer is allowed to learn. This parameter is for future use. In the current version, Network can learn only one path even if a different value is specified.

General Communication

Addr. range response for 'All RTU simulation' <Site ID +- Range>   [0]:

Assigning alternate addresses to an RTU. If the basic address is X and the range is Y, then the unit responds to all calls in the range of {X,X+1,...,X+Y}. If the range is -Y, the unit responds to all calls in the range of {X-Y, X-Y+1, ..., X}.

This parameter is for field simulation in laboratory conditions and for the Dual CPU mechanism.

MDLC Session Logical Channels

Application layer

Application manager work space <2000-6000>   [4100]:

The workspace allocated to MDLC applications (for the transmission and reception of data frames). The end-user is not expected to modify this parameter as it is reserved for the software engineer's development needs. It enables the engineer to accurately determine the memory requirements of the MDLC applications.

Stack size of application manager task <1000-20000>   [10000]:

The size of the stack to be allocated for the MDLC application manager task.

Presentation Layer

Encryption/Compression buffer length <0-100>   [0]:

For future use.

Transport Layer

Number of retries to declare TX FAIL <1-5>   [3]:

Number of retries at session oriented logical channel level after which the Transport Layer declares that transmission to destination site has failed.

Number of retries to declare 'Logical channel BUSY' <1-10>   [5]:

When the source site sends frames to a destination site and receives a "logical channel busy" signal (because the channels are busy transmitting data from other applications that already accessed them), it retries as many times as determined in this parameter. After this pre-defined number of retries, the source site declares the channel as being "busy".

Number of transmitted frames in one burst <2-32>   [4]:

Number of MDLC frames that are sent in a single burst after which the Transport Layer waits for ACK from the destination site before it sends the next burst.

Number of entries in transmit queue <5-32>   [8]:

Number of MDLC frames the Transport Layer is capable of receiving from upper layers (Application, Presentation and Session) for transmission. When this number is reached, the Transport Layer signals to the application to stop sending frames until it makes room for more frames. This number should be equivalent to twice the size of a burst or more.

Number of entries in receive queue <5-32>   [10]:

The number of MDLC frames the receiving site is capable of handling on their way to the upper layers. This number should be equivalent to twice the size of a burst or more.

Number of entries in temporary queue <5-32>   [6]:

The number of MDLC frames the receiving site is capable of handling on their way from the lower layers (Data Link Reception, Network, Transmission Multiplex).

5-47

Task suspension between transmitted frames <0-1000> mSec   [50]:

A delay that can be inserted between transmissions of frames in order to optimize CPU allocation to other processes (especially to processes that have a priority level which is lower than that of the application).

Interval between TX retries <1-1000> Sec   [15]:

The interval of time that should elapse between two retries at Source/Destination level. This period of time starts after the Data Link layer finalizes the transmission of a frame (that is, after it received an appropriate ACK or exhausted all retries for a frame that was not acknowledged).

Interval between 'Logical channel BUSY' retries (1-1000) Sec   [10]:

The waiting time between retries if the receiving end issued a BUSY signal (because all of its logical channels were busy).

Delay after last received frame for partial ACK (1-1000) Sec   [5]:

If the called unit receives only some of the frames that were supposed to arrive in one burst, it will wait a certain period of time, defined in this parameter, before it issues a partial ACK at Source/Destination level.

Interval before starting 'IS SESSION ON' checks <1-1000> Sec   [50]:

The period of time that should elapse before the "is session on" check takes place. See next parameter.

Number of 'IS SESSION ON' checks <(-1)-20>...(-1)=forever   [3]:

If a period of silence is detected in the channel at source/destination level, a special mechanism checks whether the logical channel is still available. This parameter determines the number of times the channel will be checked for availability. In any case, the first "is session on" check will not take place before the timeout defined in the previous parameter.

Interval between 'IS SESSION ON' checks <1-1000> Sec   [120]:

The interval of time between two "is session on" checks. See previous parameter.

MDLC Mini-session Applications

General

Period of time that a message is waiting in mail-box <5-255> sec. [10]:

The amount of time that a data frame will remain in the receive buffer. If the application does not retrieve it during that time, the data frame will be deleted.

RTU To RTU

RTU-to-RTU Number of boxes   <1-31>   [8]:

The number of boxes allocated at any given time for handling data frames in RTU-to-RTU communication (received, transmitted, waiting for answer, empty).

Data frames are the information stored in Txbuf in case of transmission, and in Rxbuf in case of reception.

RTU-to-RTU Number of TX retries <0-20>   [1]:

The number of retries that should take place at source/destination level if an answer was not received for a transmission via SndFrm (and not via TxFrm).

RTU-to-RTU Interval between TX retries <1-1000> Sec   [60]:

The interval of time that should elapse between retries. This period of time starts after the Data Link layer of the MDLC protocol finalizes the transmission of a frame (that is, after it received an appropriate ACK or exhausted all retries at From/To level).

RTU-to-RTU Password <Enable/Disable>   [Enable]:

Enables the user to add a communication password to data frames. The value of this parameter must be identical in both the transmitting and receiving side.

RTU-to-RTU Authentication <Enable/Disable>   [Enable]:

For future use.

Event and Burst

Event and Burst Number of boxes <1-31>   [8]:

The number of boxes allocated at any given time for transmitting data frames via the Burst and TxEvnt functions.

Event and Burst Number of TX retries <0-20>   [1]:

Number of retries to be performed by the RTU towards the central unit, if it does not receive "Application Data-Ack from central" to Burst or TxEvnt calls. If the value of the "Application Data-Ack from central" is NO, this parameter is irrelevant (because the system relies on ACK at Data Link level, that is, at From/To level, and does not need any further acknowledgments at RTU/Central Unit level).

Event and Burst Interval between TX retries <1-1000> Sec   [60]:

The interval of time that should elapse between two retries from the RTU towards the central unit. (Retries may be requested if the RTU does not receive "Application Data-Ack from central" to Burst or TxEvnt calls. See previous parameter.)

This period of time starts after the Data Link layer of the MDLC protocol finalizes the transmission of a frame (that is, after it has received an appropriate ACK or exhausted all retries at From/To level).

If the value of the "Application Data-Ack from central" is NO, this parameter is irrelevant (because the system relies on ACK at Data Link level, that is, at From/To level, and does not need any further acknowledgments at RTU/Central Unit level).

Event and Burst Application Data-Ack from central   [YES]:

The valid values are:

NO   There is no need for ACK from the central unit at RTU/Central Unit level. The system relies on Data Link ACK (at From/To level).

YES   The system requires that the central unit issues ACK to the RTU (RTU/Central Unit level), in addition to Data Link ACK.

Event and Burst Password <Enable/Disable>   [Enable]:

Enables the user to transmit events of bursts with a communication password.

The value of this parameter must be identical for all RTUs and the central unit.

Event and Burst Authentication <Enable/Disable>   [Enable]:

For future use.

Broadcast (Group Call)

Broadcast (group call) Number of boxes <1-31>   [6]:

The number of boxes allocated for storing frames that were broadcast from the central unit and that are to be processed by the RTU.

The RTU scans the box queue with intervals of 1 second, and updates the Qualifiers table accordingly. Increase this value if the reception rate is greater than the queue scanning rate.

Broadcast (group call) Password <Enable/Disable>   [Enable]:

This parameter enables you to decide whether it is allowed to receive frames that were broadcast from the central unit without a password. Change the default if the central unit is capable of broadcasting frames without a password.

Broadcast (group call) Authentication <Enable/Disable>   [Enable]:

For future use.

MDLC and User Port Heaps

MDLC Buffers

Number of formatted buffers in TX-heap <50-1000>   [500]:

The number of formatted buffers designed for RTU-to-RTU burst, event, burst seq, and event seq transmissions, as well as for transmissions from MDLC applications such as Diagnostics, Error Logger, Processes/Tables Monitor, Site Configuration and Downloader. If DEVICE=HP_F_TX is emptied frequently, increase the value of this parameter.

!   WARNING

Each buffer consumes about 250 bytes of RAM.

Number of formatted buffers in RX-heap <50-1000>   [400]:

The number of formatted buffers designed for RTU-to-RTU burst, event, burst seq, and event seq receptions, as well as for receptions from broadcasts and MDLC applications such as

Diagnostics, Error Logger, Processes/Tables Monitor, Site Configuration and Downloader. If DEVICE=HP_F_TX is emptied frequently, increase the value of this parameter.

> **! WARNING**
>
> Each buffer consumes about 250 bytes of RAM.

Unformatted (Adapter) buffer size <10-1000> byte   [50]:

The size of the unformatted buffer that serves as asynchronous port. The overhead is ≈15 bytes, that is, the user can use only 35 bytes.

Formatted buffer size <160-2000> byte   [160]:

The size of the formatted buffer that serves as asynchronous port.

User Buffers

Ladder-diagram user port buffer size <10-1000> byte   [50]:

The size of the buffer used for transmission and reception. It defines a user port, including buffer management overhead (O.H. ≈ 15 bytes). If the user port is used for communication with the terminal, the default size is enough. If the communication protocol is applied to the user port (if the port is to handle larger quantities of data), it is advisable to increase the buffer size according to scan time. The buffers should be sufficient to store all characters received during one scan time. For example, under a data speed of 9600, each character takes about 1 msec to arrive. If the scan time is greater than 8*84 msec, increase this parameter.

The user port is capable of handling up to 8 buffers. If all are full, the port sets CTS to 0 or issues XOFF according to its configuration. Not applicable for IP Gateway.

Number of buffers in ladder-diagram user port <0-200>   [40]:

Number of buffers for transmission and reception in the user port. For each user port the value of this parameter must be at least 17. This parameter is only relevant for MOSCAD versions 3.80 or earlier. Not applicable for IP Gateway.

General System Parameters

LEDs

Leds operating mode   [Light always]

This parameter determines whether the LEDs on the led panel of the CPU will be lit constantly or temporarily. If you choose "Light up to timeout", the LEDs will go on at CPU startup, and will go off after the timeout defined in the next parameter.

Leds display time out <60-1200> Sec   [600]:

If the previous parameter is 0, using PB1 or PB2 will light up the LEDs which will remain on for the period of time defined in this parameter.

Buzzer time out <10-120> Sec   [30]:

Not applicable for IP Gateway.

Timers Hookups

Number of connected service-users with '10 mSec' device <10-100>   [70]:

The 10 msec task enables different modules to perform specific activities with a resolution of 10 msec. This is achieved by letting each module link itself to the 10 msec task. The number of service users (modules) depends on the configuration and sometimes it may be necessary to increase the value of this parameter (if the configuration includes more modules than the default number specified here).

Number of '10 mSec' ticks passed before declaring error <3-10>   [4]:

The operating system is supposed to activate the 10 msec task every 10 msec. If it fails to activate the task as many times as the number specified in this parameter (for example, 4 means if the system fails to activate the task during 40 msec), an error message is sent to the Error Logger.

This is not a fatal error. If the system fails to activate the task this means that it is experiencing an unusual burden (in which case it is advisable to locate the origin of the problem).

Number of connected service-users with '100 mSec' device <10-500>   [140]:

Same as the "Number of connected service-users with '10 mSec' device" parameter for the 100 msec task. Not applicable for IP Gateway.

Number of '100 mSec' ticks passed before declaring error <3-10> [4]:

Same as the "Number of '10 mSec' ticks passed before declaring error" parameter for the 100 msec task.

Number of connected service-users with '1 Sec' device <10-100> [20]:

Same as the "Number of connected service-users with '10 mSec' device" parameter for the 1 sec task. Not applicable for IP Gateway.

Number of '1 Sec' ticks passed before declaring error <2-5>   [2]:

Same as the "Number of '10 mSec' ticks passed before declaring error" parameter for the 1 sec task.

Number of connected service-users with '1 Min' device <10-100>   [16]:

Same as the "Number of connected service-users with '10 mSec' device" parameter for the 1 min task. Not applicable for IP Gateway.

Number of '1 Min' ticks passed before declaring error <2-4>   [2]:

Same as the "Number of '10 mSec' ticks passed before declaring error" parameter for the 1 min task.

Number of '10 msec' timers for 'C' applications <0-100>   [0]

The number of 'C' block 10 msec. timers that can be used. For details on how 10 msec. timers in "C"' block can be used, see 'C' Toolkit manual. Not applicable for IP Gateway.

Number of '100 msec' timers for 'C' applications <0-1000>   [10]

The number of 'C' block 100 msec. timers that can be used. For details on how 100 msec. timers in "C"' block can be used, see '*C' Toolkit* manual. Not applicable for IP Gateway.

Buffer and Queue Size

Error logger buffer size <100-2000> byte   [300]:

The size of the buffer that is used to store error messages.

Error messages are generated by modules to inform the user of unusual events that have taken place in the system. It is advisable to increase the buffer size if a large number of errors is expected.

Time tag buffer size <100-2000> byte   [300]:

Not applicable.

Length of queue for user Message/Jobs <0-2000> byte   [200]:

The transmission queue of a user port is used for SEND purposes. This parameter determines the size of the queue. Increase the value if the number of bytes to be transmitted by SEND is expected to be greater than 200 during one SCAN of the ladder diagram.

Ladder Process Tasks

Task priority A enable   [Enable]:

Not applicable.

Task priority B enable   [Enable]:

Not applicable.

Task priority C enable   [Enable]:

Not applicable.

Task priority D enable   [Enable]:

Not applicable.

System Flags

Force command when site in fail   [No]:

Not applicable.

Translate poll for table 0, column 0, row 0 to get RTU status   [No]:

Not applicable.

System Values

Main process duty cycle <0-100>   [40]:

The ratio between the time allocated to the main process of the application (including higher priority tasks such as MDLC reception), and tasks of lower priority.

The objective of this parameter is to enable lower priority tasks to perform even when the application is busy.

Time between BURSTs <0-10000> *10mSec   [5]:

At the end of the main process and after the timeout specified in this parameter, the system checks for bursts awaiting transmission. If the period of time between bursts has not yet elapsed, the possibility exists to add new bursts to the buffer during the next scan.

Max. EVENT timer value <10-1500> *10mSec   [1000]:

This parameter defined the maximum time that the "event timer" can be activated (in units of 10 msec).

The event timers can be activated via the SetTmr function in relation to events that have been received via GtEvnt. The timers and the events are accurate to 10 msec. The timers are activated when the event actually takes place (and not when GetEvent was performed).

Increasing the maximum time consumes about 4 bytes per time unit.

Total number of EVENTs (Status/Timer) <10-300>   [150]:

Together with the previous parameter, this parameter defines the number of events and event timers that can be received simultaneously.

Increasing the number of events consumes ~35 bytes per event.

Ladder received-frame-sequence queue size <4-300> frames   [100]:

The maximum number of frames that can be stored in the frame sequence device. If more frames arrive, an error is issued to the Error Logger.

Number of BURST destination Buffers <0-6>   [4]:

The number of frames for which a burst can be created during the same scan.

RAM size for dynamic allocation <500-32000> K-bytes   [28000]:

The amount of memory reserved for dynamic allocations at runtime.

C programs require dynamic allocations. Therefore, the value of this parameter should be determined according to the amount of memory required by the C programs, or according to the number of C program blocks.

Number of entries in the dynamic Site-Table <0-2000>   [100]:

You can expand the regular site table (a Database Builder system table) using the dynamic site-table which is accessible via "C" Toolkit.

'C' application parameters

Number of user tasks for 'C' blocks <0-10>   [0]:

In addition to the 5 tasks defined by the system (main process, Task priority A...Task priority D), up to 10 additional tasks can be defined. These tasks can be activated via a user-defined C function which can be called with ucall. The tasks can be activated or suspended using a C routine. Each task allocates ≈2KB of stack. For details consult the C Toolkit.

Number of named pointers <0-100>   [1]:

It is possible to execute MOSCAD_malloc from a 'C' block, to hold the allocated buffer in named pointers between downloads (access function from "C" Toolkit), and to get it back after the download ends. This feature enables you to keep data between different downloads.

Number of slave 'C' functions for session based protocol <0-255> [0]:

Number of 'C' language functions to be supplied by the 'C' application for session based protocol.

Number of 'C' functions called by the 10 ms task <0-255>   [0]:

Number of 'C' language functions to be supplied by the 'C' application to the 10 millisecond task.

Number of 'C' functions called by the 100 ms task <0-255>   [0]:

Number of 'C' language functions to be supplied by the 'C' application to the 100 millisecond task.

Number of 'C' functions called by the 1 sec task <0-255>   [0]:

Number of 'C' language functions to be supplied by the 'C' application to the 1 second task.

Number of 'C' functions called by the 1 min task <0-255>   [0]:

Number of 'C' language functions to be supplied by the 'C' application to the 1 minute task.

Number of diagnostics functions for 'C' application <0-255>   [0]:

Number of 'C' language functions to be supplied by the 'C' application to the Software Diagnostic utility.

Size of each buffer in the 'C' application heap<0-2048>   [0]:

Maximum buffer size in the heap used by the 'C' application.

Number of buffers in the 'C' application heap <0-255>   [0]:

Maximum number of buffers in the heap used by the 'C' application.

Size of dynamic DB access functions table <0-255>   [0]:

Number of 'C' language functions to be supplied by the 'C' application to the DB map.

Size of Log Flash function table <0-255>   [0]:

Number of callback functions to be supplied by the 'C' application for logging flash operations. The first entry in the table will always contain the Program callback function, the

second entry will always contain the Erase callback function, and the third entry will always contain the Disable callback function.

System Parameters

The System parameters can be viewed and modified from the SCADA tab in the WorkspaceBar.

General

Gateway ID <1-255>   [189]:

The **Gateway ID** and the **Startup Mode** fields are essential to enable the SCADA computers to support redundant Gateway configurations. The Gateway ID should be a unique number in the range 1-255. In redundant Gateway systems, it helps to identify the source of the data.

Startup Mode   [Stand Alone]:

Values are:

- Stand Alone   Use this setting for a single Gateway configuration.
                     For NFM systems, use Stand Alone only.

- Redundant GW1 Use this setting for a redundant Gateway configuration.

- Redundant GW2 Use this setting for a redundant Gateway configuration.

If only one Gateway is used, it must be defined as Stand Alone. Then, upon system startup, the Gateway functions as a **Primary**.

For redundant Gateway configurations, the startup mode should be specified as either Redundant GW1 or Redundant GW2. Upon startup of the system, both Gateways will function as **Secondary**.

The **Startup Mode** is essential for redundant Gateway configurations. One Gateway should be assigned as Startup Mode **Primary** and the second as Startup Mode **Secondary.**

For more on IP Gateway redundancy, see the *IP Gateway Redundancy* section of the IP Gateway System Overview chapter above.

Gateway Settings

System Resources

Clients <1-10>   [4]

Allows the definition of the maximum number of SCADA clients.

Channels <1-40>   [16]

Allows the definition of the maximum number of SCADA channels.

Communication Buffers<1-50>   [20]

Allows the definition of the maximum number of communication buffers.

Communication Buffer Size <500-8192>   [8192]

Allows the definition of the maximum size of the communication buffers (in bytes).

If you entered an incorrect range, Toolbox displays a dialog box with the valid parameter range. Click **OK** to dismiss the dialog box and enter the correct value.

Task Allocation

Overall Tasks <1-20>   [6]

Allows the definition of overall concurrent application tasks.

Dedicated CMD Tasks <0-10>   [1]

Allows the definition of concurrent Command tasks (dedicated for sending commands).

Dedicated DATA Tasks <0-15>   [1]

Allows the definition of concurrent Data tasks (dedicated for polling RTUs and for downloading parameters).

Dedicated SERVICE Tasks <0-5>   [1]

Allows the definition of concurrent Service tasks (dedicated for sending/reading RTUs time).

If you entered an incorrect range, the Toolbox displays a dialog box with the valid parameter range. Click **OK** to dismiss the dialog box and enter the correct value.

Request Allocation

Overall Pending Requests <1-125>   [30]

Allows the definition of overall pending requests, (must equal the combined sum of Pending CMD, Data and Service Requests).

Pending CMD Requests<0-105>   [10]

Allows the definition of minimum pending command requests from the SCADA).

Pending DATA Requests<0-105>   [10]

Allows the definition of minimum pending data requests from the SCADA).

Pending SERVICE Requests<0-105>   [10]

Allows the definition of minimum pending service requests from the SCADA).

Network Configuration

The Network Configuration program is used for defining the communication nodes (interconnection points between two or more links) in the network. The program defines the network's structure; there is no need to define all RTUs, **only** the nodes in the network. The communication protocol uses these definitions for automatic routing of the packets through the network.

In simple networks, such as **one** IP Gateway connected to **one** communication link, it is not necessary to use this program (see *Communication Network* in the MOSCAD Programming ToolBox System Overview manual).

The RTU and IP Gateway ports defined as Computer port, which serve as connection to the ToolBox or centrals, are not considered as links in the network but as **local** ports.

A network configuration is stored in a file. The network configuration can be loaded into the RTU or IP Gateway together with the application. During application loading, the user is asked to provide the name of the network configuration file.

The same network configuration file is used for all the sites in the system and also may be used in other networks that have the same structure. The network configuration must be loaded to all sites in the system to enable each site to route the packets through the network.

When additional sites are to be added to the network, it is not necessary to change the network configuration definitions since Network Configuration defines only the nodes in the network. All you have to do is to define the main communication port of each site, via Site Configuration, and to connect it to one of the network links, using the logical (symbolic) name of the link.

Routing of Data Frames

The network configuration serves as an internal data bank which describes a path to each link in the network. When data frames are to be relayed to another site, the node checks if it has a direct link to the destination. If so, the data is transmitted. If there is no direct link, or if that link is in "fail" state, the unit will use the network map to try to identify another path.

A device called "NSTOCK" (a Software Diagnostics Level 2 device) provides the full list of data links (as defined in Network Configuration), and adds the status during runtime. The transmitting node will try each path (sequentially, starting with the first entry) until it is successful. If some of the links are in "fail" state, the node will try the first link that is in working order. If all possible links are in "fail" state, it will try the first path. If the transmission fails, the frame is discarded.

When a data link fails to acknowledge transmission, it is marked as "fail" in the network data bank. The failed link can be restored to "OK" status if another transmission happens to succeed. Another mechanism exists, whereby the network performs periodic checks on failed links and restores them to "OK" status is an acknowledgement is received. When this

mechanism is disabled, the failed link is considered to be restored after a specified period of time.

Routing over Alternative Direct Link

The *Routing of Data Frames* section above describes automatic routing between sites which are not directly connected.   The system will also perform automatic alternative routing between nodes that are directly connected by more than one direct link (if one of them is failed). In previous versions, finding alternative communication routes across such systems was performed by the user application.

All relevant links in the example below were defined in the Network Configuration and downloaded to the units. RTU100 will choose a link which is not failed for communication with RTUs 1-99 (as will be done in communication between RTU4 and RTU 88.) Thus if RTU100 is unable to initiate communications with RTU2 over the radio link, due to a radio failure, it will automatically attempt to communicate using the dial link. If no alternative links exist, or if all fail, then the transmission will fail. In the case of a failed direct link, the recovery mechanism described above in *Routing of Data Frames* is performed, according to the parameter settings in the site configuration.
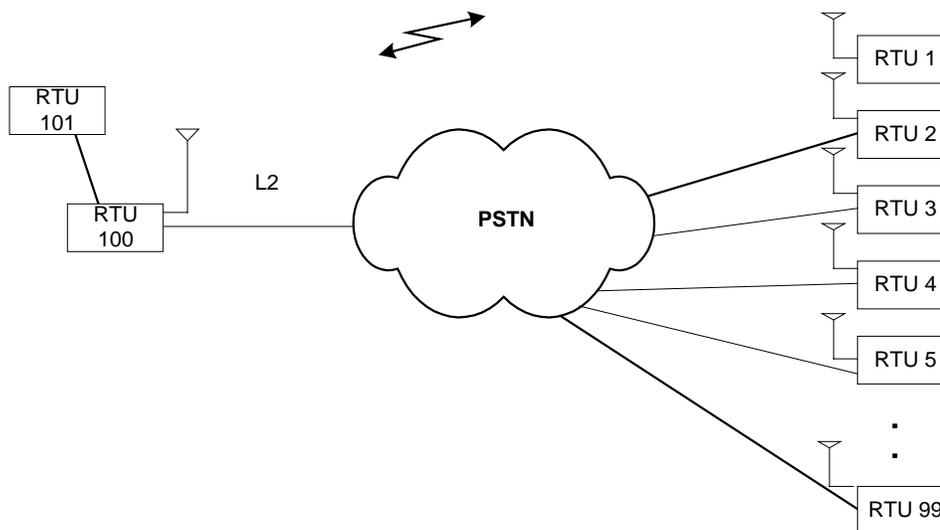
Routing over Direct Link is only possible with new versions of both the ToolBox and system. Note that if you have existing applications which try to transmit over alternate links, these should be modified to prevent redundancy.

When RTU101 tries to transmit to one of the RTUs (1-99), the routing is actually performed by RTU100. The behavior of the routing in the system, when one of the links to the designated RTU is failed, is exactly as described in *Routing over Alternative Direct Link* above.

Network Configuration Window

To start Network Configuration, double-click the Network Configuration icon in the IP Gateway ToolBox folder. Click on the New icon or select New from the File menu. The following is displayed.
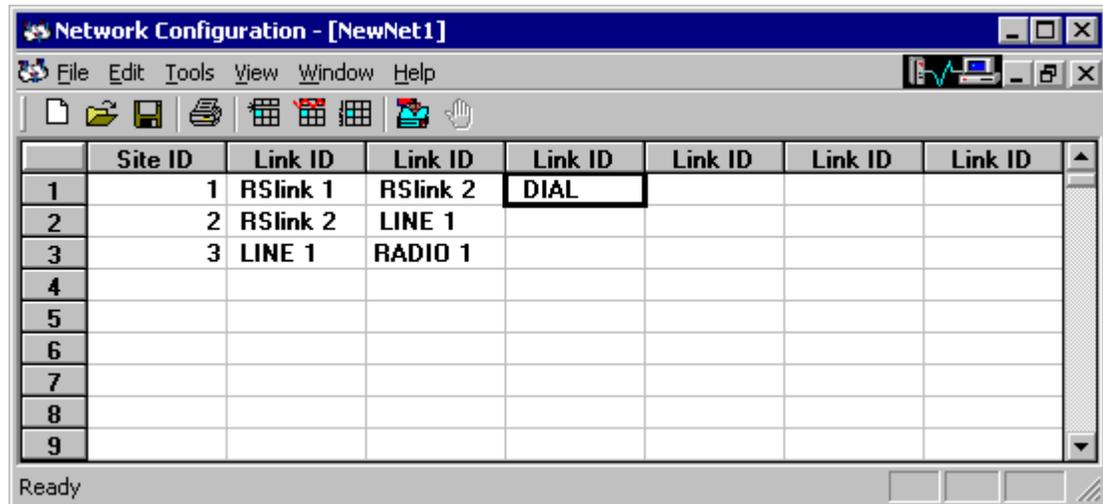
The network configuration is defined in this window.

In the displayed table, you define the accessible (logical) links for every site that serves as a node. A site that uses two or more communication ports and **does not** serve as a node should not be defined in Network Configuration. If, for example, Site 1 is directly connected to Link 1 and to Link 2, both links are added to the Site entry in the table.

For each site, you may define up to six links (minimum two links to define a site as a communication node). Just click the Site ID box, type the Site ID, and then for each Link ID, open the drop-down list and select the appropriate value.

In the example below, Sites 1, 2, and 3 serve as nodes, each connected to two links. Data packets can be relayed from Site 1 to Site 2 over RSlink2. The DIAL link enables connection via dialup modem from Site 1 to any other site attached to a modem. From Site 3 to Site 2, LINE1 is used. To display a more detailed version of the configuration, with all possible communication through the site, see *View As Text* below.
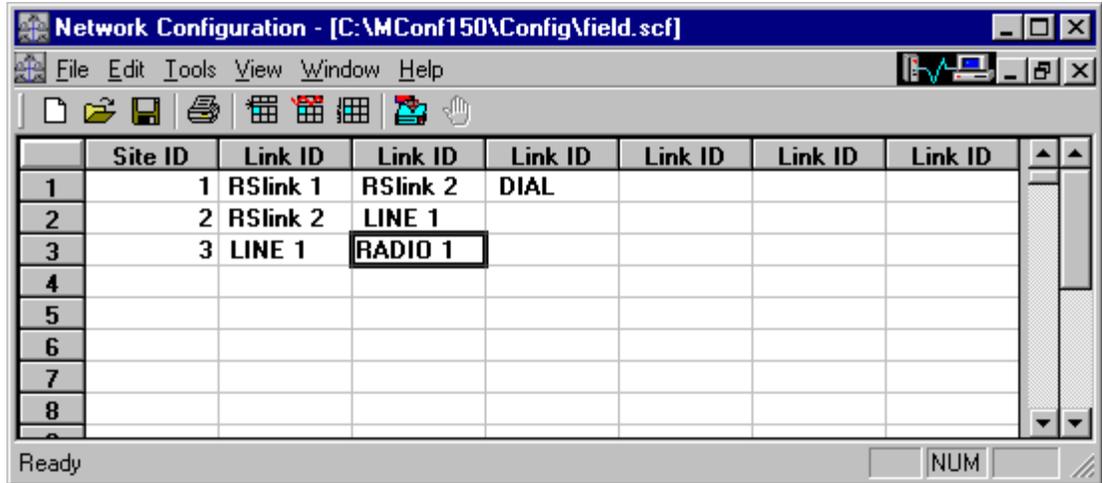
Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	File menu, Print command
	Edit menu, Insert Rows command
	Edit menu, Delete Rows command
	Edit menu, Sort by Site ID command
	Tools menu, Download command
	Abort command

File Menu

The commands in the File menu are mainly designed to handle configuration files.

New

The New command (Network Configuration File menu) opens a new network configuration file. If more than one network configuration file is opened, they can be rearranged using commands in the Window menu or resized using the standard window operations.

Open

The Open command (Network Configuration, File menu) opens an existing network configuration file. After activating this command, the ToolBox displays the Open dialog box, as shown below.
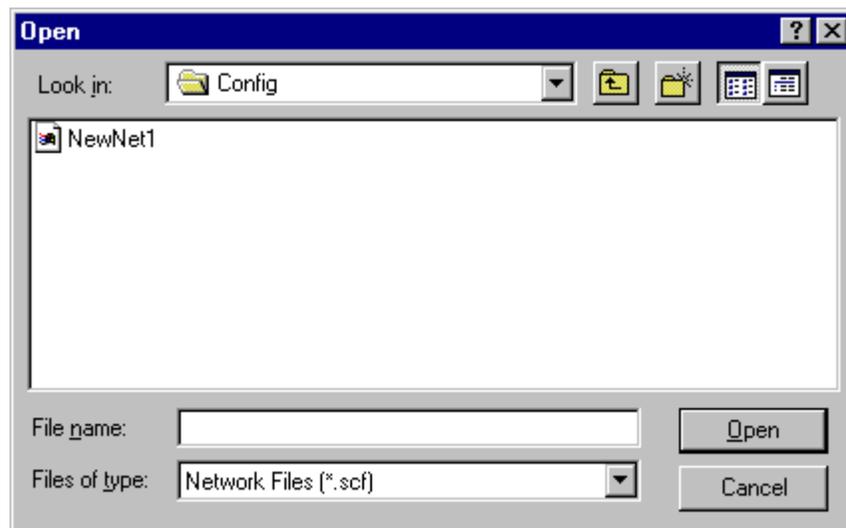
The Open dialog box defaults to the Config sub-directory of the IP Gateway ToolBox (Itbox550) directory. The Config sub-directory is where the ToolBox stores configuration files by default.

The Open command allows you to open applications that have been developed under earlier ToolBox versions. You do not have to upgrade your applications in order to continue development under the new version.

Select the configuration file (see parameters below) and click OK to load it.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the drive letter at the right of the Look in list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the configuration file. the ToolBox automatically adds the .scf extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .scf, open the drop-down list and select the .scf type.

Close

The Close command (Network Configuration, File menu) closes the current network configuration file.

Save

The Save command (Network Configuration, File menu) stores the current configuration.

If the file has not been saved at least once, the ToolBox opens the Save As dialog box where you assign a name to the configuration file.

If the file has been saved at least once, the ToolBox just saves the file.

Save As

The Save As command (Network Configuration, File menu) saves the current configuration under a different file name. Generally, you'll use this command when you want to create a configuration file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The command opens the dialog box shown below. This dialog appears also when you request to save a configuration file for the first time.
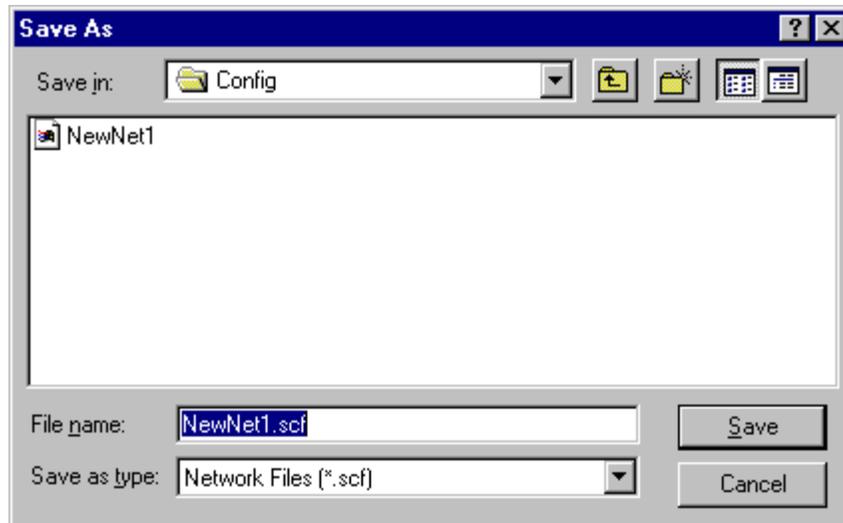
⊟⊟ Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save in
If the currently displayed directory is not the correct one, double-click the drive letter at the right of the Save in Directories list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the configuration file you want to create, and click OK. The ToolBox automatically adds the .scf extension. If you specify the name of a configuration file that appears on the list, the ToolBox issues a message asking you whether you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

Save as Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .scf, open the drop-down list and select the .scf type.

Print

The Print command (Network Configuration, File menu) prints the contents of the displayed table to a printer, as defined in Print Setup.

Page Setup

The PageSetup command (Network Configuration, File menu) enables the user to define the page setup and printer to be used.

Exit

The Exit command (Network Configuration, File menu) exits the network configuration utility.

Edit Menu

The Edit menu contains commands the affect the network configuration table in the main window.

Delete Rows

Deletes the selected row(s).

Sort Rows

Sorts the table in Site ID order.

Insert Rows

Opens a specified number of rows above the row specified in the dialog box.

Define Up To

From a specified Site ID, automatically defines a specified number of consecutive sites, each with the same configuration. The links associated with all of the sites are selected from a list by first selecting the link name (e.g. LINE 1) and then clicking on the right arrow. Links can be deselected by clicking on the left arrow.

Note: if you single-click with the right mouse button, you get the associated menu, i.e. the commands associated with the current state.

Authenticate Links

Authentication enables MOSCAD RTUs/IP Gateways to rely on the integrity of information sent on the MDLC network. An RTU/Gateway can be certain that received data was transmitted by the original sender and not by some other, unauthorized source. For background information on authentication, see the Advanced Features section of the MOSCAD Programming ToolBox Application Programmer manual.

When the Authenticate Links command is selected, a table of all links in the network is displayed, as shown in the Links Authentication Information window below.

Links Authentication Information

Link ID	Authenticated	Has Keys	Has Aliases	Server ID
LINE 12				0
RSlink 1				0
RADIO 1				0
RADIO 2				0
LINE 16				0
LINE 1				0

Help   Close

To specify that the link is authenticated, check the Authenticated box to the right of the Link ID.

Next, specify the Site ID of the server which will perform synchronization for all the RTUs on the link. If the RTU is a server, you will specify its Site ID for all the authenticated links connected to it. If an RTU is a client, its Site ID cannot be entered into the Server ID field. If an RTU is a client/server, specify its Site ID for the appropriate links for whom it will act as a server.

Each radio zone will have ONE Server ID. The first appearance of a radio zone in the network configuration file is the RTU server of that zone. That radio zone will appear first in the list of links in the Links Authentication Information window (i.e. if RADIO4/1 is the server, it will appear before RADIO4/2 and RADIO4/3 in the list.) If you enter a Server ID for another link (e.g. RADIO4/3), it will not be saved. The next time you open the Links Authentication Information window, that Server ID will not appear.

If the RTUs are not attached to a server, but have another clock source (e.g. GPS attached to each site), the Server ID is left at zero. Close the Link Authentication Information window and the authenticated link will appear in a gray background.

If the RTUs are attached to a server, you must enter a Server ID. Double-click anywhere in the entry in the Links Authentication Information window. The Define Keys and Aliases dialog (see below) will open. Enter the Site ID of the server in the Server ID field.

Next, define the authentication keys/key aliases to be used for validating the timestamp in the dataframe. If you close the Define Keys and Aliases dialog using the OK button, the Has Keys/Has Aliases buttons to the right of the entry in the Links Authentication Information will be marked with a check. When you close the Links Authentication Information, the authenticated link will appear in a red background.

Note: If the Server ID or authentication keys are not defined for any link in the table, the authentication information will not be downloaded to the network.

It is possible to authenticate a link from the main Network Configuration screen by clicking the right mouse button and selecting Authenticate Link when the cursor is in a Link ID cell. The next time you open the Links Authentication Information window, the box to the right of that Link ID will be already checked. You will still have to define the server for the link, if one exists.

Authentication Keys

The Authentication Keys are defined for a given link within a given network. This enables the user to determine which subnetworks within the system will understand each other. When either the Has Keys or Has Aliases button is selected, the screen below is displayed.

Three keys of eight bytes each should be defined. Each byte can be entered as either a numeric value or as a string. To switch from numeric to string format, click the appropriate field. If the chosen number cannot be displayed in ASCII format, an asterisk will be displayed instead.

To use the same authentication keys for all links in the network, click the Force All Links button. In this situation, all data transmitted around the network will be understood by all authenticated RTUs.

Note: Force All Links can be used to define keys for all the links and then certain links can be modified in order to vary the authentication and limit the motility of the data.

The authentication keys are not saved on the disk. When the Network Configuration utility is exited, the authentication keys are erased from the ToolBox. Yet it may be difficult to remember which authentication keys were downloaded to the Flash memory of the RTU. Therefore, a name or key alias may be defined for each authentication key to remind the user of the key without compromising the integrity of the authentication. To define a key alias, type a string in the Alias field.

Click OK to save the key definitions or Cancel to exit without saving. . If you close the Define Keys and Aliases dialog using the OK button, the Has Keys/Has Aliases buttons to the right of the entry in the Links Authentication Information will be marked with a check.

Authentication Options

To set the advanced parameters for Authentication, select the Authentication Options command from the Edit menu. The range of values for each parameter is specified between < > symbols. For example, <1-200> means that the value can be a number between 1 through 200. You can specify a value greater than the maximum value, in which case the system only issues a warning message. Exceeding the range may consume additional memory and may cause unexpected or incorrect behavior in the RTU. The default is automatically entered in the parameter field and appears between square brackets (for example: [80]). You can change this value.

TX Stamp Interval (seconds) <5-1800>   **[150]**
This parameter defines the interval between two consequent generations of an authentication stamp for transmission. A higher value saves CPU time but at the same time decreases the protection of the authentication mechanism, since an authentication stamp generated at a given instant will be used to authenticate all the outgoing frames in the next *TX Stamp Interval* seconds.

TX Periodic Server SYNC Interval (seconds) <60-30000>   **[1800]**
This parameter defines the interval between two periodic SYNC messages sent by a Server or a Client-Server. A lower value will decrease the clock drift between any two CPUs in the network, but will increase the communication overhead on the network.

RX Periodic Sync Interval (seconds) <120-60000>   **[3600]**
This parameter defines the interval between two expected SYNC messages. It is relevant to Client and Client-Server operation modes. If an expected SYNC message does not arrive at an RTU within this time interval, it will send a SYNC request message to its known Server. In case of a Client-Server, if an expected periodic SYNC message does not arrive, the RTU will not send any periodic SYNC messages on those Links it serves, until it succeeds in requesting SYNC from its Server and receiving a valid response. It is recommended that this value be set to at least *twice* the value of Server TX Periodic SYNC Interval.

TX Sync Request Retry Interval (seconds) <10-30000>   **[20]**
This parameter defines the interval between two consecutive retries to transmit a SYNC request and receive a valid response. It is relevant to Client and Client/Server operation modes. The request is used by the RTU after restarting (to initially get the Server's clock) and also when (for some reason) the periodic SYNC message is not received, or not properly authenticated.

In case of an unreachable server (due to some communication problem), communication overhead will be higher as this parameter is lower (more frequent request transmissions). On the other hand, a client may be left with an invalid clock for at least the period of time defined in this parameter, if the server is unreachable.

TX After Restart Retry Interval (Seconds) <0-255>   [20]
This parameter defines the interval between two consecutive retries to transmit an "After Restart" message to the entire network (on the authenticated Links only). This parameter is relevant only to Server and Client/Server operation modes. Note that the number of retries is not set since a Server will try endlessly to transmit an *After Restart* message until it succeeds.

Max Drift (seconds) <10-3600>   [300]
This parameter defines the maximum drift allowed between the timestamp contained in an authenticated received frame and the local clock or the receiving RTU. Hence this parameter defines the maximum drift between any two CPUs' clocks. If *Max Drift* is set to x, then for a given time t0 (local receiver clock), a received frame must carry a timestamp in the range of t0 +/- x in order that it NOT be discarded. Recall that a received timestamp is added to the value of *Maximum Network Delay* and only then it is checked against the local receiver clock. The authentication mechanism of a received frame is stricter as *Max Drift* is set lower.

Note that the maximum drift may actually be smaller than the Max Drift parameter, because the incoming timestamp is compared to an internal generated timestamp and not to an actual clock. The internal timestamp is generated every TX Stamp Interval. Consider a situation where the Max Drift is set to 300 seconds and the TX Stamp Interval is set to 150 seconds. An RTU whose clock has drifted by 200 seconds may reject the received frame as invalid if its internal timestamp was generated 140 seconds previously.

Max Network Delay (Msec) <0-3600000>   [0]
This parameter defines the maximum of all delays of the authenticated links in the network. It is relevant to received frames only. If a frame carrying a timestamp with a value of t1 is received, the receiving RTU will add the value of *Maximum Network Delay* to t1 for the purpose of authenticating the frame. In most cases, this parameter should be set to zero.

Once the parameters have been set, click OK.

Edit Links Costs

This command is for future use.

Tools Menu

View As Text

The View As Text command (Network Configuration, Tools menu) opens the network configuration parameter values in textual form, as shown below. All standard Windows text file operations are available.

```
 field.TBL - Notepad                              _ □ X
 File  Edit  Search  Help

*NODE-1
;From Link       Through Site      To Link      Cost
;---------       ------------      -------      ----
     52                   2             21      ;    6
RSlink 2    -->  LINE 1
     52                   2            110      ;   26
RSlink 2    -->  RADIO 1

*DIRECT_LINK-1
;Node ID     Direct Link
;-------     -----------

*NODE-2
;From Link       Through Site      To Link      Cost
;---------       ------------      -------      ----
     52                   1             10      ;   31
RSlink 2    -->  DIAL
     52                   1             51      ;    2
```

The text file pictured above describes each link connected to NODE 1. From LINE 1 (known internally as LINK-21) communication is possible through that node to LINE 2 (LINK-22), LINE 3 (LINK-23), and LINE 4 (LINK-24). The file contains a similar entry for LINE 2, LINE 3, and LINE 4 respectively. Thus any other nodes connected to LINES 1,2, 3, or 4 can be reached from NODE 1.

Download

The Download command (Network Configuration, File menu) is used to download the currently open configuration file to an RTU.

After selecting the command, the ToolBox requires the password. Then it opens the following dialog box:
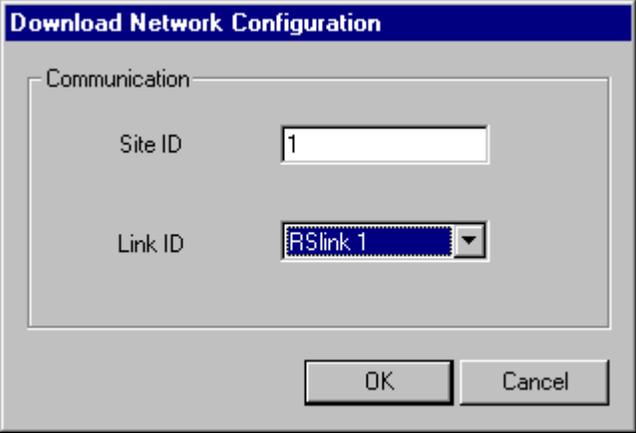
```
Download Network Configuration

┌ Communication ──────────────────────────┐
│                                          │
│      Site ID      [1            ]        │
│                                          │
│                                          │
│      Link ID      [RSlink 1   ▼]         │
│                                          │
└──────────────────────────────────────────┘

              [  OK  ]    [ Cancel ]
```

🖳 **Dialog box parameters**

Site ID

Enter the Site ID of the unit to which the network configuration is to be downloaded.

Link ID

Enter the Link ID of the unit to which the network configuration is to be downloaded.

OK

Click this button to start the download process. While the Network Configuration tool is communicating with the RTU, the [icon] icon at the top right hand corner of the Network Configuration window will be animated.

Font

The Font command (Network Configuration, Tools menu) is used to change the current settings for font name, style, size, etc.

View Menu

The View menu enables you to view or hide various screens from the utility window. Pull down the menu and click on an entry to toggle the viewing. The following views are available to the user.

Toolbar

The Toolbar displays the icons described under *Icons*.

Status bar

The Status bar displays the status messages at the bottom of the Network Configuration window.

Download window

The Download window displays a window with the progress and status of the download at the bottom of the Network Configuration window. This window can be dragged to a different area of the screen and can be closed by clicking on the X in the upper left-hand corner of the window. This window is read-only.

Window Menu

The Window menu enables the user to arrange the various screens within the Network Configuration window. The screens can also be moved, resized or closed as standard Windows. In addition to the commands below, the Window menu lists the currently open windows. The checked name is the active screen. By clicking on another filename, the user can change the active screen.

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Help Menu

The Help menu enables the user to view the version information and help files which relate to the Network Configuration tool.

Contents

The Contents opens the help files which describe the Network Configuration tool and other IP Gateway ToolBox utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway ToolBox help is used.

About

The About displays the version information for the Network Configuration tool.

MDLC Links Configurator

The MDLC Links Configurator allows you to change the number of links assigned to each medium, such as lines, Rslinks, Radio links and zones.

Note: It is recommended that users not change the default values set by the manufacturer unless absolutely necessary. Be aware that the Links Configurator may change the physical value of each link. This may cause different treatment of links in certain configurations, such as Rslink as Radio or vice versa.

After activating the Links Configurator, close all ToolBox tools, stop the Communication Driver and then double-click the icon of the tool you want to reactivate.

The MDLC Links Configurator Window

To activate the MDLC Links Configurator, double-click the icon in the IP Gateway ToolBox folder. A dialog box like the one shown below is displayed:

The first time you open the tool, two tabs will be available, Default and port.txt. The Default screen contains the values set by the manufacturer and cannot be modified. The port.txt screen above displays the (active) current configuration. This configuration file is initially the same as the Default, but both the content and the tab name can be modified.

At this point, you can choose to view either the Default dialog box or another existing dialog box (e.g. port.txt above), by clicking on the appropriate tab at the top of the screen.

To access another configuration (e.g. n1.txt above), simply click on the appropriate tab. You can open another configuration file or several files, using the Open option of the File menu.

▣ Dialog box parameters- Communications Link Number

This section is used to change the number of links assigned to each medium.

Number of free Links
Displays the number of free links in the current configuration. This is a protected field, and the displayed value cannot be changed.

Line
Displays the number of lines used in the current configuration. This is an unprotected field, and the displayed value may be changed. The minimum is two lines.

RSlink
Displays the number of Rslinks used in the current configuration. This is an unprotected field, and the displayed value may be changed. The minimum is one Rslink.

Radio
Displays the number of Radio links used in the current configuration. This is an unprotected field, and the displayed value may be changed. The minimum is one radio.

X.25
Displays the number of X.25 links used in the current configuration. This is a protected field, and the displayed value cannot be changed.

Dialog box parameters - Radio Zones Number

This section is used only to define the number of zones for each Radio link.

Number of free Radio Zones
Displays the number of free radio zones links in the current configuration. This field is updated automatically when the *Number of Zones* field changes.

Link Name
Use this field to select the particular radio link. Click the down arrow key to display the list of radio links defined, according to the Radio field. Select the desired radio link from the drop-down list box.

Zones Number
Displays the zone number corresponding to the radio link in the Link Name field. To change the value, click the down arrow key to display the drop-down list box and select the preferred zone number.

In the bottom section of the window, all zones defined in the current configuration are displayed with their corresponding radio links.

Icons

The following is a list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command

File Menu

The commands in the File menu are designed mainly for manipulating files and exiting the application. File menu commands are:

New

Creates a new configuration, based on the default settings. The ToolBox gives the new configuration a temporary name (NEW1, NEW2, etc.), until you save it under a different name.

Open

Opens an existing link configuration file. After activating this command, the ToolBox displays the Open dialog box as shown below. The Open dialog box defaults to the config sub-directory of the IP Gateway ToolBox (Itbox550) directory. The config sub-directory is where the ToolBox stores configuration files by default.

Enter the desired link configuration file name and click OK to load it.

The ToolBox automatically adds the .txt extension. Alternatively, locate the file name in the file list, and double-click the name, then click OK.

Close

Closes the currently open link configuration file.

Save

Saves the current configuration file with the name, location, and file format you previously set in the Save As dialog box.

When you save a configuration file for the first time, the ToolBox displays the Save dialog box.

Type the name of the link configuration file you want to create, and click OK. The ToolBox automatically adds the .txt extension. If you specify the name of a link configuration file that appears on the list, the ToolBox issues a message asking you whether you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

Save As

Saves the current link configuration information under a different file name. Use this command when you want to create a new link configuration file that is slightly different from an existing one. To do so, open an existing file, and click Save As in the File menu. The command opens the Save As dialog box as shown below.

To save the file under a different name, highlight the existing file name, type the new name and click OK. The ToolBox automatically adds the .txt extension. The Links Configurator program stores the current file under the new name on disk.

If you specify the name of a link configuration file that appears on the list, the ToolBox issues a message asking you whether you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

Save All

Saves all open link configuration files. If a file has not been saved before, the ToolBox displays the Save Configuration dialog box. Enter the new link configuration file name in the *File Name* box and click OK.

Print

The Print command (MDLC Links Configurator, File menu) prints the contents of the link configuration file to a printer.

Activate

Activates a different link configuration.

To activate another link configuration, use the Open command to display an existing link configuration file, then:

1. Click the tab of the desired configuration file at the top of the Links Configurator screen.
2. Open the File menu.
3. Choose the Activate command.

The ToolBox asks you to confirm that you want to activate another link configuration. Click Yes to activate the new configuration.

Activate Default

Activates the default link configuration. If you want to revert to the default link configuration:

1. Open the File menu.
2. Choose the Activate Default command.

The ToolBox asks you to confirm that you want to activate another link configuration. Click Yes to activate the default configuration.

Exit

Closes any open files and quits the MDLC Links Configurator. If a file has unsaved changes, an alert appears, asking whether to save the changes before exiting.

Help Menu

The Help menu enables the user to view the version information and help files which relate to MDLC Links Configurator tool.

Contents

The Contents opens the help files which describe the MDLC Links Configurator tool and other IP Gateway ToolBox utilities.

About

The About displays the version information for the MDLC Links Configurator tool.

Site Table

The Site Table utility enables the user to define the sites in the system with which the IP Gateway wishes to communicate. Unlike the network configuration which defines only those sites which are nodes, the Site table contains **all** the sites.

For each destination site, the user defines a logical address (Site ID), and the links (Link ID) through which it is connected. When sending data to another site, the user refers to the destination using the site index of the table.

Site Table Window

The Site Table Window allows you to define all sites in the system. To start the Site Table tool, double-click the Site Table icon in the IP Gateway Toolbox folder.

Click on the New icon or select New from the File menu to open a new Site table. The following is displayed. An existing Site table can also be opened and edited.

	Site ID	Retries	Time-Out	Primary Link ID	Primary Link Validity	Secondary Link ID	Secondary Link Validity
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
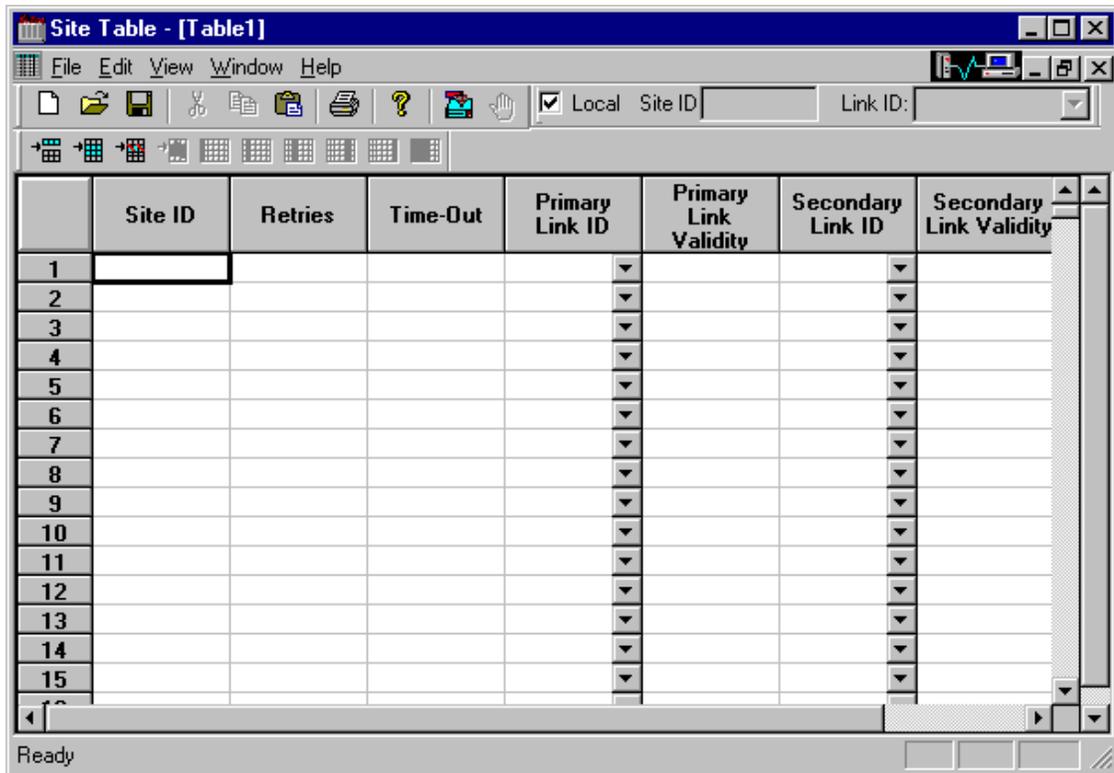
For each site in the system, enter the Site ID, the number of retries to be performed and the number of seconds to wait between retries. For each site, enter the primary link ID, secondary link ID and the length of time to wait before an unresponsive link is considered invalid. Next, click on the Save icon or select Save/Save As from the File menu. Double-click in any cell to return to the default value.

Once the file is saved, it can be downloaded to the site.

Communication parameters

Local
When this box is checked, the Site table is downloaded to the locally connected site. The default setting for communication is Local. When this box is not checked, the Site table is downloaded to the remotely connected site, and the appropriate Site ID and Link ID must be specified.

Site ID:
When the Local box is not checked, the Site table is downloaded to a remote site at the specified Site ID connected to the PC via the specified Link ID.

Link ID:
When the Local box is not checked, the Site table is downloaded to a remote site connected to the PC via the specified Link ID.

⊞ Dialog box parameters and functions

Site ID
Click in the cell to enter the Site ID for the site being added. (Note: The Site ID was defined for the site in its site configuration.)

Retries
Click in the cell to enter the number of attempts to be made to communicate with a non-responding site. The valid range of retries is 1-255. The default is 1.

Timeout
Double-click to define the time (in seconds) to wait between communication retries. The minimum value is 1 second; the maximum value is 255 seconds. The default is 30.

Primary Link ID
Click on the down arrow (or double-click in the cell) and select from the list box the link through which the site is connected to the network.

Primary Link Validity
The Gateway tests communication with the sites on a regular basis. If a site has not responded for a specific time interval, the link is considered unreachable.

Secondary Link ID
Click on the down arrow and select the proper link (other than the Primary) through which the RTU is connected to the network from the list box.

Secondary Link Validity
The Gateway tests communication with the sites on a regular basis. If a site has not responded for a specific time interval, the link is considered unreachable.

Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	Edit menu, Cut command
	Edit menu, Copy command
	Edit menu, Paste command
	File menu, Print command
	Help menu, About command
	File menu, Download command
	File menu, Abort command
	Insert Site Command
	Delete Current Site command
	Insert Group of Sites command
	Delete Group of Selected Sites command
	Change Retries Value command
	Change Timeout Value command
	Change Primary Link ID Value command
	Change Primary Link Validity Value command
	Change Secondary Link ID Value command
	Change Secondary Link Validity Value command
	Edit menu, Sort by Site ID command

Most of the icons are dimmed unless there is an open Site table file.

File Menu

The commands in the File menu are designed mainly for manipulating tables and exiting the application.

New

The New command clears the currently loaded file from the screen and opens a new file.

Open

The Open command opens an existing Site table file. After activating this command, the Toolbox displays the dialog box shown below. The Open dialog box defaults to the *config* sub-directory of the Toolbox directory. The config sub-directory is where the Toolbox stores the Site table files by default.

If the desired table is listed, double-click it. Otherwise, type the path and file name in the File Name box and click OK.

The Toolbox automatically adds the .stb extension.

Close

The Close command closes the current open Site table file. If the file has unsaved changes, an alert appears, asking whether to save the changes before closing.

WSitetbl

⚠️ Save changes to WSitet2.stb?

[Yes] [No] [Cancel]
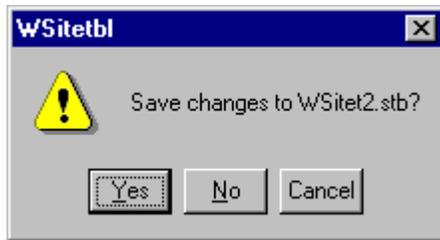
Click the appropriate button.

Save

The Save command stores the current Site table file on disk for future use.

If the file has not been saved at least once, Toolbox opens the Save As dialog box where you assign a name to the file.

If the file has been saved before, Toolbox just saves the file.

Save As

The Save As... command saves the current Site table information under a different file name. You would use this command when you want to create a new Site table file that is slightly different from an existing one. To do so, open an existing file, and click Save As… in the File menu. The command opens the Save As dialog box.

To save the file under a different name, highlight the existing file name, and then type the new name. Click OK. The Site Table program stores the current file under the new name on disk.

Print

This command sends the Site table data to the default printer. The program sends a confirmation message that the data is directed to the default printer. Click YES to continue the print process.

Download

This command downloads the Site table data to the site specified in the Communication parameters. If the download is to the site directly connected to the Toolbox computer, make sure the Local box is checked (the default). If the download is to a remote site, unselect the Local box and specify the Site ID and Link ID parameters at the top of the screen. If no communication driver has been started, the utility will prompt you for the Site password.

During the download, the utility will display the current status and actions being performed.

While the Site Table tool is communicating with the site, the [icon] icon at the top right hand corner of the Site Table window will be animated.

Because the Download command downloads the Site table data without resetting the site, it should only be used to download Site tables which add new sites to the system. If the Site table to be downloaded contains Site IDs already defined in the site, the Downloader utility should be used.

Abort

This command aborts the download of the Site table data to the specified site.

Exit

The Exit command closes any open files and quits the Site table program. If a file has unsaved changes, an alert appears, asking whether to save the changes before exiting.
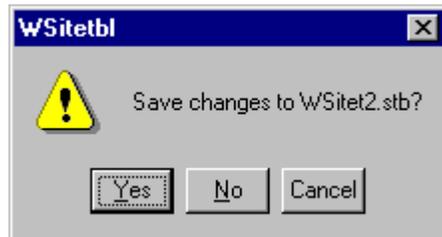
Click the appropriate button.

Edit Menu

The Edit menu contains commands that affect the Site table list.

Cut

Cuts selected row(s) from the current Site Table file to the system clipboard.

Copy

Copies selected row(s)/column(s) from the current Site Table file to the system clipboard.

Paste

Pastes selected row(s)/column(s) from the current Site Table file to the system clipboard.

Insert Site

Opens a new row above an existing row to insert a new site.

Insert Group of Sites

Inserts a single site or several sites at once. When activated, the following screen is displayed:

Insert Group of Sites

Number of Sites:	1
First Site-ID :	1
Retries :	1
Time-out :	30
Primary Link-ID :	RADIO 1
Primary Link Validity :	000:05:00
Secondary Link-ID :	LINE 1
Secondary Link Validity :	000:05:00

[OK]   [Cancel]

Dialog box parameters and functions

Number of Sites
Double-click and enter the number of sites you want to add to the Site table.

First Site ID
Double-click and enter the first Site ID in the current group.

Retries
Double-click to enter the number of attempts to be made to communicate with a non-responding site. The default value is 1. The valid range of retries is 1-255.

Time-out
Double-click to define the time (in seconds) to wait between communication retries. The minimum value is 1 second, the maximum value is 255 seconds. The default value is 30 seconds.

Primary Link ID
Click on the down arrow and select the proper Link ID from the list box. The default Link ID is Radio 1.

Primary Link Validity
Double-click to define the time to wait for a response from a RTU. The format is HHH:MM:SS. If there is no response within the specified time, the link is marked as unreachable.

Secondary link ID
Click on the down arrow and select the proper Link ID (other than the Primary) from the list box. The default Link ID is Radio 1.

Secondary Link Validity

Double-click to define the time to wait for a response from a RTU. The format is HHH:MM:SS. If there is no response within the specified time, the link is marked as unreachable.

Delete Site

Deletes the selected site.

Delete Group of Sites

You may use this command to delete either an individual site, or several sites at once. .

To delete a single site:

- Click the desired site.

- Select the *Delete Group of Selected Sites* command or click on the icon.

To delete two or more sites at the same time:

- Select the sites you wish to delete by holding the left mouse button while dragging the mouse until all sites are highlighted.

- Select the *Delete Group of Selected Sites* command or click on the icon.

Change Retries Value

Changes the number of retries of the selected site(s).

- Double-click in the retries cell of the desired Site ID and enter the new retries value;

- Or select several retries cells at once by dragging with the left mouse button until all sites to be changed are highlighted. Select the *Change Retries Value* command or click on the icon.

- Enter the desired number of retries in the dialog as shown below and click OK.
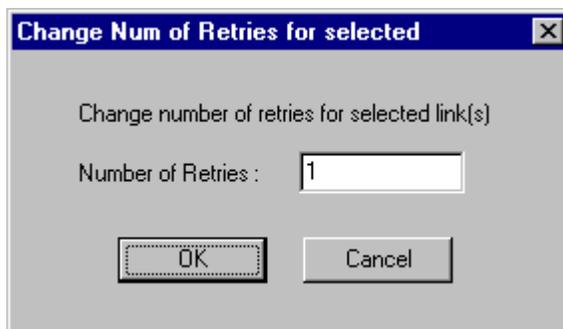
Change Timeout Value

Changes the timeout value of the selected site(s).

- Double-click in the timeout cell of the desired Site ID and enter the new timeout value;

- Or select several timeout cells at once by dragging with the left mouse button until all sites to be changed are highlighted. Select the *Change Timeout Value* command or click on the icon.

- Enter the new timeout value in the dialog box as shown below and click OK**.**
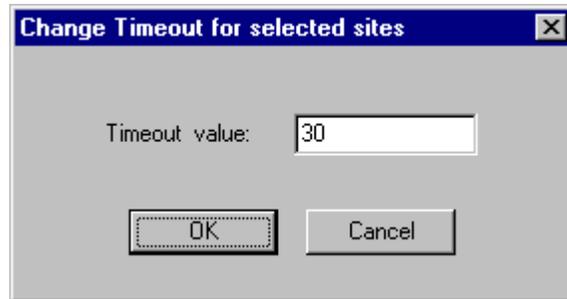
Change Primary Link ID Value

Changes the Primary Link ID of the selected site(s).

To change the Primary Link ID of a single site:

- Double-click in the Primary Link ID cell of the desired Site ID or click on the down arrow to the right of the cell.

- Select the proper Link ID from the displayed list box and click OK**.**

To change the Primary Link ID of several sites at once:

- Select several Primary Link ID cells at once by dragging with the left mouse button until all sites to be changed are highlighted.

- Select the *Change Primary Link ID Value* command or click on the icon.

- Click on the down arrow and select the proper Link ID from the displayed list box as shown below and click OK**.**
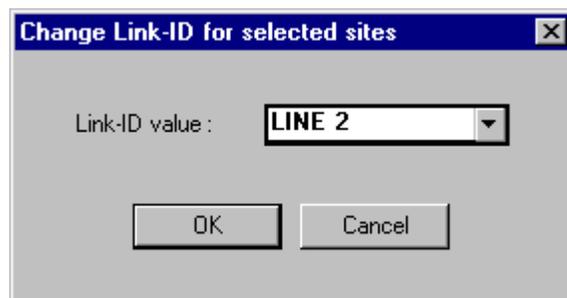
Change Primary Link Validity Value

Changes the primary link validity value of the selected site.

- Double-click in the desired Primary Link Validity cell and enter the new value;

- Or select several Primary Link Validity cells at once by dragging with the left mouse button until all sites to be changed are highlighted. Select the *Change Primary Link Validity Value* command or click on the icon.

- Enter the new link validity value in the dialog box as shown below and click OK.
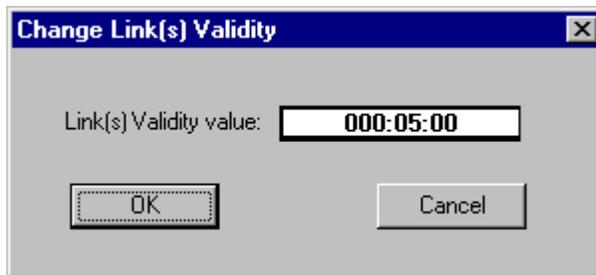
Change Secondary Link ID Value

Changes the Secondary Link ID of the selected site(s).

To change the Secondary Link ID of a single site:

- Double-click in the Secondary Link ID cell of the desired Site ID or click on the down arrow to the right of the cell.

- Select the proper Link ID from the displayed list box and click OK.

To change the Secondary Link ID of several sites at once:

- Select several Secondary Link ID cells at once by dragging with the left mouse button until all sites to be changed are highlighted.

- Select the *Change Secondary Link ID Value* command or click on the icon.

- Click on the down arrow and select the proper Link ID from the displayed list box as shown below and click OK.
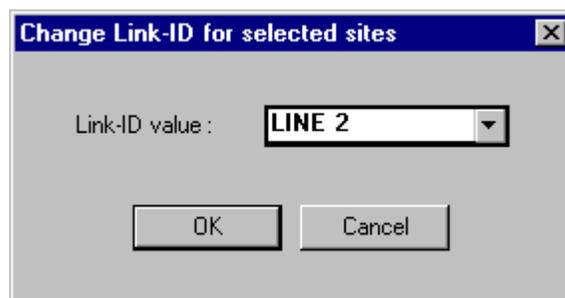
Change Secondary Link Validity Value

Changes the secondary link validity value of the selected site.

- Double-click in the desired Secondary Link Validity cell and enter the new value;

- Or select several Secondary Link Validity cells at once by dragging with the left mouse button until all sites to be changed are highlighted. Select the *Change Secondary Link Validity Value* command or click on the icon.

- Enter the new link validity value in the dialog box as shown below and click OK.
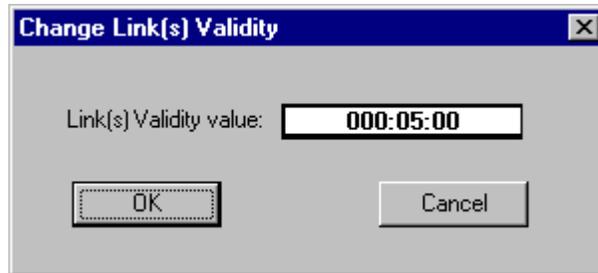
Sort By Site ID

Arranges the cells in the Site Table by site order.

Default Center

The Default Center command enables the user to set up the Site table entry for the default central for burst to central. This screen is read-only.
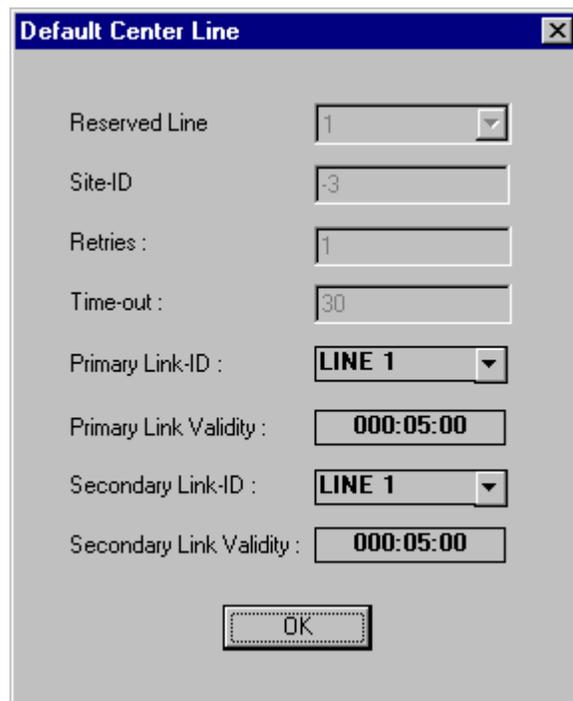
⊟⊟ Dialog box parameters and functions

Reserved Line
The row in the Site table where the default center will be defined.

Site ID
The Site ID for the site being defined as the default center. (Note: The Site ID was defined for the site in its site configuration.)

Retries
The number of attempts to be made to communicate with a non-responding site.

Time-out
The time (in seconds) to wait between communication retries.

Primary Link ID
The link through which the site is connected to the network.

Primary Link Validity
The Gateway tests communication with the sites on a regular basis. If a site has not responded for a specific time interval, the link is considered unreachable.

Secondary Link ID
The link (other than the Primary) through which the RTU is connected to the network from the list box.

Secondary Link Validity
The Gateway tests communication with the sites on a regular basis. If a site has not responded for a specific time interval, the link is considered unreachable.

View Menu

The following views are available to the user. Click on an entry to select it, and a check mark will appear on the menu. The associated view is then displayed on the Site Table window.

Toolbar

The Toolbar displays the icons described under *Icons*.

Table bar

The Table bar displays, at the top of the Site Table window, the commands used to manipulate the Site Table cells.

Site bar

The Site bar displays the Site ID/Link ID at the top of the Site Table window and enables the user to define the site (local/remote) to which it will download the Site table.

Status bar

The Status bar displays the status messages at the bottom of the Site Table window.

Window Menu

The Window menu enables the user to arrange the various screens within the Site Table window. The screens can also be moved, resized or closed as standard Windows. In addition to the commands below, the Window menu lists the currently open windows. The checked name is the active screen. By clicking on another filename, the user can change the active screen.

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Help Menu

The Help menu enables the user to view the version information and help files which relate to the Site Table tool.

Contents

The Contents command opens the help files which describe the Site Table tool and other IP Gateway Toolbox utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway Toolbox help is used.

About

The About command displays the version information for the Site Table tool.

SNMP Configurator

General

The SNMP Configurator program allows the definition of the SNMP and the Motorola SSC (System Support Center) parameters. Selecting the SSC option sets the Gateway MIB to support Motorola specific OmniLink and SmartZone systems.

The SNMP Configurator Window

The SNMP Gateway Configurator Window is used to set the SNMP configuration for the IP Gateway. After activating the program from the IP Gateway Toolbox Group, the following dialog box is displayed:

Gateway Name
The Gateway Name identifies the name of the Gateway's location/zone. The NMC (Network Management Control Center) application retrieves this name by using the IP Gateway MIB.

SSC Settings
Gateway source IP
The IP Gateway sends SNMP Trap_PDUs that include a virtual "Gateway source IP" address.

Manager host IP
The IP Gateway sends, without the need for registration, SNMP Trap_PDUs to the SSC manager with "Manager host IP" address.

Manager Port ID
The IP Gateway sends SNMP Trap_PDUs to the SSC manager with non-standard SNMP Port ID.

MIB II
The following four fields are part of MIB II parameters that define the contact person's name and the location of the Gateway, as well as the Community Strings that serve as passwords for accessing the Gateway.

Contact
The name of the contact person responsible for setting, configuring and maintaining the IP Gateway and all NFM RTUs and devices installed at the communication sites.

Location
For maintenance purposes, the address of the location of the IP Gateway device should be provided. The NMC application or the MIB Browser can retrieve this address by using the IP Gateway MIB.

Community Read
The definition of the Community String Read provides a READ security password to the IP Gateway. The NMC should supply the same Community String (case sensitive) in order to read information from the IP Gateway: (Get_PDU/Get_Next_PDU Requests PDUs) and for sending Traps.

Community Write
The definition of the Community String Write provides a WRITE security password to the IP Gateway. The NMC should supply the same Community String (case sensitive) in order to write information to the IP Gateway: Set_PDU Request.

DB refresh interval[s]
The database refresh interval specifies the refresh (validity) interval in seconds of the data received from the sites in the internal IP Gateway cache. The data is discarded after this interval expires.

Icons

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	File menu, Download command
	File menu, Upload command

File Menu

The commands in the File menu are designed mainly for managing SNMP Configuration files and exiting the application. File menu commands are:

New

The New command clears the current settings from the main window. If you made changes to the current settings without saving them, the SNMP Configurator program displays a confirmation screen, asking if you want to save the data. Click the appropriate button.

Open

The Open command opens an existing SNMP Configuration file. After activating this command, Toolbox displays the Open dialog box. The Open dialog box defaults to the *config* sub-directory of the Toolbox (itbox550) directory and to the .snm type files. The config sub-directory is where Toolbox stores SNMP Configuration files by default. Locate the file name in the file list, and double-click the name.

Save

The Save command stores the current SNMP Configuration parameters that appear on the main screen. If the file has not been saved at least once, Toolbox opens the Save As dialog box where you assign a name to the SNMP Configuration file. If the file has been saved at least once, Toolbox just saves the file.

Save As

The Save As command saves the current download settings under a different file name. Generally, you'll use this command when you want to create a SNMP Configuration file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The command opens the Save As dialog box. This dialog appears also when you request to save a configuration file for the first time.

Type the name of the SNMP Configuration file you want to create, and click **OK**. Toolbox automatically adds the .snm extension. If you specify the name of a SNMP Configuration file that appears on the list, Toolbox issues a message asking you whether you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

Download

The Download command is used to download a SNMP Configuration file to the IP Gateway unit (to be stored in the FLASH memory in the CPU module). You can download to an IP Gateway unit directly connected to the Toolbox computer, or to a remote IP Gateway unit.

This command also enables you to change the Site ID and system address of the IP Gateway unit. Before activating the Download command:

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- Make sure that you have loaded the correct configuration file - the one that contains the configuration for the IP Gateway unit you are communicating with. Use the Open command to open a configuration file.
- Ensure that the Toolbox computer is ready to communicate.

After you select Download, Toolbox asks you to specify the communication password, if this is the first time that the Communication Driver is used. If the Communication Driver was activated before, no password is required. Following the entry of the correct password, the Download SNMP Configuration dialog is displayed.
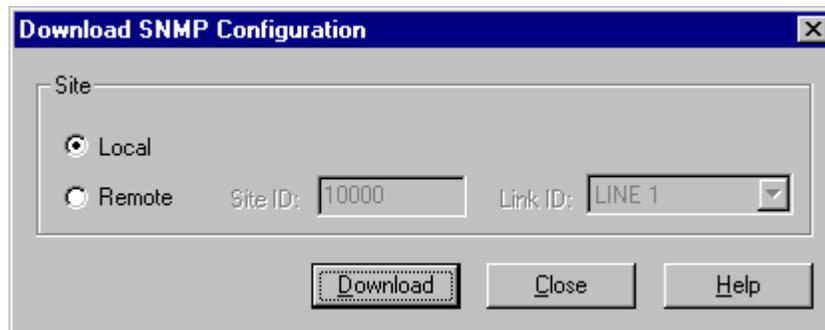
Local
Select this parameter if the Toolbox computer is locally connected to the IP Gateway.

Remote
Select this parameter if the Toolbox computer is connected to a remote IP Gateway. This selection enables the Site ID and Link ID parameters.

Site ID, Link ID
To configure a remote site, specify the Site ID, then open the Link ID drop-down list and select the appropriate Link ID.

Download button
After entering the parameters, click this button to download the configuration file. Toolbox displays the download progress, as shown below.
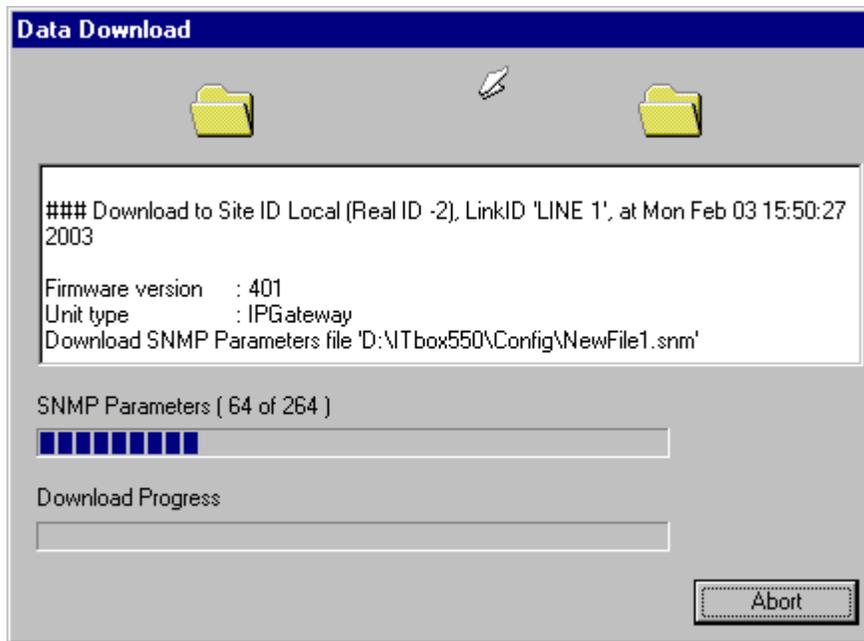
This screen records the ongoing activity of the SNMP Configuration downloading process from the Toolbox computer to the IP Gateway unit. Click **Abort** to abort the download.

If the Download ended successfully, the "Download finished successfully" message will display in the output screen. Click **OK** to return to the Download SNMP Configuration screen.

In case of a malfunction, the corresponding error message will be displayed.

At the end of this operation, the IP Gateway builds the software object entities according to the users definitions.

Close button
Click this button to stop the download process.

Upload

The Upload command is used to read the SNMP configuration of a site into Toolbox. You can upload from the IP Gateway directly connected to the Toolbox computer, or from a remote IP Gateway unit.

Before you activate the Upload command, ensure that the Toolbox computer is ready to communicate. After you select Upload, Toolbox asks you to specify the communication password, if this is the first time that the Communication Driver is used. If the Communication Driver was activated before, no password is required. Following the entry of the correct password, the Upload SNMP Configuration dialog is displayed.
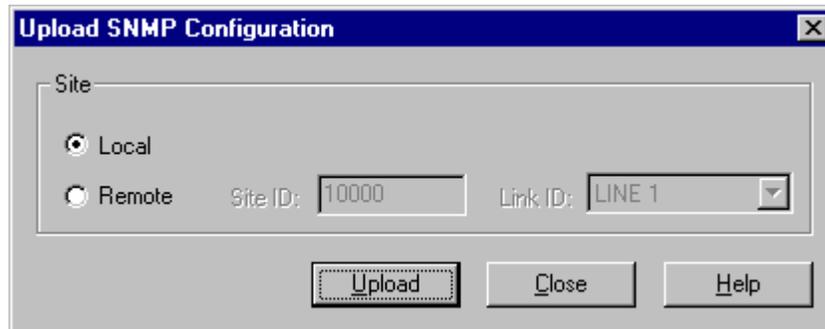
Local
If the Toolbox computer is locally connected to the IP Gateway, select this parameter.

Remote
If you want to upload the configuration of a remote site, click this parameter.

Site ID, Link ID
To upload the configuration of a remote site, specify its Site ID, then open the Link ID drop-down list and select the appropriate Link ID. The Toolbox displays the following screen.
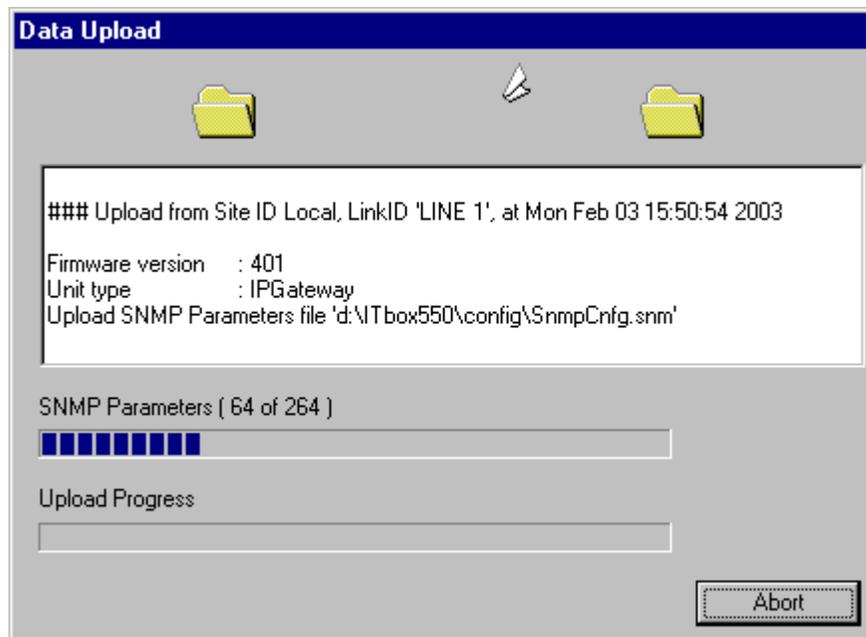
This screen records the ongoing activity of the SNMP Configuration uploading process from the IP Gateway unit to theToolbox computer.

Click **OK** to return to the Upload SNMP Configuration screen.

Exit

The Exit command closes any open files and quits SNMP Configurator.

If a file has unsaved changes, an alert appears, asking whether to save the changes before exiting.
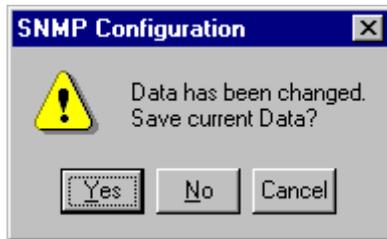
Click the appropriate button.

Help Menu

This menu enables you to view the version information and help files which relate to the SNMP Configurator utility.

Contents

The Contents command opens the help files which describe the SNMP Configurator tool and other IP Gateway utilities.

Using Help

The Using Help command explains to the user how the IP Gateway help is used.

About

The About command displays the version information for the SNMP Configurator tool.

Downloader

The Downloader utility enables you to download multiple blocks or files needed to configure the IP Gateway. You can specify the names of files to download and save the list of names in a file (.ini) which can be reused.

The Downloader is also used to upgrade the system software of the IP Gateway. An alternative method of upgrading the system software is described in the *IP Gateway Web Operation* chapter below.

Downloading Files

After activating the utility from the ToolBox folder, the following dialog box is displayed.
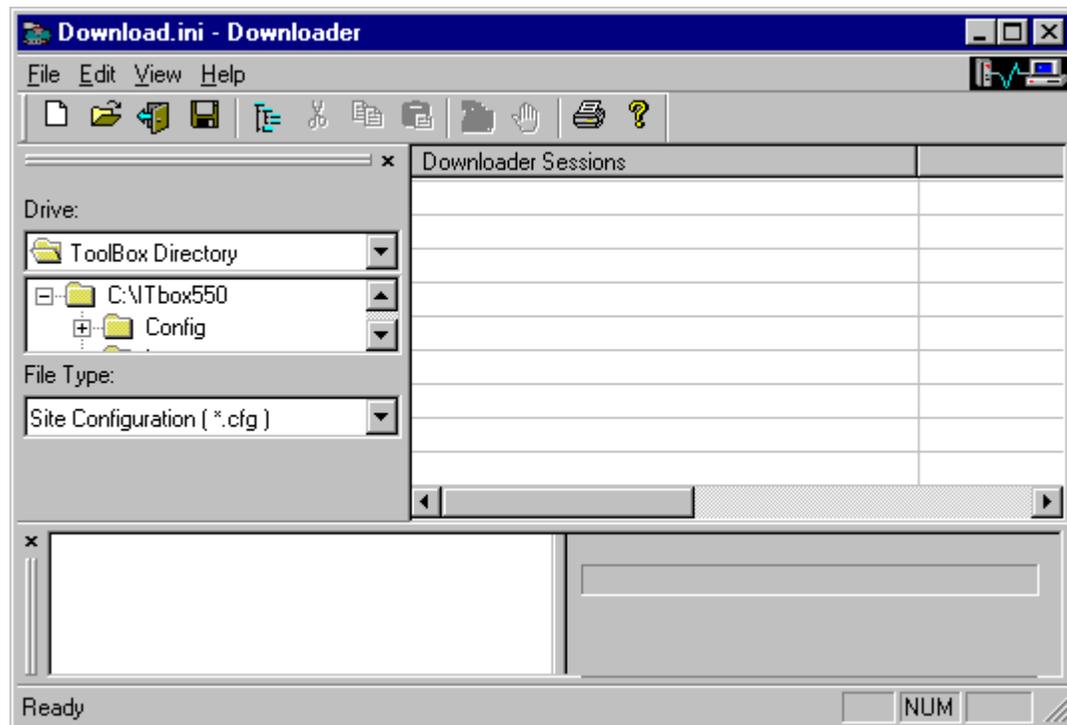
To define a session, click on the Add Session icon or select Add New Session from the Edit menu. The initial/default download settings file will be named download.ini. To open an existing download settings file, click on the Open icon or select Open from the File menu. An example of a session is shown below:
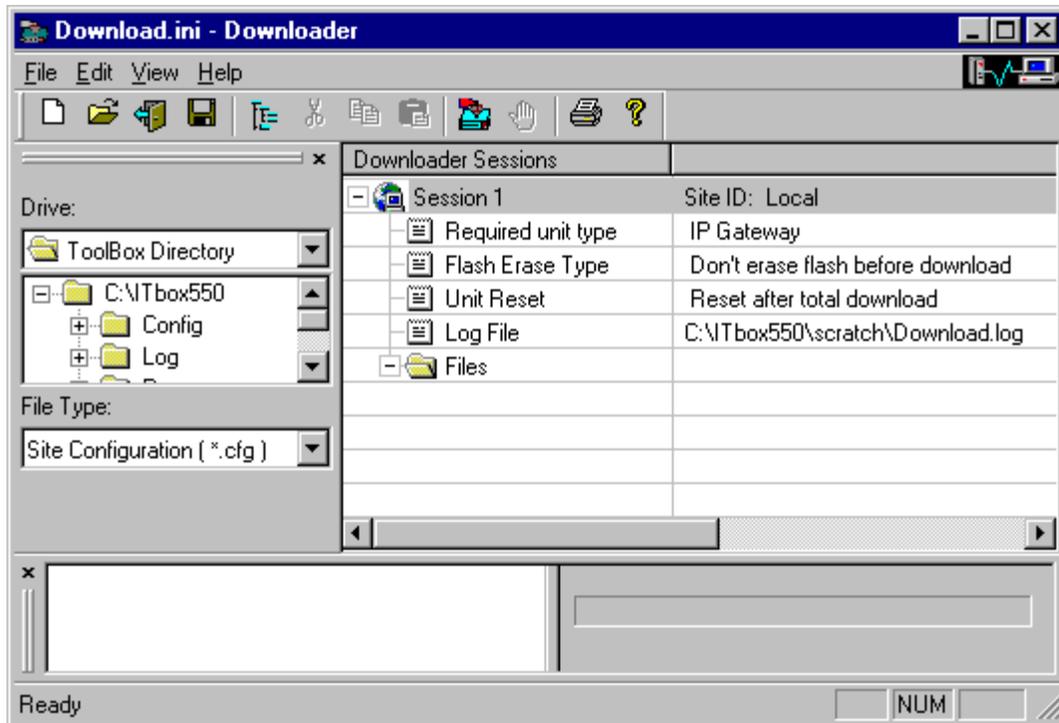
Identify the IP Gateway to which the download will be performed, by default, the local RTU. To define a remote IP Gateway, specify the Site ID and Link ID. Next specify the various download parameters. The values for the parameters are changed by clicking in the cell and either typing or selecting from a choice list. Finally, select the files to be downloaded to the IP Gateway. Pick the desired file type and locate the desired file. Drag the file names into the session text area or right-click on the file name and select Add to the desired session(s). Files such as Site Configuration, Network Configuration, Phone Book, etc. can be downloaded. A new version of the system software can be downloaded, though a separate download settings file is used.

Additional sessions to the same or different IP Gateways can be defined in the same way. Click on the Add Session icon or select Add New Session from the Edit menu, or right-click on an existing session and select Add Session. Each new session added is named SessionX where X represents the session index of the current file. Use the Edit menu (when the session name is selected) or right-click on the session name to rename, delete, copy, cut, and paste the session.

The settings can be saved in the .ini file for future downloads. A download session can be saved in a file, then slightly modified for use with other IP Gateways.

To print the current .ini file, right-click on the session name and select Print.

When the download session is defined, click on the Download icon to download the files to the IP Gateway. If no communication has been set up, you will be prompted for the password to the IP Gateway. To download only one session within the .ini file, right-click on the session name and select Download this session.

During the Download process, the ToolBox displays its current status and actions being performed, as shown below.
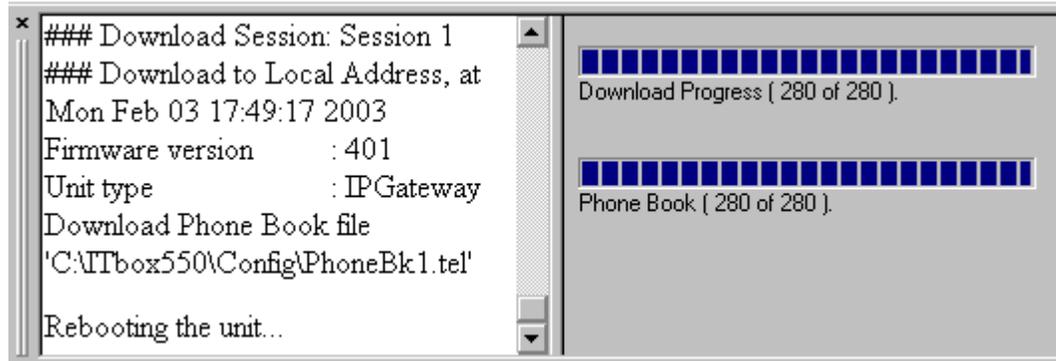
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```
x  ### Download Session: Session 1
   ### Download to Local Address, at
   Mon Feb 03 17:49:17 2003
   Firmware version      : 401
   Unit type             : IPGateway
   Download Phone Book file
   'C:\ITbox550\Config\PhoneBk1.tel'

   Rebooting the unit...
```

Download Progress (280 of 280).

Phone Book (280 of 280).

If for any reason you need to abort the download, press the Abort icon in the toolbar at the top of the window.

After successful completion of the download, the following message appears: **Download finished successfully**.

If a new system is to be downloaded, follow the process *Downloading system software* described below.

Dialog box parameters and functions

Download button
Starts the process of downloading files. The progress of the download will be documented in the download window, placed by default at the bottom left corner of the screen. A transcript of the download will be saved in the Log File defined for the Download Session. While the Downloader tool is communicating with the IP Gateway, the [icon] icon at the top right hand corner of the Downloader window will be animated.

Abort button
Aborts the downloading process. The failure of the download will be documented in the download window at the bottom left corner of the screen.

Downloader Sessions
Session n
The session number. By default, the Downloader begins with Session 1 and then increments the session number for each successive downloader session defined. Several sessions can be defined in one download setting file. Double-clicking on any entry in this row acts as a toggle to open/close the parameters for that session.   The name of the session can be changed by selecting the session (left click) and pressing Enter, or by right-clicking on the name and selecting Rename Session, or using Edit ->Rename Session. When the name has been edited, press Enter again to save it.

Site ID: Local
If you plan to download to the locally connected IP Gateway, Local must be selected. The default value is Local. To download to a remotely connected IP Gateway, click on the word Local and enter a Site ID when the cell becomes editable. Then click on the last cell of the row and select a Link ID. If a blank Link ID is selected, the Site ID will revert to Local.

Link ID:
To download to a remotely connected IP Gateway, click on the cell and select a Link ID. Make sure that the appropriate Site ID was selected.

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Required unit type

Specify the unit type to which the files are to be downloaded. The only possible value is:

> IP Gateway

Flash Erase type

The IP Gateway hardware does not include EPROMs. Instead, its software is stored on Flash memory chips. In order to load and burn the Gateway software and the Gateway configuration, a small kernel software file was developed, and is factory-installed in the IP Gateway. This kernel includes a unique Ethernet address and resides on a read-only Kernel partition of the Flash memory.

Other partitions of the IP Gateway Flash memory are:

> **CODE** (system) partition
> **CONFIGURATION** (parameters) partition.

Loading a new version of the Gateway software is done using the Downloader utility, which downloads the Gateway programs into the Code partition. Before loading the new software, the old version should be erased from the Flash memory, using the Erase flash and preserve siteConf option.

Occasionally, it is necessary to erase the Gateway configuration in order to restore the default configuration. In such cases, the old configuration should be erased from the Configuration partition, by using the Erase all flash before download option.

The erasing and loading of the Gateway software requires communication between Port-2B in the IP Gateway and Port COM1 in the PC, as shown in the IP Gateway Toolbox Connection figure below:
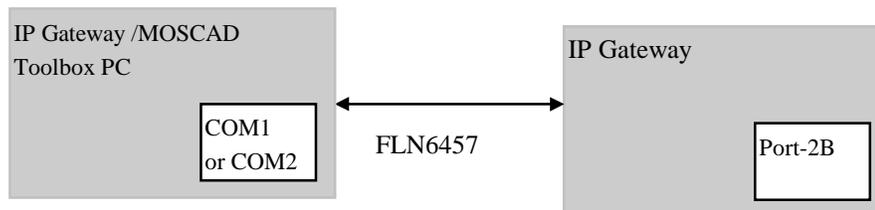
Specify whether the flash memory should be erased before downloading and whether the site configuration should be preserved. The possible values are:

> Don't erase flash before download (default)

> Erase all flash before download

> Erase flash and preserve siteConf

Don't Erase Flash Before Download

The download operation does not erase the contents of the flash memory.

Erase All Flash Before Download

Causes the utility to erase the contents of the flash memory before the download.

Erase Flash and Preserve SiteConf

Causes the utility to erase the contents of the flash memory, except for the site configuration data, before the download.

Unit Reset

Specify whether the IP Gateway should be reset after downloading or under what circumstances the IP Gateway should be reset. The only possible values is:

> Reset after total download

If you have changed the site ID, you must first download the site configuration **alone**, with the modified ID. If you want to download more data, repeat the Download operation for the additional blocks (**do not** download the site configuration together with the other blocks).

Log File

Specifies the name of the file where the download session is logged.

New Site ID

Enables the user to change the Site ID of the IP Gateway. The Site ID defines the unit's logical address, and it may range from 1 to 65,287. By default, this value is 1. This parameter is only visible when adding a site configuration file to the session. If the site configuration file is deleted from the session, this parameter will also be deleted.

System Address

The system address is the physical base address assigned to the whole system, and may range from 1 to 65,287. The base address is used in broadcast transmissions. By default, this value is 0. This parameter is only visible when downloading the site configuration. If the site configuration file is deleted from the session, this parameter will also be deleted.

Files

Specify the files to be downloaded to the IP Gateway. The files can include Site Configuration (.cfg), Network Configuration (.scf), Phone Book (.tel), Sites Table (.stb), SNMP Configuration (.snm), Host Table (.hst), IP Conversion Table (.ipc), DataTac (RNC) Modem ID Table (.rnc), NTP Configuration (.ntp). A new version of the system software (.krl) can also be downloaded in a separate System Download session.

> **Specifying files to be downloaded:**
>
> First choose a file type for the file to be downloaded from the File Type choice list at the bottom of the Directory bar.
>
> Find the desired file name on the computer, using the Drive parameters described below. Drag the file name to the session text area or right-click on the file and select Add to the

desired session(s). A new entry of the appropriate type will be created (e.g. Site Configuration).

Once a file type entry has been created for the session, the filename listed (e.g. C:\Itbox550\Config\conf1.cfg) can be edited or erased. If you decide not to download a file of that type, you can delete the file type entry, by right-clicking on the entry and selecting Delete or by single-clicking on the entry and pressing the Delete button on the keyboard.

You will be prompted as follows:
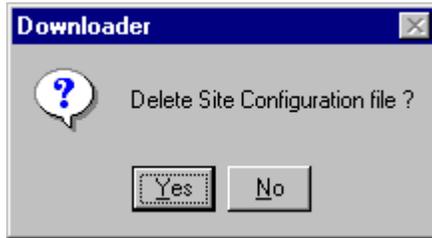
If a new Site Configuration is being downloaded, a new Site ID must be defined.

Specifying system software files to be downloaded:

To select a system software kernel file to be downloaded, select Open System File from the File menu. The utility will default to the C:\Itbox550\system directory. You can also select another directory. Select the desired .krl file. The downloader session will automatically be renamed System Downloader Session with the following parameters:

Product Type

IP Gateway. (This field cannot be edited.)

System File Path

The full pathname of the kernel (.krl) file selected. (This field cannot be edited.)

Communication Port

Select the PC communication port to be used for the download to the IP Gateway (COM1-COM9).

Data Speed

Select the data speed to be used for the download to the IP Gateway (1200-115200).

Drive

Select a directory containing files to be downloaded to the IP Gateway. The default directory is the ToolBox home (Itbox550). Click on the arrow to browse through other drives/directories on the computer.

File Type

Select a file type to identify files to be downloaded to the IP Gateway.

Downloading system software

Downloading system software requires a separate download session. Before downloading new system software, make sure the communication driver is not running on the port to be used for the download. (For example, if the driver is running on COM1, either download on COM2 or

stop the driver.) To change the Communication Port or Data Speed, select the parameter (left click) and select the value from the choice list.

To specify a system software kernel file to be downloaded, select Open System File from the File menu. The utility will default to the C:\Itbox550\system directory. You can also select another directory. Select the desired .krl file and click on the Open button. The downloader session will automatically be renamed System Downloader Session.

Note: The user does not need to erase the existing system software from the IP Gateway before downloading a new system. This is done automatically by the Downloader utility.

Set the download parameters as detailed above in the **Specifying system software files to be downloaded** section under Downloading Files.

Click on the Download icon or select Download this Session from the Edit menu. The following message will appear.

```
┌─────────────────────────────────────────────┐
│ IP Gateway System Download            ☒ │
├─────────────────────────────────────────────┤
│                                             │
│   Make sure that you are connected to PORT 2.│
│   Power OFF the Gateway and Power  it ON.... │
│                                             │
│                      ┌──────────────┐       │
│                      │    Cancel     │       │
│                      └──────────────┘       │
│                                             │
└─────────────────────────────────────────────┘
```
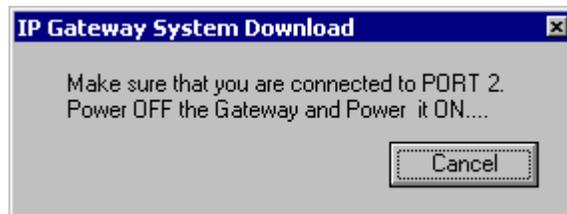
Switch off the IP Gateway, and then switch it on again. This will put the IP Gateway into bootstrap mode and enable a new system to be downloaded. The download process will begin immediately. Upon successful completion of the download process, the DIAG LED will blink. All the gateways LEDs will blink once and then blink again after approximately 30 seconds.

During the Download process, the ToolBox displays its current status and actions being performed. If for any reason you need to abort the download, press the Abort icon in the toolbar at the top of the window. During the download of the kernel file, the ToolBox displays various statistics in the text area, as shown below.

```
┌─────────────────────────────────────────────┐
│ Downloader Sessions                          │
├─────────────────────────────────────────────┤
│ ⊞ 🖳 System Download Session                  │
│ ⊟ 📁 Downloading Statistics                   │
│    ├ 📄 No. of Transmitted Packets            │
│    ├ 📄 No. of Retransmitted Packets          │
│    ├ 📄 No. of Received Packets               │
│    ├ 📄 No. of Received Bad Packets           │
│    ├ 📄 No. of Received Packets With Bad Checksum │
│    ├ 📄 Transmitting Packet                   │
│    ├ 📄 Load Address                          │
│    ├ 📄 Loaded Data Size                      │
│    ├ 📄 Total Data Size                       │
│    └ 📄 Versions: Target Kernel/PC            │
│ ◄                                            │
└─────────────────────────────────────────────┘
```
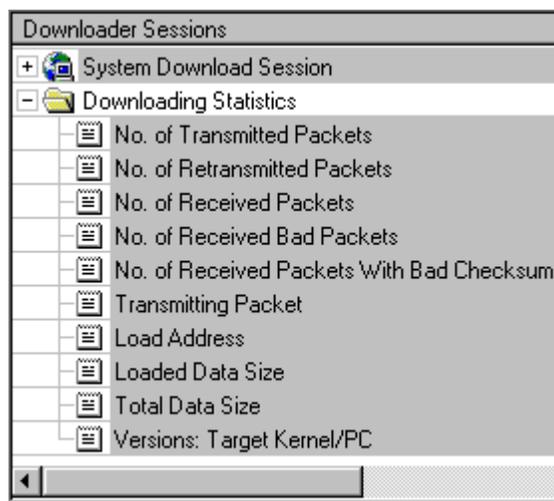
If the version of the existing configuration or user application is incompatible with the new version of the firmware software, an error message will appear to that effect. In this case, the

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user part of the Flash memory (Site/Network Configuration, phone book, etc.) must be erased and the contents downloaded again.

Erasing Configuration

Occasionally, it is necessary to erase the IP Gateway configuration and the contents of the user Flash memory, in order to restore the default configuration.

To erase the existing configuration and the user part of the Flash , select Open System File from the File menu. The utility will default to the C:\Itbox550\system directory. Select the desired .krl file and click on the Open button. The downloader session will automatically be renamed System Downloader Session.

Next click on the Erase Configuration icon in the toolbar at the top of the screen. The following message will appear.

Switch off the Gateway, and then switch it on again. This will put the Gateway in bootstrap mode and enable a new configuration to be downloaded. The download process will begin immediately after these actions.

Upon successful completion of the download process, the DIAG LED will blink. All the gateways LEDs will blink once and then blink again after approximately 30 seconds.

Icons

The following is the list of the available command icons and buttons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Open System File command
	File menu, Save As command
	Edit menu, Add new session command
	Edit menu, Cut session command
	Edit menu, Copy session command
	Edit menu, Paste session command

	Erase Configuration command
	Edit menu, Download command
	Edit menu, Abort command
	File menu, Print command
	Help menu, About command

File Menu

The commands in the File menu are mainly designed to handle download settings files.

New

The New command (Downloader, File menu) opens a new download settings file (.ini). After activating this command, Downloader displays the New dialog box, as shown below.
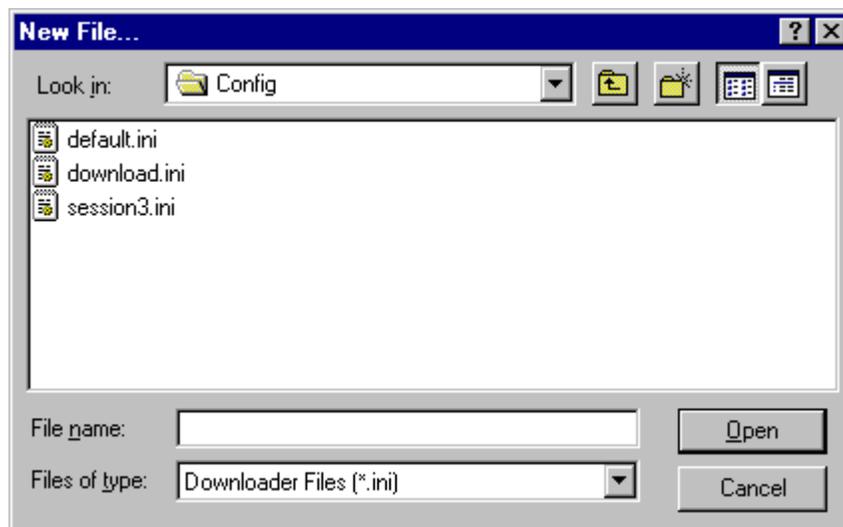
The New dialog box defaults to the config sub-directory of the ToolBox (Itbox550) directory, and to the .ini type files (download settings files). The config sub-directory is where the ToolBox stores download settings files by default.

Select the download settings file (see parameters below) and click OK to load it.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Enter the name of the download settings file. The ToolBox automatically adds the .ini extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .ini, open the drop-down list and select the .ini type.

Open

The Open command (Downloader, File menu) opens an existing download settings file. After activating this command, Downloader displays the Open dialog box, as shown below.
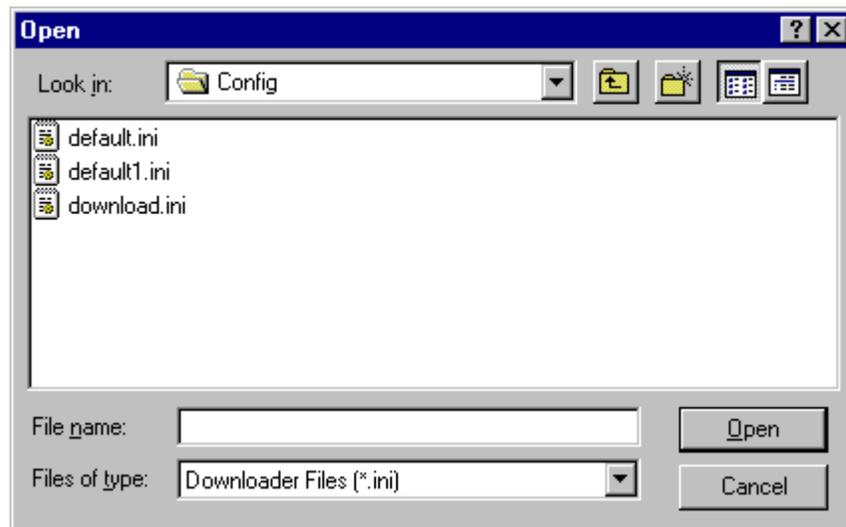
The Open dialog box defaults to the config sub-directory of the ToolBox (Itbox550) directory, and to the .ini type files (download settings files). The config sub-directory is where the ToolBox stores download settings files by default.

Select the download settings file (see parameters below) and click OK to load it. If another file is open, it will be closed and replaced by the selected file. If changes were made to the open file, you will first be prompted to save the changes.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Enter the name of the download settings file. The ToolBox automatically adds the .ini extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .ini, open the drop-down list and select the .ini type.

Save

The Save command (Downloader, File menu) saves the current download file. The initial/default download file is called download.ini.

If an existing download file is opened or a new file is created, the changes must be saved before performing the download. If no save is done, you will be prompted to save the file.

Save As

The Save As command (Downloader, File menu) saves the current download settings under a different file name. Generally, you'll use this command when you want to create a download settings file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

For a standard download settings file, the command opens the dialog box shown below. An open system file can also be saved under a different name using the Save As command, but the default directory and file type in the dialog box will be different.
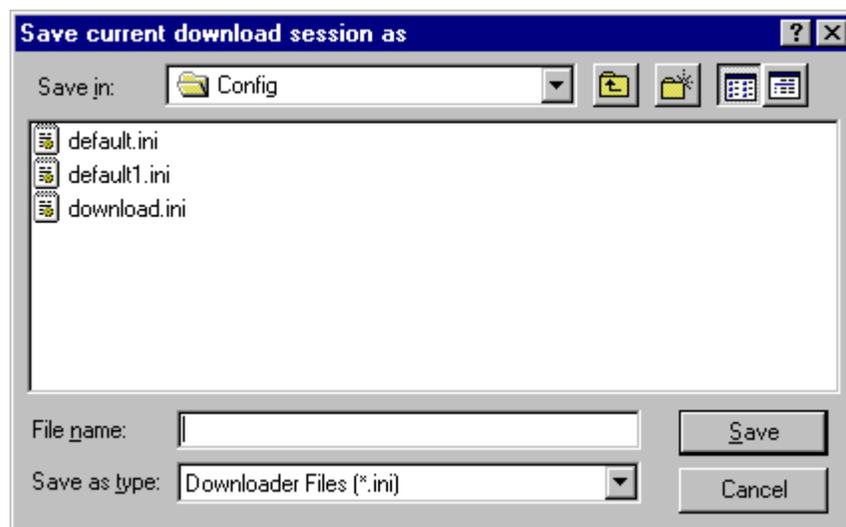
Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories. The default directory for .ini files is the Config subdirectory. The default directory for .krl files is the System subdirectory.

File Name

Type the name of the download settings file you want to create, and click OK. The ToolBox automatically adds the .ini extension to download setting files and .krl to system files. If you specify the name of a download settings file that appears on the list, the ToolBox issues a message asking you whether you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

Save as type

This box shows the type (extension) of the files currently displayed in the File Name list. The default type for download setting files is .ini. The default type for system files is .krl. If the displayed file type "filter" is not correct, open the drop-down list and select the correct type.

Close

The Close command (Downloader, File menu) closes the current open download/system file.

Open System File

The Open System File command (Downloader, File menu) opens an existing a system file (.krl). After activating this command, Downloader displays the dialog box below.
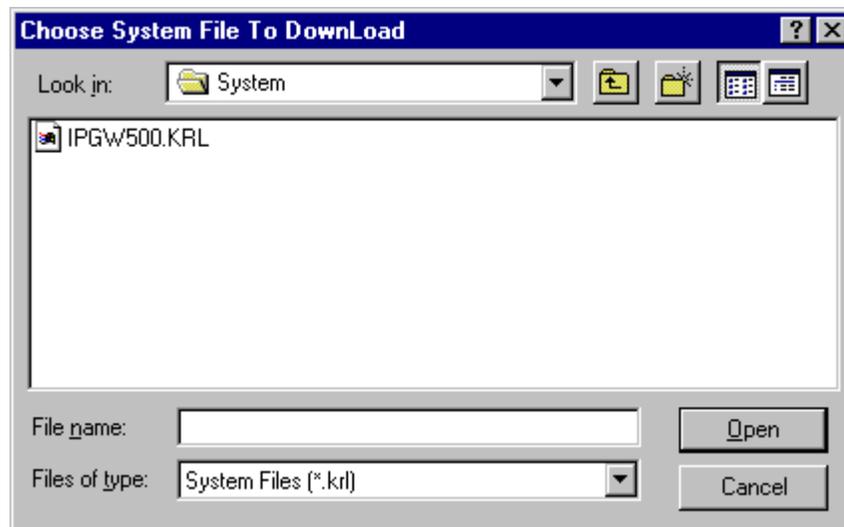
The dialog box defaults to the system sub-directory of the ToolBox (Itbox550) directory, and to the .krl type files (system files). The system sub-directory is where the ToolBox stores system files by default.

Select the system file (see parameters below) and click OK to load it.

⊞ Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Enter the name of the system file. The ToolBox automatically adds the .krl extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .krl, open the drop-down list and select the .krl type.

Download

This command downloads all sessions of the download settings file or system file to the IP Gateway.

Abort

This command aborts the download of the download settings file or system file to the IP Gateway.

Print

This command sends the current open file to the default printer. The program sends a confirmation message that the data is directed to the default printer. Click **YES** to continue the print process.

Print Setup

This command opens a standard Windows print setup dialog which enables the user to configure the default printer.

Recent System Files

This command enables the user to easily access the four most recently used system files.

Recent Download Files

This command enables the user to easily access the four most recently used download files.

Exit

The Exit command closes the open file and quits the Downloader utility. If a file has unsaved changes, an alert appears, asking whether to save the changes before exiting. If the screens in

the Downloader window have been rearranged/resized by the user, they will appear in those places/sizes the next time the Downloader is started.

Edit Menu

The Edit menu contains the following commands which are applicable for download settings files only. In System sessions, only the Communication Port and Data Speed parameters can be edited, and this is done using choice lists, not the Edit menu.

Download This session

Downloads the current session to the IP Gateway. While the Downloader tool is communicating with the IP Gateway, the icon at the top right hand corner of the Downloader window will be animated.

Rename Session

Renames the current session.

Add Session

Adds a new session to the current active download file.

Copy Session

Copies selected session from the current download settings file to the system clipboard.

Paste Session

Pastes session from the system clipboard to the selected cells in the current download settings file.

Cut Session

Cuts selected session from the current download settings file to the system clipboard.

Delete

Deletes session from the current download settings file.

View Menu

The following views are available to the user. Click on an entry to select it, and a check mark will appear on the menu. The associated view is then displayed on the Downloader window.

Toolbar

The Toolbar displays the icons described under *Icons*.

Status bar

The Status bar displays the status messages at the bottom edge of the Downloader window. This message area is read-only.

Directory bar

The Directory bar displays a window with the list of directories, by default, to the left of the Downloader window. The user can select files to download, using the Drive and Files Type boxes. This window can be dragged to a different area of the screen and can be closed by clicking on the X in the upper right hand corner of the window.

Download bar

The Download bar displays a window with the progress and status of the download at the bottom of the Downloader window. This window can be dragged to a different area of the screen and can be closed by clicking on the X in the upper left-hand corner of the window. This window is read-only.

Help Menu

This menu enables you to view the version information and help files which relate to the Downloader utility.

Contents

The Contents command opens the help files which describe the Downloader utility and other IP Gateway ToolBox utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway ToolBox help is used.

About

The About command displays the version information for the Downloader utility.

Dial Up

One of the most important features of the IP Gateway Toolbox is the capability to call a modem connected to any unit (RTU or FEP) in the system by means of a dialup modem (HAYES® or compatible), and perform **all** the functions of the IP Gateway Toolbox remotely (from your office, home, or any other place).

You may perform the following remotely:

- Site Configuration upload and download
- System software diagnostics
- Error logger retrieving to identify hardware and software failures
- Phone book downloading
- Specific file downloading

Modem Connections

Before using the Dial Up program, ensure that the baud rate of the communication port is equal to the modem baud rate. Use the Communication Setup utility to modify the communication port baud rate. See *Communication Setup* later in this chapter.

Connect the modem to the RTU or FEP (MCP-M, IP Gateway, FIU) communication port defined as RS-232 Local Computer port by the Site Configuration program.

To connect the modem, use the modem adapter cable FLN6458 (with male 25-pin D-type connector).
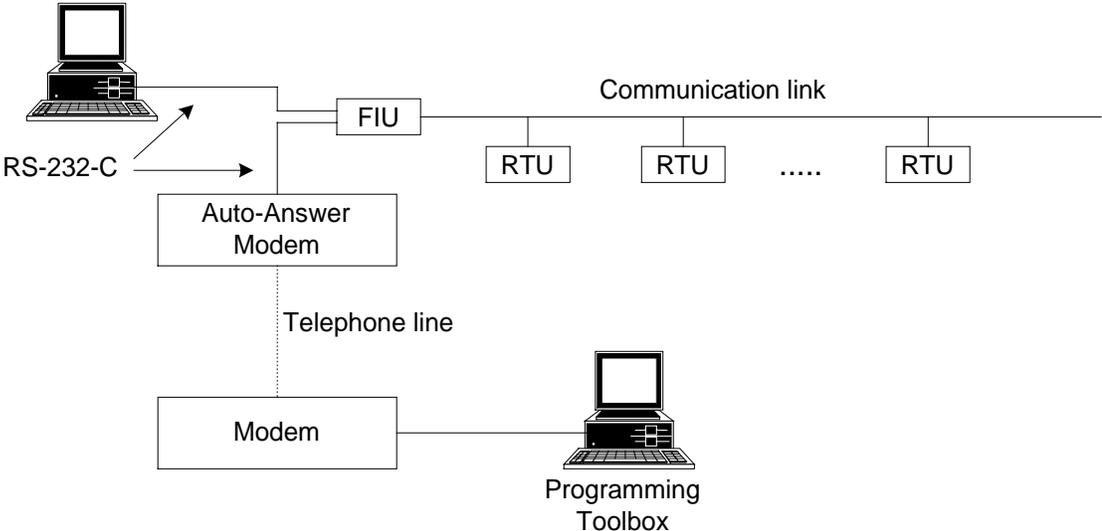
The FEP communication port is defined as Computer port to allow the engineer to temporarily disconnect the modem and connect the IP Gateway Toolbox instead. Note that the connection cable to the computer is different.

The FEP communication port baud rate should be equal to the modem baud rate. When connecting the IP Gateway Toolbox instead of the modem, the Toolbox baud rate should also be set up to be equal.

The unit to which the modem is connected may be referred to as Local or by Site ID and Link ID. All other sites in the system should be referred to by their Site ID and Link ID.

The modem connected to the site must be in Auto-Answer mode.

For example, for the Hayes Smart Modem 1200 the jumpers should be as detailed in the following table.

PARAMETER	SWITCH	OPTION	POSITION
DTR Status	SW1	Ignore DTR	Down
Auto Answer	SW5	Enabled	Up
Command Recognition	SW8	Disabled	Up

All other jumpers should be according to the default supplied by the manufacturer.

The jumpers setting of the modem connected to the central are detailed in the following table.

PARAMETER	SWITCH	OPTION	POSITION
DTR Status	SW1	Ignore DTR	Down
Carrier Detect	SW6	Reflects Actual State	Up

All other jumpers should be according to the default supplied by the manufacturer.

For more instructions on setting up the modems, see *Appendix B: Remote Toolbox Modem Setup.*

Parameter Settings

Three Dial Up parameters may be changed by the user, if necessary. The changes are made directly in the WMDLCDRV.INI file located in the itbox550\Prg\ directory. The file can be modified using a standard Windows text editor. All three parameters are found in the [Dial] section of the file, as shown below.

The first parameter enables the user to lengthen the pause time in dialing. The second specifies whether the dialing method is Tone, Pulse or the default of the phone line. The third parameter can be used to define a default string, if such is required by the modem.

```
[Dial]

pcc_delay_dial0= 20              ; dial delay time in sec
pcc_dial_method0= 0             ; dialing method: 0= Tone, 1=Pulse, 2=None
; optional string to be sent before dial
;pcc_optional_str0= at+ms=,,,9600P    ; This string forces line communication to 9600
```

In order for the changes to the Dial Up Utility to take effect, close all Toolbox tools and Stop Communication Driver.

Dial Up Window

To start the program, double-click the Dial Up icon in the IP Gateway Toolbox folder. After the correct password is entered, the Dial Up screen is opened. A new or existing Dial Up file can be opened (using the New or Open commands or icons), and entries can be input as shown below. Several Dial Up files can be opened at the same time.

Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	Edit menu, Cut command

📋	Edit menu, Copy command
📋	Edit menu, Paste command
🖨	File menu, Print command
❓	Help menu, About command
📲	Phone menu, Dial Up command
📟	Phone menu, Hang Up command
▦	Edit menu, Insert Row command
🔳	Edit menu, Delete Row command
▦	Edit menu, Sort command

🖳 Dialog box parameters and functions

Name
A logical name of the addressed site.

Phone Number
The phone number at the addressed site. If a pulse phone is to be used, you should enter 'p' before the phone number. Refer to the modem manual for information about codes (such as wait, pause, etc.) to be added to the phone number.

Description
A free-format field for describing the addressed site.

File Menu

The File menu commands enable you to save phone numbers to a file and to carry out file operations.

New

The New command opens a new dial up file. If an existing file is currently displayed, the new dial up file will be opened in front of it. To view the previous file, simply minimize, close or resize the new file. Multiple windows can be displayed simultaneously.

Open

The Open command opens an existing file. After activating this command, Toolbox displays the Open dialog box, as shown below.
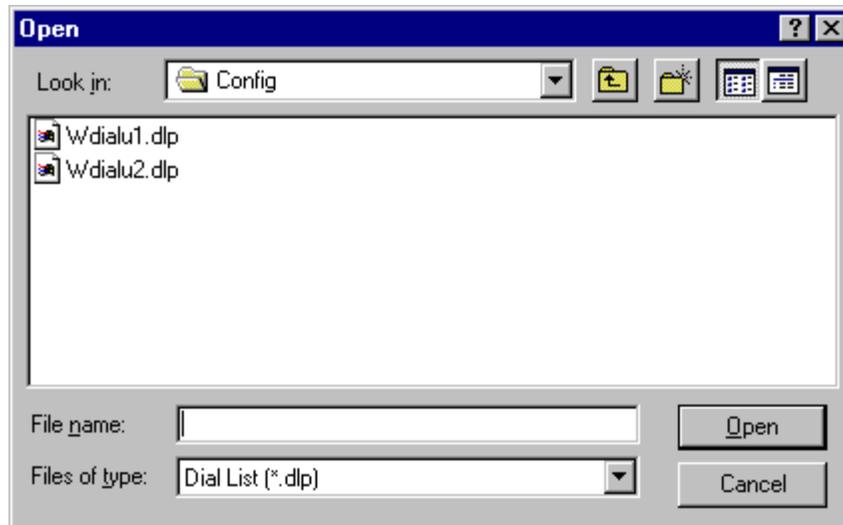
The Open dialog box defaults to the config sub-directory of the Toolbox (itbox550) directory. The config sub-directory is where Toolbox stores dial-up files by default.

Select the configuration file (see parameters below) and click Open to load it.

⊡ Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the dial up file. ToolBox automatically adds the .dlp extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .dlp, open the drop-down list and select the .dlp type.

Close

The Close command closes an existing file.

Save

The Save command stores the current dial-up file.

If the file has not been saved at least once, Toolbox opens the Save As dialog box where you assign a name to the file. (See below.)

If the file has been saved at least once, Toolbox just saves the file.

Save As

The Save As command saves the current dial-up information under a different file name. Generally, you'll use this command when you want to create a dial-up file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The command opens the dialog box shown below. This dialog also appears when you request to save a file for the first time.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the dial up file you want to create, and click OK. ToolBox automatically adds the .dlp extension. If you specify the name of an existing dial up file, ToolBox asks you if you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .dlp, open the drop-down list and select the .dlp type.

Print

This command prints the current dial up file to your standard system printer. If no printer is set up, see Windows Help or your system administrator.

Merge

The Merge command combines two dial-up files. Follow these steps:

1. Open one of the files.

2. Open the File menu and select the Merge command. The following is displayed.
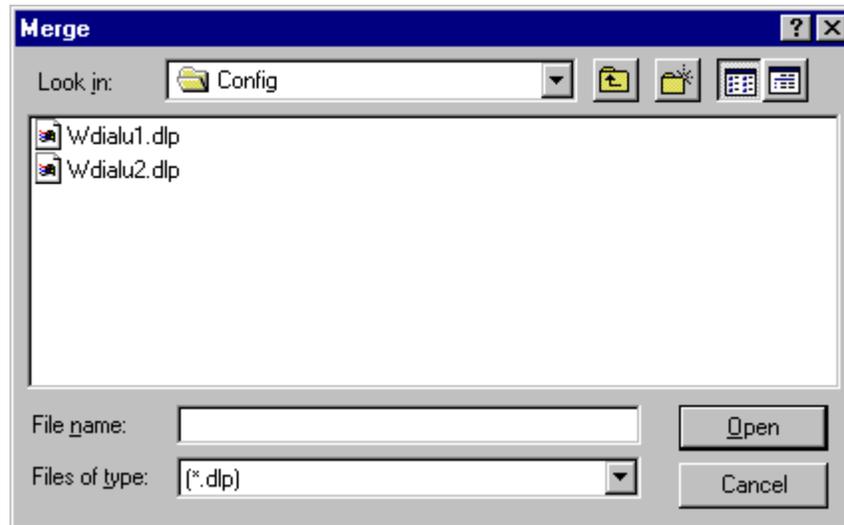
3. In the Merge dialog box, double-click the name of the other dial-up file.

Note that Dial Up adds the contents of the second file to the first. The current file is the first file. You can Save or Save As.

Exit

The Exit command exits the Dial Up utility.

Edit Menu

The edit menu contains commands that affect the dial-up list in the main window.

Cut

Cuts selected block of cells from the current dial up file to the system clipboard.

Copy

Copies selected block of cells from the current dial up file to the system clipboard.

Paste

Pastes block of cells from the system clipboard to the selected cells in the current dial up file.

Insert Row

Opens a new row above an existing row.

Delete Current Row

Deletes the current row from the file.

Sort

Sorts the file entries in Name order.

View Menu

The View menu enables you to view or hide the Toolbar or Status Bar from the utility window. Pull down and select the entry to toggle the viewing.

Toolbar

The Toolbar displays the icons described under *Icons*.

Status bar

The Status bar displays the status messages at the bottom of the Dial Up window.

Phone Menu

This menu includes commands for dialing and hanging up.

Dial Up

Select a row and then this command to dial the corresponding phone number. If a channel is currently open, the dial up utility asks you to close it first.

Hang Up

Use this command to disconnect the telephone line. The line is not automatically disconnected when you close the Dial Up window.

Window Menu

This menu enables you to arrange and view the open files as desired, using standard Windows commands.

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Help Menu

This menu enables you to view the version information and help files which relate to the Dial Up utility.

Contents

The Contents command opens the help files which describe the Dial Up tool and other IP Gateway utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway help is used.

About Dial Up

The About command displays the version information for the Dial Up tool.

Site Date & Time

The Site Date & Time utility enables the user to update the date and time of any site and IP Gateway in the system and retrieve the date and time from any site or IP Gateway. The utility can communicate with more than one site in any given session, with multiple screens opened simultaneously. All the RTUs in the network can be synchronized to the same time as the host computer.

Site Date & Time Window

To start the Site Date & Time tool, double-click the Site Date & Time icon in the IP Gateway ToolBox folder. If no previous applications have been used which require communications with the IP Gateway, you will be prompted for a password. The following is displayed.
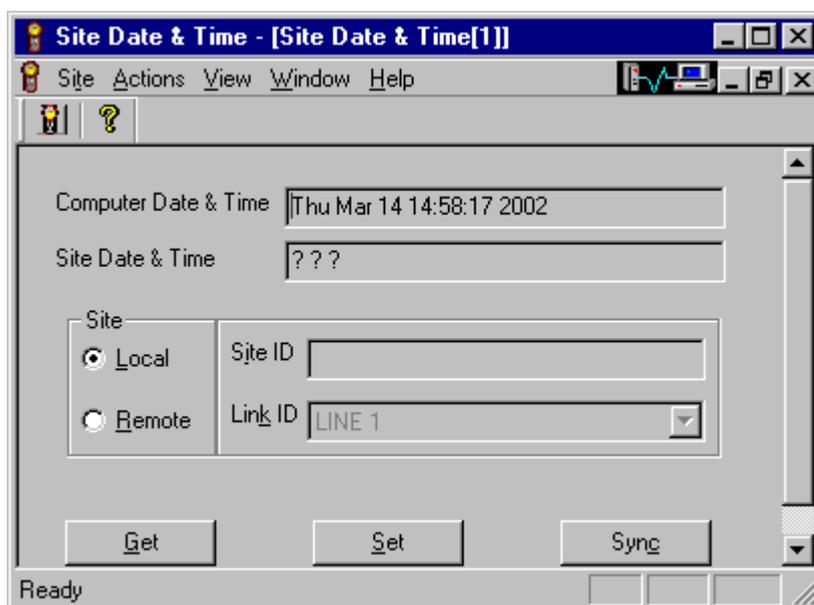
The header of the window will reflect the tool name (Site Date & Time), the sequential number of the current screen (e.g. Site Date & Time[1]). The first screen to be opened (Site Date & Time[1]) occupies the entire window.

Click on the clock icon or select the New command from the Site menu to open a new Date & Time session with another IP Gateway. During communication, the site (either Local or Site ID x Link ID y) will also be displayed in the window header. While the Site Date & Time tool is communicating with the IP Gateway, the [icon] icon at the top right hand corner of the Site Date & Time window will be animated.

Dialog box parameters and functions

Computer Date & Time
This parameter shows the current computer date and time in the format shown above and cannot be edited.

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Site Date & Time
This parameter displays the current date and time at the site, and cannot be edited. While the tool is sending a command to the IP Gateway, the string "?? ?? ??" will be displayed in the Site Date & Time Field.

Site
The information below identifies the IP Gateway with which the Site Date & Time tool will communicate.

Local
When this box is checked, the Date & Time functions are performed on the locally connected IP Gateway. The default setting for communication is Local.

Remote
When this box is checked, the Date & Time functions are performed on the remotely connected IP Gateway. and the appropriate Site ID and Link ID must be specified.

Site ID
When the Remote box is checked, the Date & Time functions are performed on a remote IP Gateway at the specified Site ID connected to the PC via the specified Link ID.

Link ID
When the Remote box is checked, the Date & Time functions are performed on a remote IP Gateway connected to the PC via the specified Link ID.

Get
Gets the IP Gateway Date & Time, and displays it in the Site Date & Time box.

Set
Sends the current computer Date & Time to the IP Gateway. Make sure that the PC Date & Time are correct.

Sync
Select this command to synchronize all the sites in the system to the PC Date & Time. When the Sync button is clicked, the following dialog box is displayed:
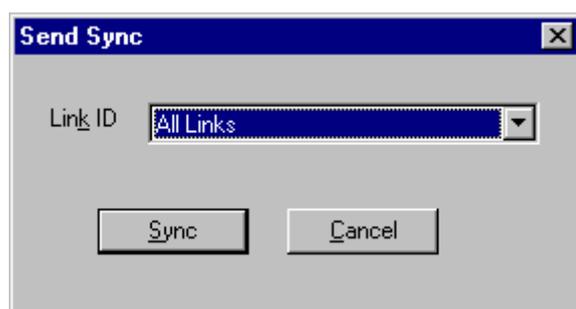
In the Link ID drop-down list, select All Links to synchronize the entire system, or select a specific Link ID. Note that All Links does not work on DIAL.

If the synchronization is successful, a message will appear.

Press the Cancel button to abort the Sync function.

Icons

The following command icons are available in the toolbar.

Icon	Corresponding menu command
👤	Site Date & Time
❓	Help menu, About command

Site Menu

The Site menu enables the user to perform commands on the Site Date & Time screens.

New

The New command opens a new Site Date & Time screen. If an existing file is currently displayed, the new Site Date & Time screen will be opened in front of it. Screens open in a cascade, but can be moved around the Site Date & Time window. (See *Window Menu*.) To view the previous file, move, minimize, close or resize the new file. Multiple windows can be displayed simultaneously. Each new screen is numbered sequentially (i.e. Site Date & Time[1], Site Date & Time[2], etc.)

Close

The Close closes the current Site Date & Time screen.

Exit

The Exit command exits the Site Date & Time utility.

Actions Menu

The following actions are available to the user.

Get

The Get command retrieves the current Date & Time from the IP Gateway. During the retrieval, the string "?? ?? ??" will be displayed in the Site Date & Time Field. If the get is successful, the IP Gateway Date & Time will be displayed in the Site Date & Time Field. If the get fails, a message "No Communication" will be displayed.

Set

The Set command writes the current Date & Time of the host PC to the IP Gateway. During the write process, the string "?? ?? ??" will be displayed in the Site Date & Time Field. If the set is successful, the updated Date & Time will be displayed in the Site Date & Time field. If the set fails, a message "No Communication" will be displayed.

Sync

The Sync command sends a message to synchronize all sites in the Network with the Date & Time of the host PC. During the sync process, the string "?? ?? ??" will be displayed in the Site Date & Time Field. If the sync is successful, the updated Date & Time will be displayed in the Site Date & Time Field.

View Menu

The following views are available to the user. Click on an entry to select it, and a check mark will appear on the menu. The associated view is then displayed on the Date & Time window.

Toolbar

The Toolbar displays the icons described under *Icons*.

Status bar

The Status bar displays the status messages at the bottom of the Site Date & Time window.

Window Menu

The Window menu enables the user to arrange the various screens within the Date & Time window. The screens can also be moved, resized or closed as standard Windows. In addition to the commands below, the Window menu lists the currently open windows. The checked name is the active screen. By clicking on another filename, the user can change the active screen.

New Window

The New Window command creates a new screen within the Date & Time window and displays it on top of any existing windows. This window is another instance of an existing window and will be numbered sequentially (i.e. Site Date & Time[1]:2)

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Help Menu

The Help menu enables the user to view the version information and help files which relate to the Date & Time tool.

Contents

The Contents command opens the help files which describe the Date & Time tool and other IP Gateway utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway help is used.

About Site Date

The About command displays the version information for the Date & Time tool.

Phone Book

The Phone Book utility allows you to conduct a session with another unit via a telephone line. The utility connects to the unit as any other unit or link in the system (using Site ID and Link ID). After you activate Phone Book from the Program Manager, the following is displayed.
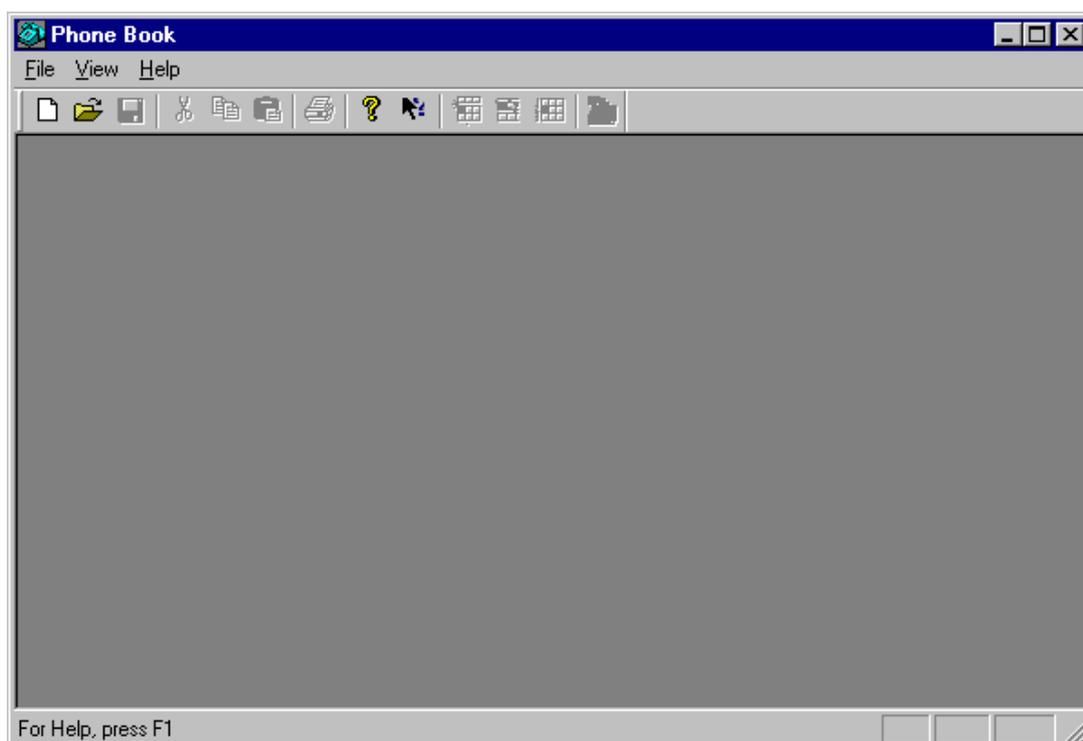
The utility opens with an empty phone book. You can create a new phone book or load an existing one and type in changes or additions.

Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	Edit menu, Cut command
	Edit menu, Copy command
	Edit menu, Paste command

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🖨	File menu, Print command
❓	Help menu, About command
▶	Help menu, Help command
⊞	Edit menu, Insert Row command
⊟	Edit menu, Delete Row command
⊞	Edit menu, Sort command
🔽	File menu, Download command
✋	Edit menu, Abort command

▤ Dialog box parameters and functions

Site Id
Type or edit the site ID of the unit.

Phone Number 1, 2, 3
You can enter up to three telephone numbers for each site. The phone number can hold up to 50 characters.

The valid characters are: 1234567890*#ABCDabcdPTWptw and the comma (,) which is used for pausing. Note P or p are used form pulse dialing and T or t for tone dialing.

File Menu

You can perform all the basic file operations using the commands of the File menu. After opening the menu, the following commands are displayed:

New

The New command opens a new phone book file.
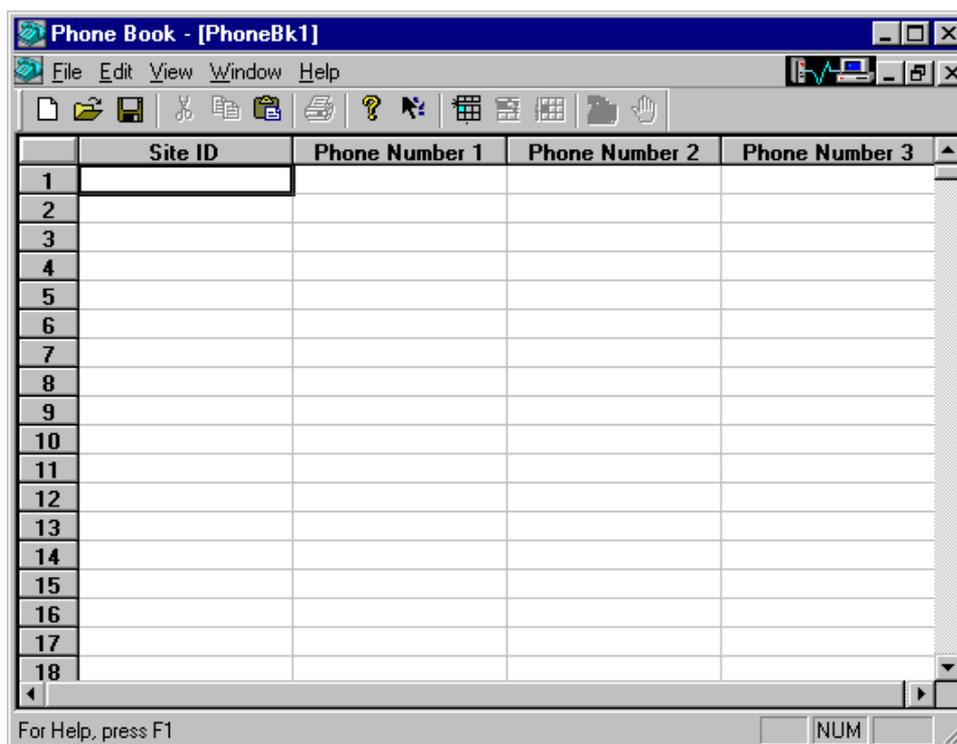
Open

The Open command opens an existing phone book. After activating this command, Phone Book displays the Open dialog box, as shown below.

The Open dialog box defaults to the config sub-directory of the ToolBox (Itbox550) directory, and to the .tel type files (phone book files). The config sub-directory is where ToolBox stores phone book files by default.

Select the phone book file (see parameters below) and click OK to load it.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in

If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name

Type the name of the dial up file. ToolBox automatically adds the .tel extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type

This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .tel, open the drop-down list and select the .tel type.

After loading the file, you can edit existing data by direct typing or using the Edit menu command, or add new telephone numbers.

Close

The Close command closes an existing file.

Save

The Save command stores the current phone book.

If the file has not been saved at least once, ToolBox opens the Save As dialog box where you assign a name to the phone book file.

If the file has been saved at least once, ToolBox just saves the file.

Save As

The Save As command saves the current phone book under a different file name. Generally, you'll use this command when you want to create a phone book file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The command opens the dialog box shown below. This dialog appears also when you request to save a phone book file for the first time.

□□ Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save in
If the currently displayed directory is not the correct one, double-click the arrow to the right of the Look in parameter and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the phone book file you want to create, and click OK. ToolBox automatically adds the .tel extension. If you specify the name of a phone book file that appears on the list, ToolBox issues a message asking you whether you want to overwrite the existing file. Select Yes only if you want to replace the existing file with the new one.

If you want to Save As an older version of the phone book, ToolBox allows you to select a format. See Save command for explanation.

Save as Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .tel, open the drop-down list and select the .tel type.

Print

This command prints the current phone book file to your standard system printer. If no printer is set up, see Windows Help or your system administrator.

Merge

The Merge command combines two phone books. Follow these steps:

1. Open one of the phone books.

2. Open the File menu and select the Merge command. The following is displayed.
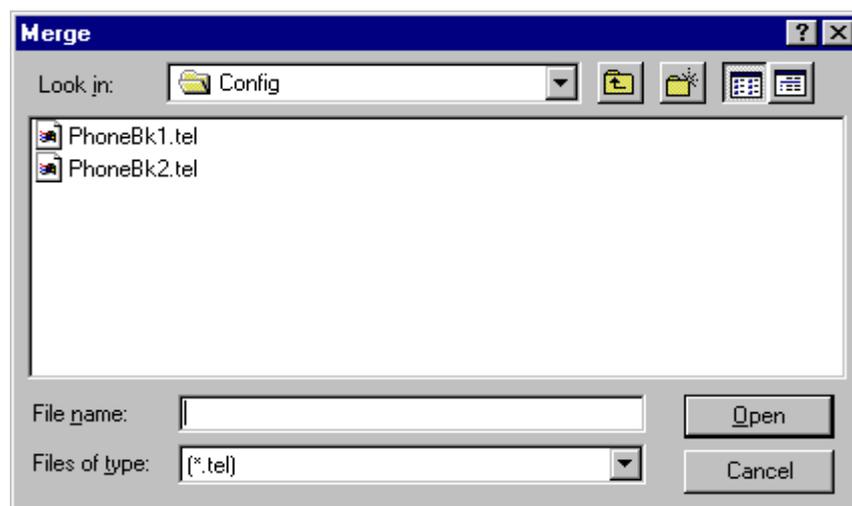
3. In the Merge dialog box double-click the name of the other phone book.

Note that Phone Book adds the contents of the second file to the first. The current file is the first file. You can Save or Save As.

Download

The Download command sends the current phone book to any IP Gateway in the network. Before selecting this command, select Local if you are locally connected to the IP Gateway, or Remote (including Site ID and Link ID) if you are communicating with a remote unit.

Internal modems support phone numbers up to 20 characters. If you download to an older version of the IP Gateway and the phone number is longer than 20 characters (the maximum for earlier versions), the number is truncated.

Exit

The Exit command exits the Phone book utility.

Edit Menu

The Edit menu contains the following commands:

Cut

Cuts selected block of cells from the current Phone book file to the system clipboard.

Copy

Copies selected block of cells from the current Phone book file to the system clipboard.

Paste

Pastes block of cells from the system clipboard to the selected cells in the current Phone book file.

Insert Row

Inserts a new line above the line where the cursor currently stands.

Delete Row

Deletes the line where the cursor currently stands.

Sort Table

Rearranges the table in Site ID order.

View Menu

The View menu enables you to view or hide the Toolbar or Status Bar from the utility window. Pull down and select the entry to toggle the viewing.

Toolbar

The Toolbar displays the icons described under *Icons*.

Status bar

The Status bar displays the status messages at the bottom of the Dial Up window.

Window Menu

This menu enables you to arrange and view the open files as desired, using standard Windows commands.

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Help Menu

This menu enables you to view the version information and help files which relate to the Phone book utility.

Contents

The Contents command opens the help files which describe the Phone Book tool and other IP Gateway utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway help is used.

About

The About command displays the version information for the Phone Book tool.

Communication Setup

This utility is designed to set the parameters to be used by the communication driver.
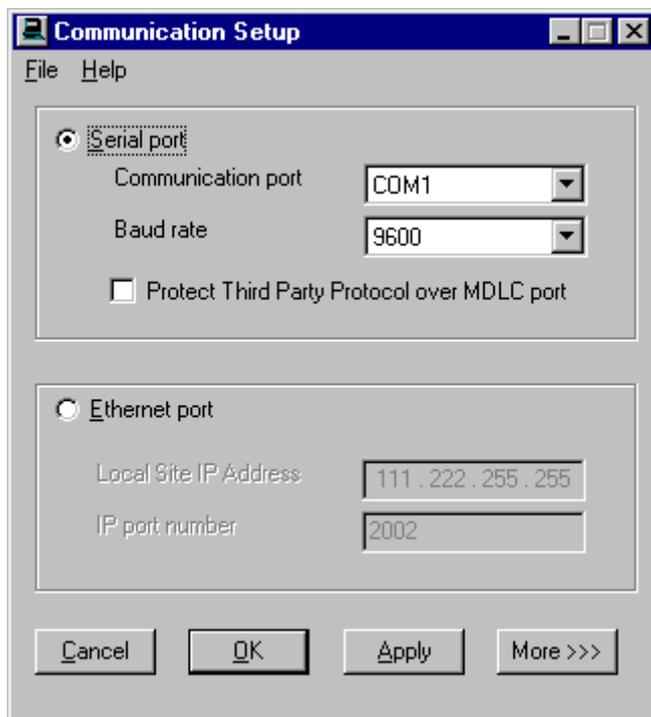
If you want to change the communication setup, close all Toolbox tools, stop the communication driver using the Stop Communication Driver tool, and then make the modifications you want.

The Ethernet port checkbox enables communication between an IP Gateway Toolbox and an IP Gateway unit over a TCP/IP interface. Once you are connected to the IP gateway via the TCP/IP interface, the Toolbox can access all the RTUs in the system connected to the IP Gateway using 'Remote Site ID' (The Link IDs must be properly defined in order to use this feature.)

The 'Protect Third Party Protocol over MDLC port' checkbox is relevant only when a Toolbox MDLC port is also used for some Third Party protocol. If this Third Party protocol is not sophisticated enough to ignore messages from other protocols sharing the port, the Communication Setup utility allows you to block all messages not intended for that protocol for the length of the session.

Before each MDLC session, MDLC sends a 'start protection' message, after which the remote prevents MDLC messages from being sent to Third Party protocol. At the end of the session, an 'end protection' is sent which opens the port to all MDLC messages. If communication fails and the 'end protection' transmission is lost, protection will end after a few minutes, as determined by an internal timer.

Third Party protocol protection adds overhead of approximately 20 bytes/session (start/end protection bytes) and therefore should not be selected if the port is only used for MDLC. Mature protocols such as MDLC and DNP do not require this protection and can recognize and reject messages which are irrelevant to them.

Dialog box parameters

Serial Port
Select this option if the communication will go over the serial port and specify the port and data speed below.

Communication Port
Specify the serial port over which the ToolBox will communicate with the RTU.

Data Speed
Specify the data speed at which the ToolBox will communicate with the RTU.

Protect Third Party Protocol over MDLC port
The 'Protect Third Party Protocol over MDLC port' checkbox (≥ V7.50) is relevant only when a ToolBox MDLC port is also used for some Third Party protocol. If this Third Party protocol is not sophisticated enough to ignore messages from other protocols sharing the port, the Communication Setup utility allows you to block all messages not intended for that protocol for the length of the session.

Before each MDLC session, MDLC sends a 'start protection' message, after which the remote prevents MDLC messages from being sent to Third Party protocol. At the end of the session, an 'end protection' is sent which opens the port to all MDLC messages. If communication fails and the 'end protection' transmission is lost, protection will end after a few minutes, as determined by an internal timer.

Third Party protocol protection adds overhead of approximately 20 bytes/session (start/end protection bytes) and therefore should not be selected if the port is only used for MDLC. Mature protocols such as MDLC and DNP do not require this protection and can recognize and reject messages which are irrelevant to them.

Ethernet Port
Select this option if the communication will go over an Ethernet connection and specify the IP address below. A MOSCAD/MOSCAD-L RTU or IP Gateway with connectivity to Ethernet must act as a bridge to the Ethernet for other RTUs in the field with no such connectivity.

Local Site IP Address
If the communication is over an Ethernet connection, specify the IP Address of the IP Gateway. Range: 000.000.000.001-255.255.255.254

IP port number
Range: <1-65535>   Default: 2002

If the communication is over an Ethernet connection, specify the IP Port Number of the IP Gateway. This number is common to all RTUs and IP Gateways connected to the link.

Cancel
If you press the Cancel button, the Communication Setup window will close.

OK
The OK button saves changes made to the Communication Setup. A message will appear reminding you to close any ToolBox applications and Stop the Communication Driver in order for the changes to take place. Once all other ToolBox applications are closed and the driver has been stopped, click the Apply button to apply changes. If you press the OK button, the Communication Setup window will close.

Apply
The Apply button saves changes made to the Communication Setup. A message will appear reminding you to close any ToolBox utilities and Stop the Communication Driver in order for the changes to take place. Press OK to close the window.

More
If you press the More button, the Communication Setup window will expand as follows:
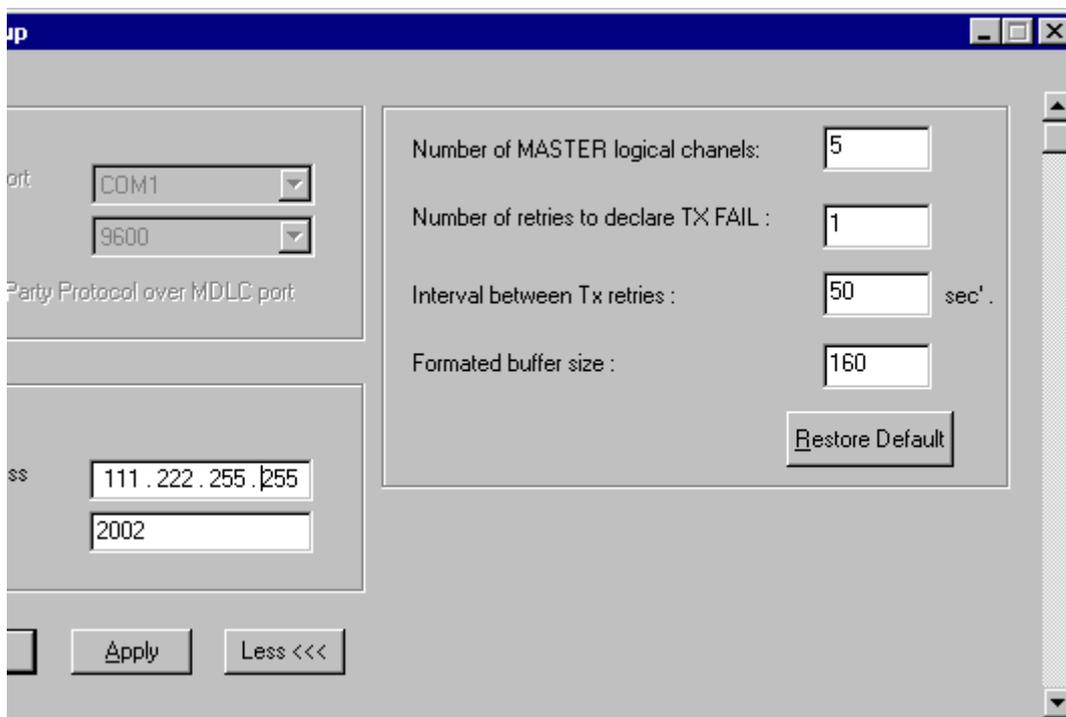
⊞ **Dialog box parameters**

Less
If you press the Less button, the Communication Setup window will shrink back to its original size.

Number of MASTER logical channels
Specify the number of logical channels in the MDLC protocol capable of initiating communication via a session oriented channel.

Number of retries to declare TX FAIL
Specify the number of retries at session oriented logical channel level after which the Transport Layer declares that transmission to destination site has failed.

Interval between Tx retries
Specify the interval of time that should elapse between two retries at Source/Destination level.

Formatted buffer size
Specify the size of the formatted buffer that serves as asynchronous port.

Restore Default
If you press the Restore Default button, the default values for the four parameters on the right side of the Communication Setup window will return to their original values.

Stop Communication Driver

The Stop Communication Driver is used when a session password is changed. This utility allows you to sever the connection to the current unit and connect to another IP Gateway, or work off-line. Before stopping communications, close all Toolbox tools and then double-click the Stop Communication Driver icon in the Toolbox program folder (shown below).

If you try to stop the communication driver while a communication session is in progress, a message warns you that a logical channel is currently open.

If you chose to continue (stop the driver), the results of the current communication cannot be predicted. It is, therefore, advisable to finish the current task and then to stop the driver.

If all applications were closed before activating the utility, the following dialog box is displayed.

If no drivers were active before stopping the communication driver, the following message is displayed.

Host Table

General

The Host Table enables users to define all the SCADA/NFM manager host computers in the system which are connected to a particular IP Gateway. When the hosts have been defined, they can be downloaded to the IP Gateway. After downloading the Host Table, the IP Gateway will send SNMP Traps to all the SNMP Type hosts in the Host Table for all the spontaneous events that occur.

The Host Table Window

To start the Host Table utility, double-click the Host Table icon in the IP Gateway Toolbox folder. The Host Table Window, as shown below, enables the user to define each host with IP Address, Host Name, and Host Type. The same window is used to define the hosts for the NTP Configuration.

	IP Address	Host Name	Host Type
1	192.1.2.100	SCADA1	TCP/IP
2	192.2.1.100	NFM	Generic (SNMP)
3	192.2.1.101	Motorola	FullVision (SNMP)
4			
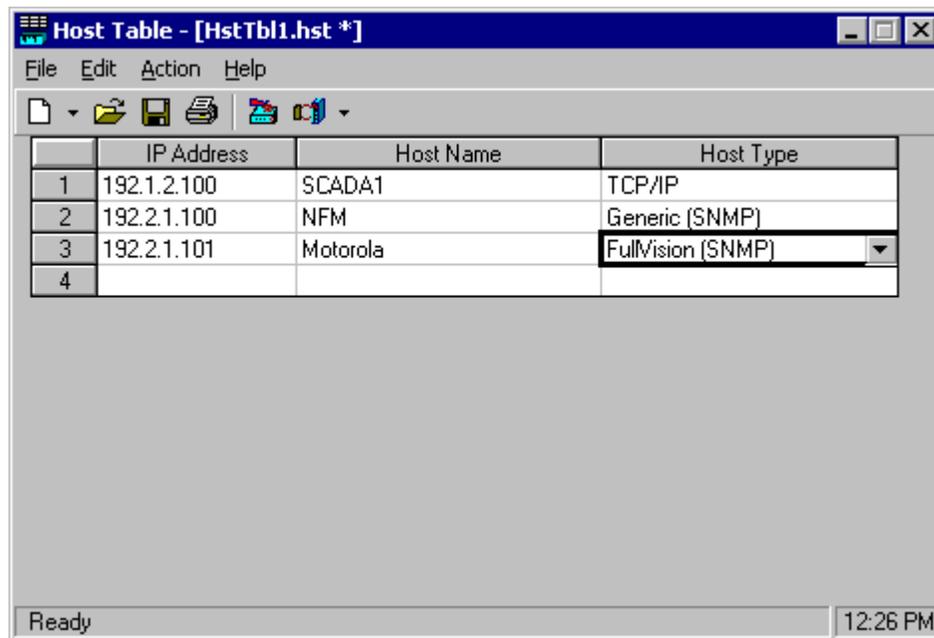
⊞ Dialog box parameters

IP Address
The IP address of the host computer.

Range: 000.000.000.001-255.255.255.254

Host Name
Alphanumeric name assigned by user. Up to 10 characters.

Host Type
There are four host type options for the standard Host Table:

- Generic SNMP – for SNMP for a Network Manager which uses generic MIB (SNMP Database). (See MOSCAD NFM Manual.)

- FullVision – for interface with the Motorola Network Fault Manager.

- TCP/IP – for a Host which is only a SCADA manager. (See MDLC Gateway for TCP/IP Application Programming Interface User's Manual.)

- (not applicable)

There is one host type option for the NTP Configuration File:

- NTP Server – for a Host which provides time related services, using the Network Time Protocol.

Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
🗋	File menu, New command
📂	File menu, Open command
💾	File menu, Save command
🖨	File menu, Print command
📥	File menu, Download command
📤	File menu, Upload command

File Menu

The commands in the File menu are designed to handle host/NTP Configuration files.

New

The New command opens a submenu and enables the user to create either a new host or NTP Configuration file. If there is an open host/NTP file on the screen, it will be closed. (The user will be prompted to save the file if changes were made.)

Open

The Open command opens an existing host/NTP file. When the Open command is executed, the Toolbox displays the Open dialog box, as shown below.

The Open dialog box defaults to the config sub-directory of the Toolbox directory (e.g., c:\itbox550\config).

Select the host table/NTP file (see parameters below) and click **OK** to load it.

Dialog box parameters

Use the parameters in the order specified below. For host files, you will probably only use the File Name parameter. For NTP files, you may have to change the Files of Type parameter.

Look In
If the currently displayed directory is not the correct one, double-click the drive letter at the beginning of the Directories list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the host/NTP file. Toolbox automatically adds the .hst extension. If the desired file is an NTP file, select .hst under Files of Type. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type

This box shows the type (extension) of the files currently displayed in the File Name list. The default should be .hst. If the desired file type "filter" is .hst, but it is not shown, open the drop-down list and select the .hst type. If the desired file type "filter" is .ntp, open the drop-down list and select the .ntp type. Alternatively, select All Files (*.*) to see all types.

Save

The Save command stores the current host/NTP file.

If the file has not been saved at least once, Toolbox opens the Save As dialog box where you assign a name to the host/NTP file. The name may contain up to 6 characters to ensure backward compatibility.

If the file has been saved at least once, Toolbox just saves the file.

Save As

The Save As command saves the current host/NTP table under a different file name. Generally, you'll use this command when you want to create a host table/NTP file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The command opens the dialog box shown below. This dialog also appears when you request to save a host/NTP file for the first time.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save In

If the currently displayed directory is not the correct one, double-click the drive letter at the beginning of the Save In list and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the host/NTP file. Toolbox automatically adds the .hst/.ntp extension. Alternatively, locate the file name in the file list, and double-click the name.

Save as Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .hst/.ntp, open the drop-down list and select the .hst/.ntp type.

Close

The Close command closes the current host table/NTP file. If changes have been made to the file, the tool will ask if you want to save those changes. If you specify yes, the Save As dialog box will appear and enable the current host/NTP file to be saved under a different file name. If no changes have been made, the dialog box reverts to an empty screen.

Print

The Print command prints the current host table/NTP Configuration file to a local printer.

Exit

The Exit command exits the Host Table utility. If changes have been made to the current file, the tool will ask if you want to save those changes. If you specify yes, the Save As dialog box will appear and enable the current host/NTP file to be saved under a different file name. If no changes have been made, the Host Table screen will disappear.

Edit Menu

The Edit menu contains commands that affect the entries in the host table/NTP Configuration file.

New Host

Creates a new entry in the Host Table/NTP Configuration file. Note that once an empty entry has been created, a valid IP Address must be entered, or an error message will appear.

Delete Host

Deletes the current entry in the Host Table/NTP Configuration file.

Copy Host

Copies the current entry in the Host Table/NTP Configuration file.

Paste Host

Pastes the copied entry after the current entry in the Host Table/NTP Configuration file and creates a new empty entry after it. If the entry was copied from a Host Table and it can be pasted to an NTP file. The Host Type will be changed automatically to NTP Server.

Action Menu

Upload

Uploads the Host Table or NTP Configuration file from a specified IP Gateway as shown in the figure below. The type of file to be uploaded is selected from the Upload submenu. The IP Gateway can be local or remote.
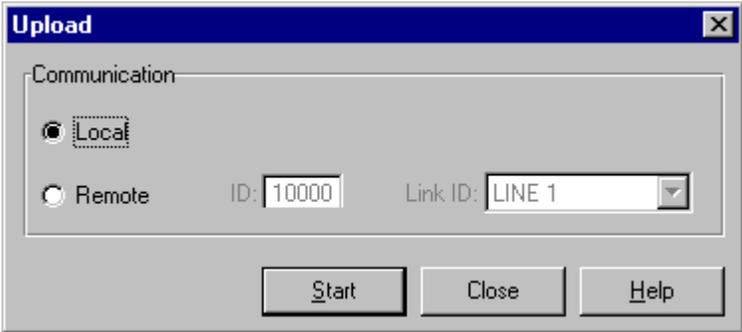
Download

Downloads the currently open Host Table/NTP Configuration file to a specified IP Gateway as shown in the figure below. The IP Gateway can be local or remote.
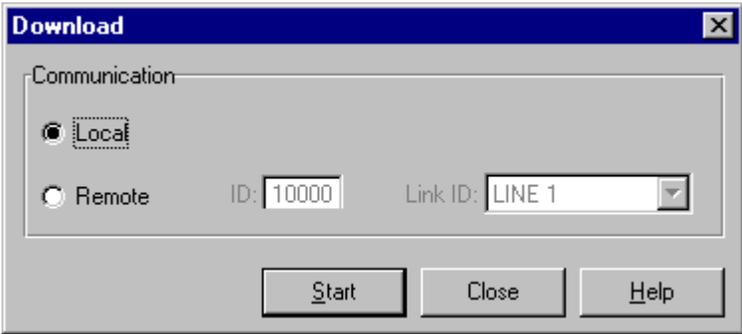
Help Menu

This menu enables you to view the version information and help files which relate to the Host Table utility.

Help Topics

The Contents command opens the help files which describe the Host Table tool and other IP Gateway utilities.

About

The About command displays the version information for the Host Table tool.

DataTac Modem ID Table

General

Two sites (MOSCAD RTUs) can communicate with one another through the IP Gateway (with Reflector capability), if both are connected to Private DataTac radios. The MDLC message is encapsulated and sent over IP to the Gateway. The user ports on the RTUs must be configured properly and the IP Gateway must have the Modem IDs for both sites. The figure below depicts such a system.
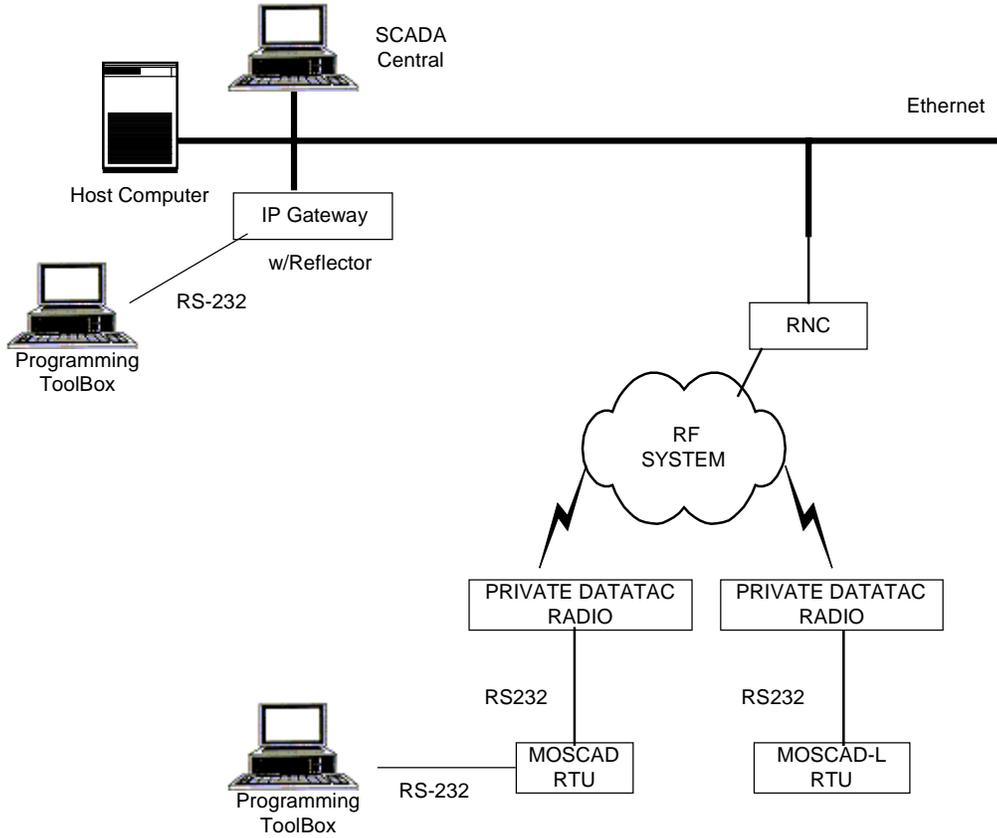
The DataTac Modem ID Table enables users to define all the DataTac Modems in the system which are connected to a particular MOSCAD RTU. When the Modem IDs have been defined, they can be downloaded to the IP Gateway. MDLC communication from one RTU to another can then be routed through the IP Gateway.

For more information, see the MDLC over Private DataTac chapter in the MOSCAD Programming Toolbox Application Programmer manual (Advanced Features).

The DataTac Modem ID Table Window

To start the DataTac Modem ID Table utility, double-click the DataTac Modem ID Table icon in the IP Gateway Toolbox folder. The DataTac Modem ID Table Window, as shown below, enables the user to define the Modem ID for each site.

```
DataTac Modem ID Table - [DTM_ID1.rnc *]      _ □ ✕
File  Edit  Action  Help

  Site ID         Modem ID
1

Ready                                        12:25
```
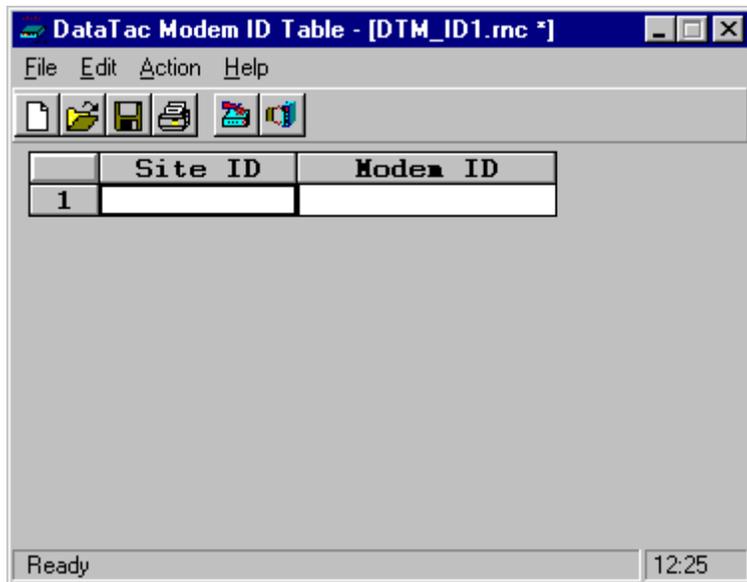
Dialog box parameters

Site ID
The Site ID whose modems are being defined.

Modem ID
Number assigned by the system (80000001, 80000002, etc.)

Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	File menu, Print command
	File menu, Download command
	File menu, Upload command

File Menu

The commands in the File menu are mainly designed to handle Modem ID table files.

New

The New command clears the current Modem ID data from the screen, and opens a new Modem ID file.

Open

The Open command opens an existing Modem ID file. When the Open command is executed, the Toolbox displays the Open dialog box, as shown below.

The Open dialog box defaults to the config sub-directory of the Toolbox directory (e.g., c:\itbox550\config).

Select the Modem ID table file (see parameters below) and click **OK** to load it.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look In
If the currently displayed directory is not the correct one, double-click the drive letter at the beginning of the Directories list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the Modem ID file. Toolbox automatically adds the .rnc extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .rnc, open the drop-down list and select the .rnc type.

Save

The Save command stores the current Modem ID table.

If the file has not been saved at least once, Toolbox opens the Save As dialog box where you assign a name to the Modem ID file. The name may contain up to 6 characters to ensure backward compatibility.

If the file has been saved at least once, Toolbox just saves the file.

Save As

The Save As command saves the current Modem ID table under a different file name. Generally, you'll use this command when you want to create a Modem ID table file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The command opens the dialog box shown below. This dialog also appears when you request to save a Modem ID table file for the first time.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save In
If the currently displayed directory is not the correct one, double-click the drive letter at the beginning of the Save In list and locate the drive/directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the Modem ID file. Toolbox automatically adds the .rnc extension. Alternatively, locate the file name in the file list, and double-click the name.

Save as Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .rnc, open the drop-down list and select the .rnc type.

Close

The Close command closes the current Modem ID table file. If changes have been made to the file, the tool will ask if you want to save those changes. If you specify yes, the Save As dialog box will appear and enable the current Modem ID file to be saved under a different file name. If no changes have been made, the dialog box reverts to an empty screen.

Print

The Print command prints the current Modem ID table file to a local printer.

Exit

The Exit command exits the DataTac Modem ID Table utility. If changes have been made to the current file, the tool will ask if you want to save those changes. If you specify yes, the Save As dialog box will appear and enable the current Modem ID file to be saved under a different file name. If no changes have been made, the DataTac Modem ID Table screen will disappear.

Edit Menu

The Edit menu contains commands that affect the entries in the Modem ID table.

New

Creates a new entry in the DataTac Modem ID Table. Note that once an empty entry has been created, a valid IP Address must be entered, or an error message will appear.

Delete

Deletes the current entry in the DataTac Modem ID Table.

Action Menu

Upload

Uploads the DataTac Modem ID Table from a specified IP Gateway as shown in the figure below. The IP Gateway can be local or remote.
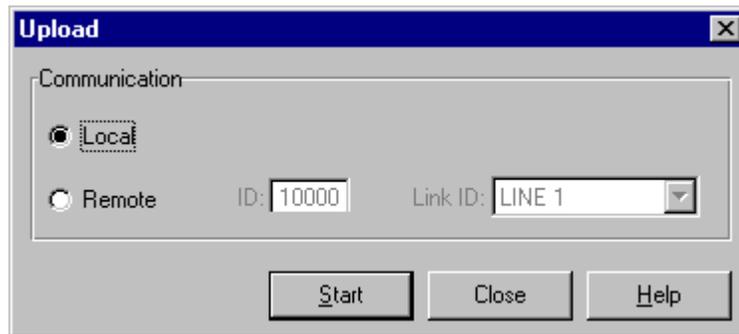
Download

Downloads the DataTac Modem ID Table to a specified IP Gateway as shown in the figure below. The IP Gateway can be local or remote.
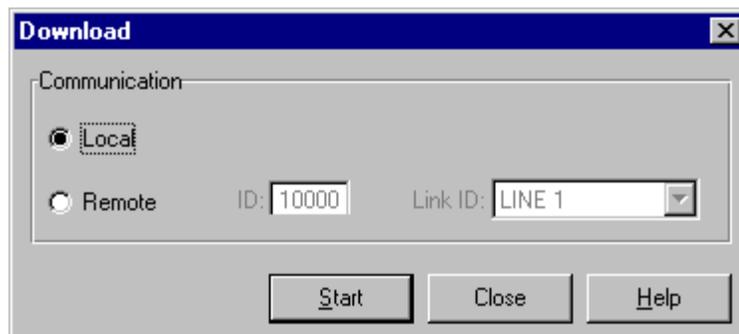
Help Menu

This menu enables you to view the version information and help files which relate to the DataTac Modem ID Table utility.

Help Topics

The Contents command opens the help files which describe the DataTac Modem ID Table tool and other IP Gateway utilities.

About

The About command displays the version information for the DataTac Modem ID Table tool.

IP Conversion Table

General

IP (Internet Protocol) technology can be used to interface between MOSCAD RTUs and IP Gateways over advanced radio infrastructure (e.g. digital ASTRO IP conventional systems) and standard private IP networks. MDLC packets to be transmitted are enveloped inside IP datagrams and sent between remote RTUs or between an IP Gateway and an RTU.

An IP Gateway can act as a gateway between the field and the SCADA Central to extract the enveloped frames from the IP message. A Toolbox can be connected to one of the RTUs or to one of the serial ports of the IP Gateway.

Each RTU/IP Gateway is assigned a Site ID. In addition, each RTU/IP Gateway with an IP interface is assigned an IP address. An IP conversion table which maps Site IDs to IP addresses is created in the Toolbox and downloaded to the RTUs and IP Gateway. This enables routing over the IP network to the proper destination.

For more details on the possible network configurations and RTU setup, see the MDLC over IP section of the MOSCAD Programming ToolBox Application Programmer Manual (Advanced Features).

IP Gateway Site Configuration

Configure an IP Port as TCP/IP, as follows:

(Note that this is one of the virtual ports over Port 1, rather than physical port.)

Link ID:
(e.g. LINE 1) Same as for all RTUs.

Port number:
(e.g. 2002) Same as for all RTUs.

The rest of the parameters are set up according to normal IP Gateway procedures. Any exceptions or known problems are described in the release notes.

IP Conversion Table Preparation

Click on the IP Conversion Table icon in the IP Gateway Toolbox folder to start the tool. Add entries for each Site ID, as shown below.
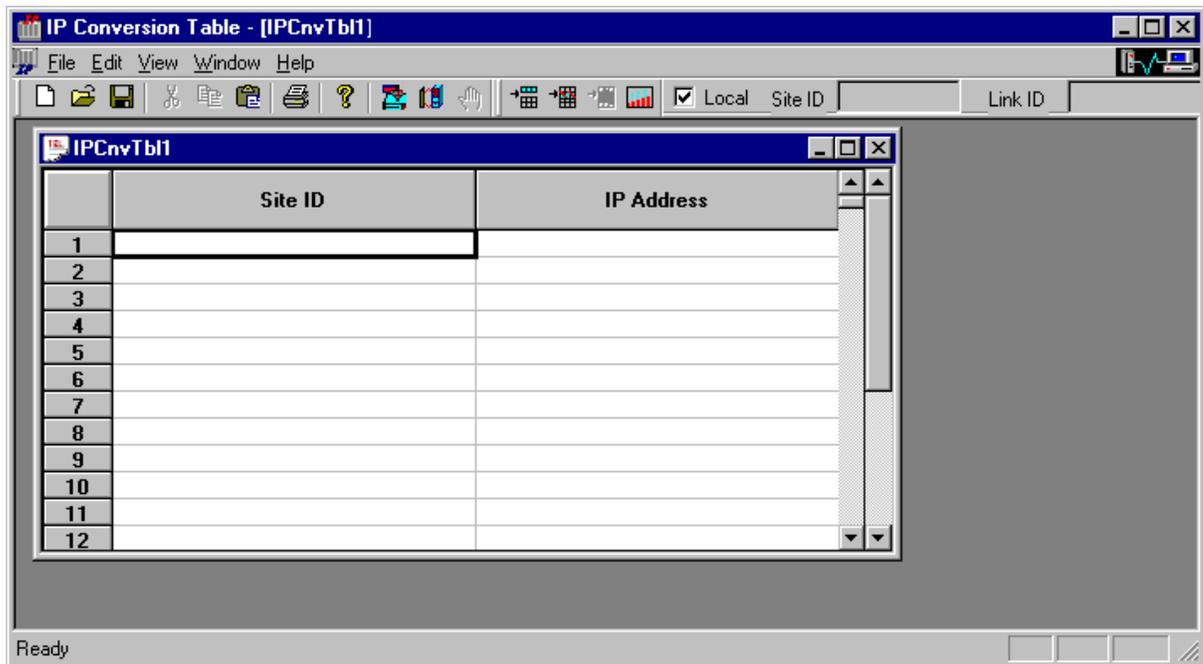
Download the IP Conversion Table to the IP Gateway and to all RTUs in the network, along with the site configuration and network configuration, if necessary.

Icons

The following is the list of the available command icons.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	Edit menu, Cut command
	Edit menu, Copy command
	Edit menu, Paste command
	File menu, Print command

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[icon]	Help menu, About command
[icon]	File menu, Download command
[icon]	File menu, Upload command
[icon]	Edit menu, Abort command
[icon]	Insert New Line command
[icon]	Delete Current Site command
[icon]	Delete Group of Sites command
[icon]	Sort by ID command

[icon] Dialog box parameters and functions

Site ID
Type or edit the Site ID of the unit.

IP Address
The IP address of the host computer.

Range: 000.000.000.001-255.255.255.254

File Menu

You can perform all the basic file operations using the commands of the File menu. After opening the menu, the following commands are displayed:

```
New        Ctrl+N
Open...     Ctrl+O
Close
Save       Ctrl+S
Save As...

Print...    Ctrl+P

Download  Ctrl+D
Upload
Abort

Exit
```

New

The New command opens a new, empty IP conversion table.

Open

The Open command opens an existing IP conversion table file. When the Open command is executed, the Toolbox displays the Open dialog box.

The Open dialog box defaults to the config sub-directory of the Toolbox directory (e.g., c:\itbox550\config).

Select the IP conversion table file (see parameters below) and click **OK** to load it.

🖭 Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save in
If the currently displayed directory is not the correct one, double-click the drive letter at the beginning of the Directories list and locate the directory. To access sub-directories, double-click parent directories.

File name
Type the name of the host file. Toolbox automatically adds the .ipc extension. Alternatively, locate the file name in the file list, and double-click the name.

Save as type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .ipc, open the drop-down list and select the .ipc type.

Close

The Close command closes the current IP conversion table.

Save

The Save command stores the current IP conversion table.

If the file has not been saved at least once, Toolbox opens the Save As dialog box where you assign a name to the IP conversion file. The name may contain up to 6 characters to ensure backward compatibility.

If the file has been saved at least once, Toolbox just saves the file.

Save As

The Save As command saves the current IP conversion table under a different file name. Generally, you'll use this command when you want to create an IP conversion table file that is slightly different from an existing one (load the existing file, save it under a new name, and make the changes).

The Save As dialog also appears when you request to save an IP conversion table file for the first time.

Print

The Print command prints the current IP conversion file to your standard system printer. If no printer is set up, see Windows Help or your system administrator.

Download

Downloads the IP Conversion Table to a specified IP Gateway. The IP Gateway can be local or remote. While the IP Conversion table tool is communicating with the RTU, the icon at the top right hand corner of the window will be animated.

Upload

Uploads the IP Conversion Table from a specified IP Gateway. The IP Gateway can be local or remote. While the IP Conversion table tool is communicating with the RTU, the icon at the top right hand corner of the window will be animated.

Abort

The Abort command terminates the download or upload operation currently in progress with the IP Gateway.

Exit

The Exit command exits the IP Conversion Table utility. If changes have been made to the current file, the tool will ask if you want to save those changes. If you specify yes, the Save As dialog box will appear and enable the current IP conversion file to be saved under a different file name. If no changes have been made, the IP Conversion Table screen will disappear.

Edit Menu

The Edit menu contains commands that affect the list of sites in the main window.

Cut

Cuts selected block of cells from the current IP Conversion file to the system clipboard.

Copy

Copies selected block of cells from the current IP Conversion file to the system clipboard.

Paste

Pastes block of cells from the system clipboard to the selected cells in the current IP Conversion file.

View Menu

The following views are available to the user. Click on an entry to select it, and a check mark will appear on the menu. The associated view is then displayed on the window.

Toolbar

The Toolbar displays the basic icons, described under *Icons*, used for handling files and editing text.

Tablebar

The Tablebar displays the icons, described under *Icons,* used for manipulating rows in the IP Conversion Table.

Sitebar

When checked, this command displays the Sitebar, usually towards the top of the screen. Use the SiteIDBar to specify the RTU to which the IP Conversion file is to be downloaded. If the ToolBox computer is locally connected to the RTU, make sure that Local is selected (default). If you want to configure a remote site, unclick Local and specify the Site ID and the appropriate link ID.

Statusbar

The Status bar displays the status messages at the bottom of the IP Conversion Table window.

Window Menu

The Window menu enables the user to arrange the various screens within the IP Conversion Table window. The screens can also be moved, resized or closed as standard Windows. In addition to the commands below, the Window menu lists the currently open windows. The checked name is the active screen. By clicking on another filename, the user can change the active screen.

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Help Menu

The Help menu enables the user to view the version information and help files which relate to the IP Conversion Table tool.

About IP Conv. Table

The About command displays the version information for the IP Conversion Table tool.

SW Diagnostics & Loggers

The SW Diagnostics & Loggers utility enables the user to run several instances of three different diagnostics tools simultaneously. The user can interface with one of three tools at any one time, jumping from one window to another as necessary.

The diagnostics applications are:

- Error Logger
- Software Diagnostics

The Error Logger retrieves error information (hardware or software malfunctions) from the IP Gateway. The Software Diagnostics program allows access to each of the modules (or "devices") that handle the various tasks of the IP Gateway according to their logical names. The tools can communicate with any IP Gateway in the system, local or remote, based on the setup of the communication links.

SW Diagnostics and Loggers Window

To activate the tool, double-click the SW Diagnostics and Loggers Tool icon in the IP Gateway ToolBox folder. The following window is displayed.
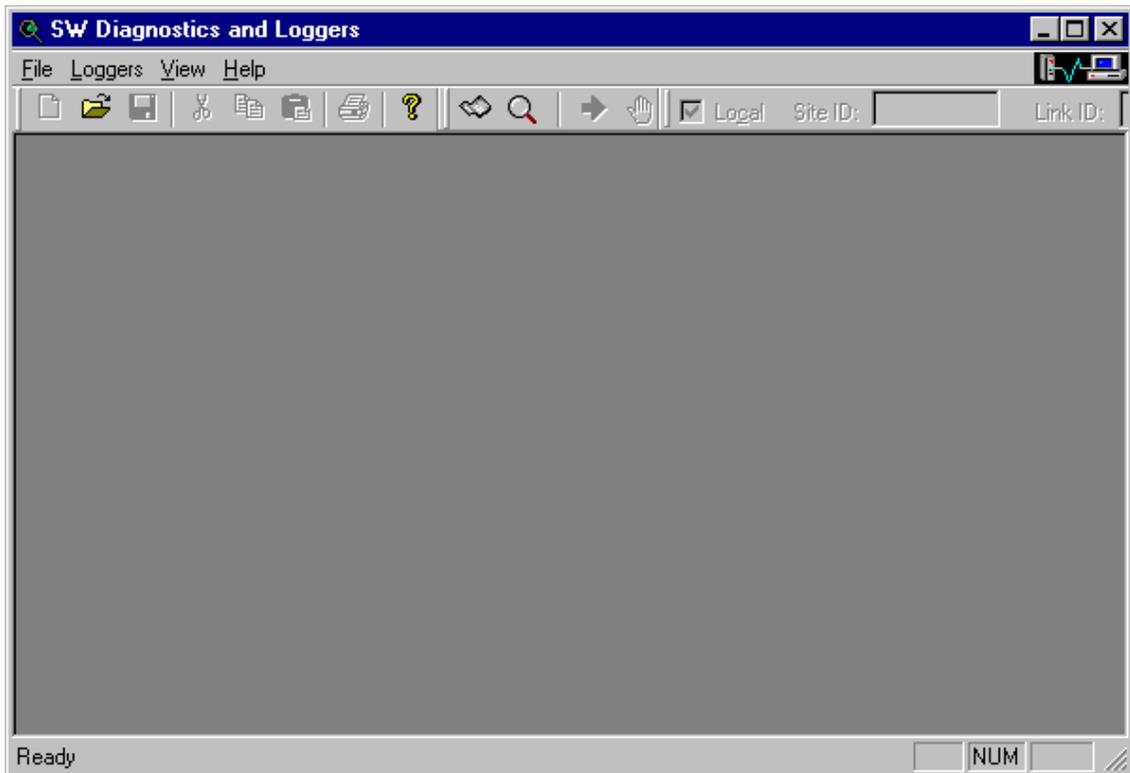
Select one or more applications by clicking on the appropriate logger icon or by selecting from the Loggers menu. New logger windows open in a cascade, but can be moved around the Logger window. (See *Window Menu*.) Before the logging is begun, the files are empty, with only one screen active at a time. The header of each screen includes the application name, file name and Site ID (e.g. Error Logger Errlog102.30.01_15.25.32.log Site: Local). The log file name incorporates the window instance (Errlog1) and the date/time.

For each window, identify the IP Gateway from which the information is to be retrieved. In the Site Toolbar, make sure that Local is selected if you are connected locally to the IP Gateway. If you are connecting to a remote IP Gateway, specify the Site ID and Link ID. If the Site Toolbar is not shown, select it from the View menu.

If you are running the Error Logger, press the Start icon or select Start from the Loggers menu, to begin communication with the IP Gateway and retrieve Error Log data. For more details on the Error Logger, see the *Error Logger Tool* section.

If you are running the SW Diagnostics tool, the device and level must be defined in the Device toolbar. If the Device toolbar is not shown, select it from the View menu. Type in the device name to be tested or select it from the pull-down menu. If the name does not appear on the list, run the Get Device List command from the Loggers menu or click on the icon. This retrieves the full list of devices from the IP Gateway. Next enter the level at which the diagnostics will be performed. All devices in the system have a level of request, starting from Level 0. Level 10 gets the data and resets all counters. Level 11 gets the data without resetting the counters. For details on the devices and levels, refer to the *Software Diagnostics Output* section. Press the Start icon or select Start from the Loggers menu, to begin communication with the IP Gateway and retrieve the diagnostics data. For more details on the Software Diagnostics tool, see the *Software Diagnostics Tool* section.

While the SW Diagnostics & Loggers utility is communicating with the IP Gateway, the
 icon at the top right hand corner of the SW Diagnostics & Loggers window will be animated.

Error Logger Tool

The Error Logger retrieves error information (hardware or software malfunctions) from any gateway or site in your system. Several logger windows can be opened simultaneously, each one numbered sequentially Errlog1, Errlog2, etc. The information is stored in the c:\Itbox550\log\ErrLog directory. Log files will be named Errorlog<#>_Date_Time.log by default, where # is the sequential number (1, 2, etc.) of the error logger window opened. The default log file name can be changed. For a review of error messages, see the *Error Messages* section. For an example of an Error Log, see *Error Log example.*

When the Error Logger is activated from the ToolBox, the contents of the site's error log are appended to the log file and the site's log file is then cleared. (This is important, as the size of the site's error log is limited.) The error log in the ToolBox, however, is not cleared, and it is recommended that the file be cleaned out manually from time to time.

Software Diagnostics Tool

The IP Gateway software is based on an "Object Oriented Multi-Tasking" operating system. The software is comprised of modules, named "devices" (objects, entities), that handle the various tasks of the MOSCAD RTU.

Some of the devices handle the operation of physical elements such as communication ports or I/O modules, and other devices are simply software modules such as communication applications, time handling etc.

One of the many advantages of such an operating system is that it creates the devices according to the user configuration requirements as defined by the Site Configuration program.

For example, devices are created to handle the I/O modules (one device for each module according to the type of module) and each of the physical ports according to the required protocol and parameters defined by the user.

Another advantage of this operating system is the Software Diagnostics program that allows access through the communication (local or remote) to each of the devices according to their logical names (the devices are created with a logical name).

The Software Diagnostics program provides reports on the status of each device at different levels of breakdown. It also provides historical and statistical data on the device activities. The Software Diagnostics data is useful for system maintenance, problem identification for remote services and statistics data on the communication system performance.

The Software Diagnostics tool allows access to each of the modules (or "devices") that handle the various tasks of the IP Gateway according to their logical names. The tool retrieves information from any site in your system. For more background on communication, diagnostics and devices, see *Diagnostics* below.

Several logger windows can be opened simultaneously, each one numbered sequentially Diaglog1, Diaglog2, etc. The information is stored in the c:\Itbox550\log\DiagLog directory. Log files will be named Diaglog<#>_Date_Time.log, where # is the sequential number (1, 2, etc.) of the Software Diagnostics window opened. (The default name of the log file can be changed.) For a review of the possible devices and their levels, refer to the *Software Diagnostics Output* section.

The device and level must be defined in the Device toolbar. If the Device toolbar is not shown, select it from the View menu. Select the device name to be tested from the pull-down menu or type it into the Device Name field. If the name does not appear on the list, run the Get Device List command from the Loggers menu or click on the icon. This retrieves the full list of devices from the IP Gateway. Next enter the level at which the diagnostics will be performed. All devices in the system have a level of request, starting from Level 0. Level 10 gets the data and resets all counters. Level 11 gets the data without resetting the counters. Select the appropriate level. For details on the devices and levels, refer to the *Software Diagnostics Output* section.

Press the Start icon or select Start from the Loggers menu, to begin communication with the IP Gateway and retrieve the diagnostics data.

When the Software Diagnostics tool is activated from the ToolBox, the diagnostics information is appended to the log file, and the site's log file is then cleared. (This is important as the size of the site's log is limited.) The log file in the ToolBox, however, is not cleared, and it is recommended that the file be cleaned out manually from time to time.

Icons

The following command icons are available in the toolbar. Those icons which are specific to a given logger, are marked accordingly below. Note that during execution, the icons displayed in the toolbars relate to the active tool.

Icon	Corresponding menu command
	File menu, New command
	File menu, Open command
	File menu, Save command
	Edit menu, Cut command
	Edit menu, Copy command
	Edit menu, Paste command
	File menu, Print command
	Help menu, About command
	Loggers menu, Error Logger command
	Loggers menu, Diagnostics command
	Loggers menu, Start command
	Loggers menu, Device list command (SW Diagnostics only)
	Loggers menu, Abort command

File Menu

The File menu commands enable you to save logger information to a file and to carry out file operations. Those commands which are specific to a given logger, are marked accordingly below.

New

The New command opens a new log file and prompts user to save it in the logger directory. The default name and directory of the log file in the dialog box can be changed in the dialog. You can also enter an existing log file name. The old logger information (from an earlier session) will be displayed and the new logger information will be appended to it. The New command and the corresponding icon are only available when a logger tool has been opened.

Open for Editing

The Open for Editing command opens an existing file and enables the user to edit the contents of the file. After activating this command, the ToolBox displays a dialog box, as shown below. The user can specify whether the file to be opened is an Error log or a Diagnostics log.
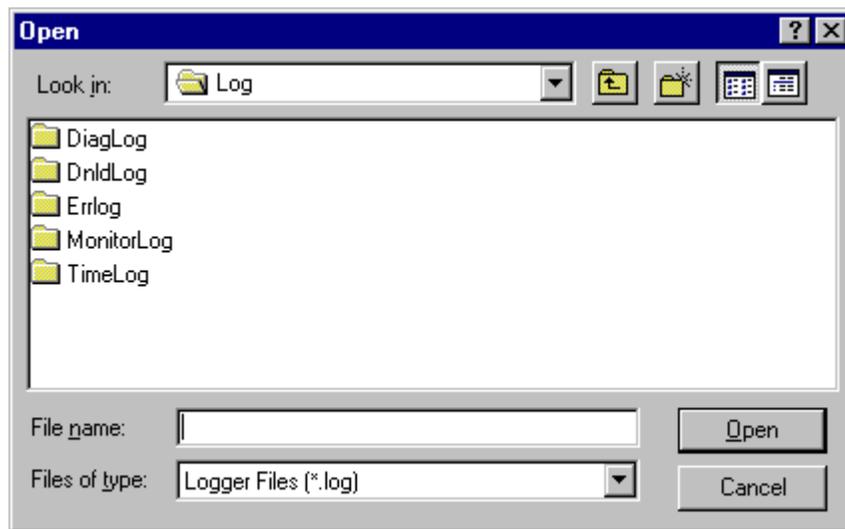
The Open dialog box defaults to the appropriate sub-directory of the ToolBox log (c:\Itbox550\log) directory, where logger files are stored by default.

Select the log file (see parameters below) and click OK to load it.

Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Look in
If the currently displayed directory is not the correct one, double-click the drive letter at the right of the Look in list and locate the directory. To access sub-directories, double-click parent directories.

File Name
Type the name of the logger file. The ToolBox automatically adds the .log extension. Alternatively, locate the file name in the file list, and double-click the name.

Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .log, open the drop-down list and select the .log type.

Save As

The Save As.. command saves the current logger information under a different file name. The Save As dialog box defaults to the appropriate logger sub-directory of the ToolBox log directory (c:\ltbox550\log), based on the active logger (Errlog, Diaglog). If, for example, the Error Logger is active, the default log file name incorporates the window instance (Errlog1) and the date and time: Errlog102.30.01_15.25.32.log. Both the default name and directory of the log file can be changed in the dialog.

The command opens the dialog box shown below.
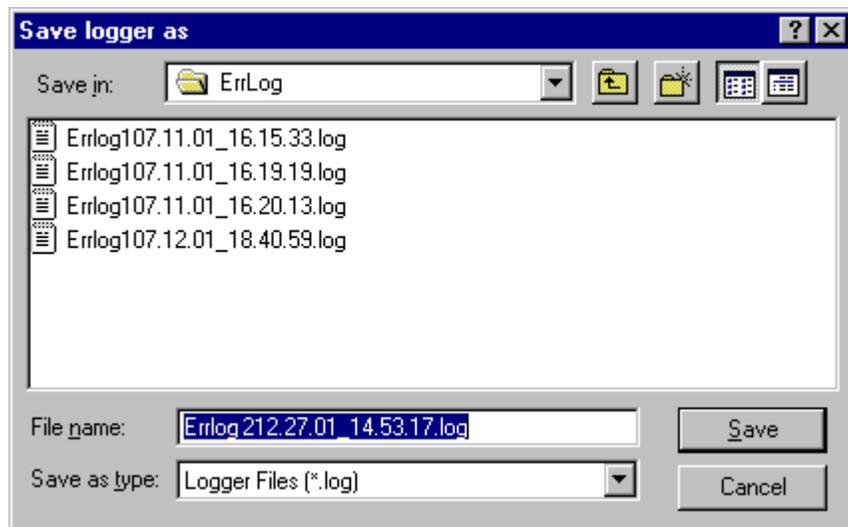
⊞ Dialog box parameters

Use the parameters in the order specified below. Normally you'll only use the File Name parameter.

Save in
If the currently displayed directory is not the correct one, double-click the drive letter at the right of the Save in list and locate the directory. To access sub-directories, double-click parent directories.

List Files of Type
This box shows the type (extension) of the files currently displayed in the File Name list. If the displayed file type "filter" is not .log, open the drop-down list and select the .log type.

File Name
The file name (e.g. Errlog102.30.01_15.25.32.log) represents the current log file of the active utility and incorporates the window instance (Errlog1) and the date/time. The tool automatically adds the .log extension to the file.

Select Central File

This command allows you to select the central file by opening the following dialog box:
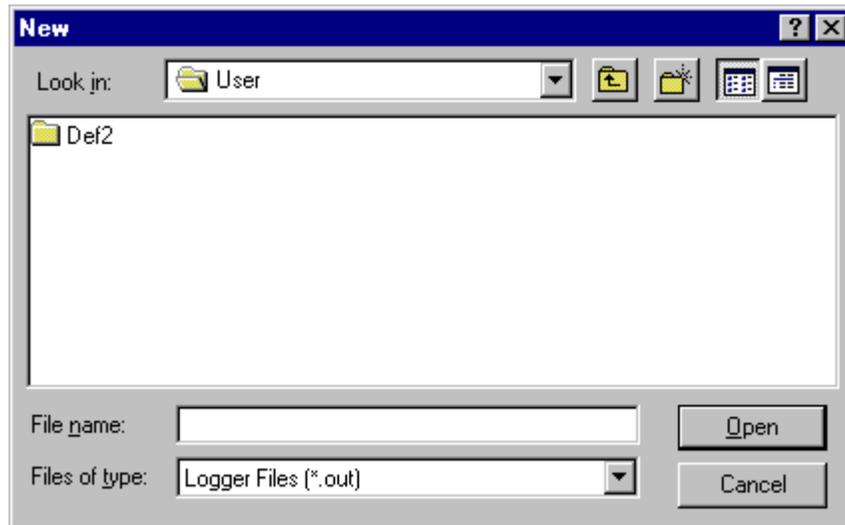
If you do not select a central file, the variables are displayed by their Z, Y, and X coordinates. If you select the central file, their logical names are displayed.

Close Central File

Closes the currently open central file.

Print

The Print command prints the contents of the current log file to your standard system printer, as defined in Print Setup.

Print Setup

The Print Setup enables the user to define the page setup and printer to be used. If no printer is set up, see Windows Help or your system administrator.

Recent Error Logger Files

The Recent Error Logger Files enables the user to easily access the five most recently used error logger files.

Recent Diagnostics Files

The Recent Diagnostics Files enables the user to easily access the five most recently used software diagnostics files.

Edit Menu

The Edit menu contains commands that affect the logger file or logger view in the current window. The Edit menu displays certain commands when a view is open for editing and others when a logger tool is open.

Undo

Undoes the last edit action performed in the current logger file.

Cut

Cuts selected text from the current logger file to the system clipboard.

Copy

Copies selected text from the current logger file/view to the system clipboard.

Paste

Pastes text from the system clipboard to the selected cells in the current logger file.

Delete

Deletes selected text from the current logger file to the system clipboard.

Find

Finds a specified text string in the current logger file/view.

Replace

Replaces text with a specified text string in the current logger file.

Clear View

Clears the screen of the active logger view. Note that the file still contains the log information, although the view is blank.

Loggers Menu

The Loggers menu contains commands that start the logger tools.

Error Logger

The Error Logger command starts an instance of the Error Logger.

Error Log example

The error logger window header is as follows: Error Logger <filename> <site id><link id>

The format of the error message itself is as follows:

- The first row displays the date and time in the PC.
- The second row displays the date and time in the IP Gateway, and the error number.
- The third row displays the error message.

  Thu May 31 11:12:51 2001 SITE: Local
   01/01/80 05:21 ERROR #: 141
  Cannot find link id in network configuration, network layer: NETWRK
    dest site: 17   ,   dest link: 23 ,   dest port: 0

Diagnostics

The Diagnostics command starts an instance of the Software Diagnostics.

Communication System Statistics

The IP Gateway and MOSCAD communication systems implement the seven layers of OSI (Open Systems Interconnection) model. In each layer, one or more devices are created to handle that specific layer. Each of the devices (in addition to its functions) performs statistical follow-up that may be used to analyze the status of the communication system. The following figure describes the devices (objects) of the communication system:
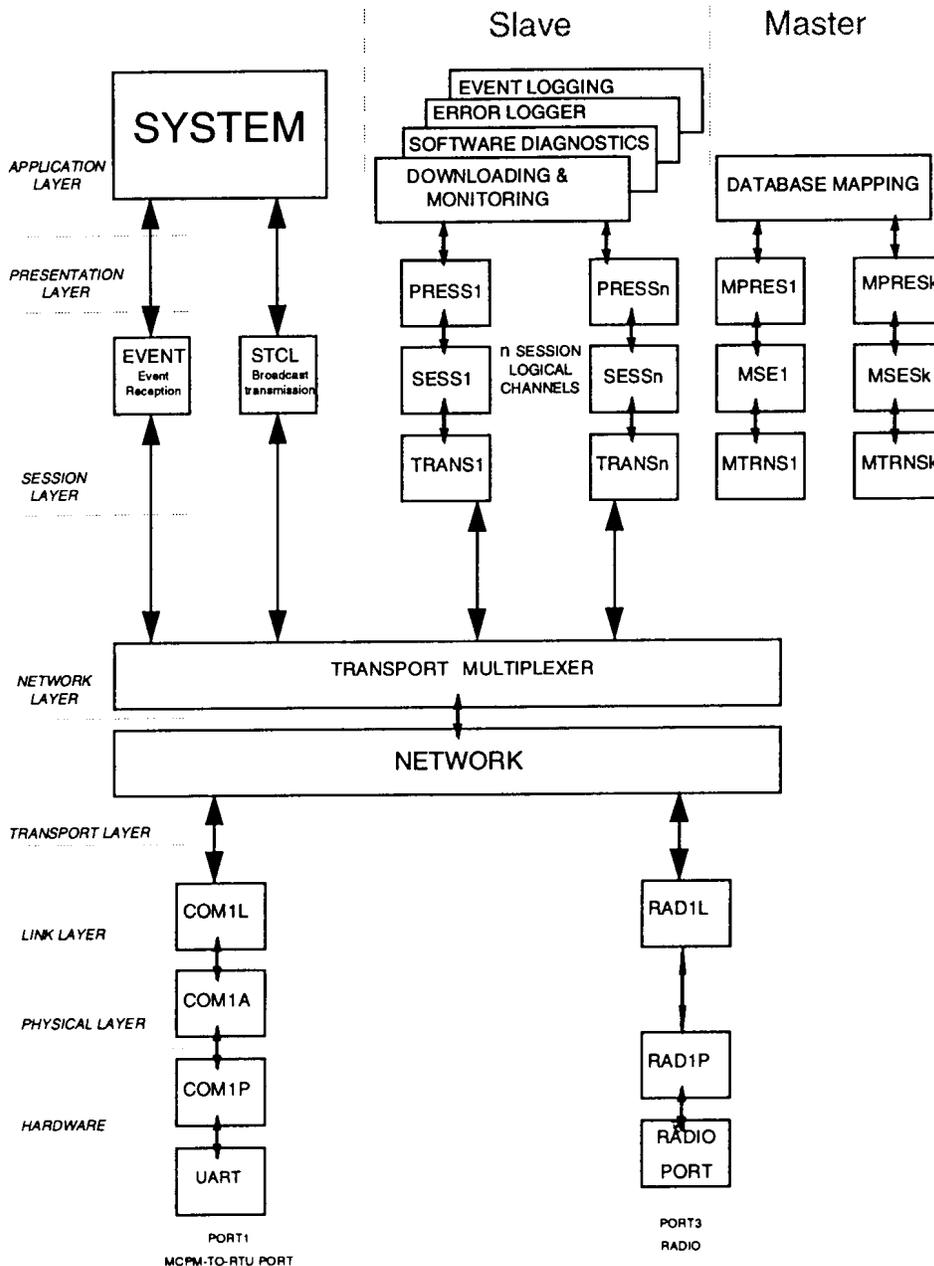
It shows a typical IP Gateway with two physical ports: Local Computer and Radio. The physical ports are supported by the **Link** and **Physical** layers.

It also shows n **Session Logical Channels** used by various applications. In addition, three **Minisession Logical Channels** support event & burst transmission and broadcast reception.

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The names of the devices of the Link and Physical layers are taken from the **logical names** of the links, as defined by the user in the Site Configuration program. There is no connection between the number that is part of the device name and the port number.

For example, the device of the link of port 3 is named *RAD1L*, since the link name is RADIO1 and L indicates a link device.

The IP Gateway communication supports two modes of transmission:

- **Synchronous** mode (may be used in ports 3 and 4 of the CPU module)

- **Asynchronous** mode, UART (all ports of the CPU module)

Port 3 is used in the Synchronous mode of transmission, when:

1) A radio of any type is connected.

2) A modem is connected and synchronous communication is defined in the Site Configuration program (except dial-up mode that allows only asynchronous mode of operation).

3) An RS232 Synchronous piggyback is connected to ports 3 and 4.

When the communication is **synchronous** (bit oriented), the physical channel consists of the Link device and Physical device. The transmitted frame is composed of a stream of bits that starts and ends with flags that indicate the frame limits.

When the communication is **asynchronous** (byte oriented), the frame is broken down and encoded into a series of bytes, transmitted and received by a UART. This type of communication is handled by the Adapter device.

To get the statistics of a specific device, define the **device name**, the **Site ID**, and also the **Level** of request. All devices in the system have a level of request, starting from Level 0.

Level 10 and **Level 11** should be used to get communication statistics.

The following table provides the device names that respond to Level 10 and Level 11.

Layer Name	Device Name	Notes
Mini-Session	*EVNT*	for Event application
	STCL	for Group-Control application
Transport	*TRANSx*	x – logical channel
Network	*NETWRK*	–
Link	*COMxL*	for COMPUTER link
	RTUxL	for RSlink
	RADxL	for RADIO link
	LINxL	for LINE link
	TSxL	for link above Terminal Server
		x – logical number

Layer Name	Device Name	Notes
UART-Physical (Adapter)	*DILxA*	For DIAL link
	COMxA	for COMPUTER link
	RTUxA	for RSlink link
	RADxA	for RADIO link
	LINxA	for LINE link via ext. modem
	TSxA	for adapter over Terminal Server
		x − logical number
Physical	*DILxP*	For DIAL link
	COMxP	for COMPUTER link
	RTUxP	for RSlink link
	RADxP	for RADIO link
	LINxP	for LINE link via ext. modem
	TSxP	for Terminal Server port
		x − logical number

Link ID	Link	Adapter	Physical Layer
For dial	DIL1L	DIL1A	DIL1P
Line 1- Line 9	LIN1L-LIN9L	LIN1A-LIN9A	LIN1P-LIN9P
Line 10	LIN:L	LIN:A	LIN:P
Line 11	LIN;L	LIN;A	LIN;P
Line 12	LIN<L	LIN<A	LIN<P
Line 13	LIN=L	LIN=A	LIN=P
Line 14	LIN>L	LIN>A	LIN>P
Line 15	LIN?L	LIN?A	LIN?P
Line 16	LIN@L	LIN@A	LIN@P
Line 17-Line 29	LINAL	LINAA-LINMA	LINAP-LINMP
Line 30-Line 99	L030L-L099L	L030A-L099A	L030P-L099P
Line 100-Line 200	L100L-L200L	L100A-L200A	L100P-L200P
Rslink 1-Rslink9	RTU1L-RTU9L	RTU1A-RTU9A	RTU1P-RTU9P
Rslink 10	RTU:L	RTU:A	RTU:P
Rslink 11	RTU;L	RTU;A	RTU;P

Link ID	Link	Adapter	Physical Layer
Rslink 12	RTU<L	RTU<A	RTU<P
Rslink 13	RTU=L	RTU=A	RTU=P
Rslink 14	RTU>L	RTU>A	RTU>P
Rslink 15	RTU?L	RTU?A	RTU?P
Rslink 16	RTU@L	RTU@A	RTU@P
Rslink 17-Rslink 19	RTUAL-RTUCL	RTUAA-RTUCA	RTUAP-RTUCP
Rslink 20-Rslink 99	S020L-S099L	S020A-S099A	S020P-S099P
Rslink 100-Rslink 200	S100L-S200L	S100A-S200A	S100P-S200P
Radio 1-Radio 9	RAD1L-RAD9L	RAD1A-RAD9A	RAD1P-RAD9P
Radio 10-Radio 99	R010L-R099L	R010A-R099A	R010P-R099P
Radio 100-Radio 200	R100L-R200L	R100A-R200A	R100P-R200P
Computer 1-Computer 9	COM1L-COM9L	COM1A-COM9A	COM1P-COM9P
Terminal Server 1-Terminal Server 32	TS1L-TS32L	TS1A-TS32A	TS1P-TS32P

Reading Diagnostics Information

The structure of the statistical data is described below for each device name.

COMxA (Adapter device of Computer X)

```
Jun 30 14:49:10    Site: LOCAL  Device: COM1A   Level: 11
# of Transmitted Frames        : 6
# of Re-transmitted Frames     : 0
# of Received Frames           : 6
# of Received Frames (With Error): 0
```

The # of Received Frames includes only correct frames (including acknowledgment frames).

The # of Re-transmitted Frames represents only frames rejected by the physical layer (do not use this number; use the # of Re-transmitted Frames in the Link device).

RADxL (Link device of Radio X)

```
Jun 30 14:50:10    Site: LOCAL  Device: RAD1L   Level: 11
# of Transmitted Frames        : 0
# of Re-transmitted Frames     : 0
# of Received Frames           : 0
# of Received Frames (With Error): 0
```

The # of Transmitted Frames does not include retransmission and acknowledgment frames.
The # of Received Frames includes only correct frames.

<u>COMxL</u> (Link device of Computer X)

```
Jun 30 14:55:26    Site: LOCAL   Device: COM1L    Level: 11
# of Transmitted Frames         : 17
# of Re-transmitted Frames      : 0
# of Received Frames            : 35
# of Received Frames (With Error): 0
```

The # of Transmitted Frames does not include retransmission and acknowledgment frames.
The # of Received Frames includes only correct frames.

<u>NETWRK</u> (Network device)

```
Jun 30 14:56:20    Site: LOCAL  Device: NETWRK   Level: 11
# of Transmitted Frames         : 21
# of Received Frames            : 43
# of Received Frames (With Error): 0
```

<u> STCL</u>

```
Jun 30 15:09:25    Site: LOCAL  Device: STCL    Level: 11
# of transmitted frames as ORIGINATE: 0
# of transmitted frames as GROUPCALL: 0
# of transmitted frames as ANSWER   : 0
# of transmitted frames as MESSAGE  : 0
# of re-transmitted frames          : 0
# of received frames as ORIGINATE   : 0
# of received frames as GROUPCALL   : 0
# of received frames as ANSWER      : 0
# of received frames as MESSAGE     : 0
# of received frames (with error)   : 0
```

<u>TRANSx, MTRNSx</u>

```
Jun 30 15:12:38    Site: LOCAL  Device: TRANS1   Level: 11
# of Transmitted Frames                        : 25
# of Received Frames                           : 26
# of Re-transmitted Frames                     : 0
# of Received Frames (With Error)              : 0
# of Frames  in TX queue                       : 0
# of Frames  in RX queue                       : 0
# of Frames  in TX queue (hold by LINK     layer): 0
# of Frames  in TX queue (hold by PHYSICAL layer): 0
```

<u>REQMNG</u> Requirements Manager device

The meaningful levels are 0, 1. Diagnostic levels of 2, 3, 4 are for internal use only.

Example of Level 0 Diagnostics:

```
Oct 31 09:45:36  Site: 10000  Link: Rslink1  Device: REQMNG Level: 0
max clients             :4
max channels            :18
max buffers             :10
comm buffer length      :8256
clients offset          :84
channels offset         :324
buffers offset          :936
read list offset        :900
next client             :20
next channel            :10
n read channels         :5
cur buf                 :0
gateway id              :1
gateway status          :1H
client error            :0H
mng thread channel      :0
tx global               :901b6H
rx global               :8b192H
mng global              :8616eH
site id                 :0
startup mode            :0
left                    :0
```

Interesting fields:

Static Data

```
    max clients             :4
    max channels            :18     (Allocated channels + 2)
    max buffers             :10
    gateway id              :1
    startup mode            :0     - Stand-alone
                            :1     - Redundant 1
                            :2     - Redundant 2
```

Dynamic Data

```
    gateway status          :1H - Primary mode
                            :5H - Secondary mode
```

Example of Level 1 Diagnostics:

```
Oct 31   09:45:36    Site: 10000   Link: Rslink1  Device: REQMNG Level:  1

name             free  id    tx    burst  error
myclnt           0     1     2     2      0
another          0     2     3     3      0
                 1     255   255   255    0
                 1     255   255   255    0
```

Interesting fields:
The name column indicates the names of the connected clients, (if a row starts with 1, the first
- name field is empty).

<u>LNKHNDL</u>

```
Tue Dec 21 09:00:50 1999  SITE: Local  DEVICE: LNKHNDL  LEVEL: 1
 Site #:  100
Site Up   Time : 2              Site Discover Time :  3
Site Down Time : 0              Site Mirror    Time :  4
  Primary   Link 51   is Up   1      0
  Secondary Link 51   is Up   1      0
  Site #:  101
Site Up   Time : 3              Site Discover Time :  6
Site Down Time : 0              Site Mirror    Time :  7
  Primary   Link 51   is Up   1      0
  Secondary Link 51   is Up   1      0
  Site #:  102
Site Up   Time : 4              Site Discover Time :  9
Site Down Time : 0              Site Mirror    Time :  9
  Primary   Link 51   is Up   1      0
  Secondary Link 51   is Up   1      0
  Site #:  167
Site Up   Time : 69             Site Discover Time :  165
Site Down Time : 0              Site Mirror    Time :  166
  Primary   Link 51   is Up   1      0
  Secondary Link 51   is Up   1      0
```

<u>HELTHCH</u> Health Check Device

```
Tue Dec 21 09:01:37 1999  SITE: Local  DEVICE: HELTHCH  LEVEL: 0

Health Check Diagnostics
-----------------------

Actual number of RTUs:        100
Maximum RTUs:                 500
Time to wait in ping task:    1000         mili seconds
Time to wait in pong task:    1000         mili seconds
Time to wait in dead task:    1000         mili seconds
Time to give up ping:         900          seconds
Number of pings until fail:   2

pointer to pingHndl:             fa32H
pointer to deadHndl:             fa58H
pointer to pongHndl:             fa44H
pointer to rtuList:              f240H
pointer to notify function:   206f698H
parameter to notify function:      0H
TMUX key:                     1b96392H
FRAM_SEQ key:                 1d51ca6H
System maximum ping trials    1
```

```
Time to wait after ping:        1000            mili seconds
```

Tue Dec 21 09:01:43 1999 SITE: Local DEVICE: HELTHCH LEVEL: 1

Health Check Diagnostics - Rtus   (times are in seconds)

SiteId	LinkId	Status	PingTime	ResponseTime	PingsSent
100	51	alive	163292	163293	0
101	51	alive	163293	163294	0
102	51	alive	163294	163295	0
103	51	alive	163300	163301	0
104	51	alive	163129	163130	0
105	51	alive	163304	163305	0
106	51	alive	163125	163126	0
107	51	alive	163240	163241	0
108	51	alive	163187	163188	0
109	51	alive	163261	163262	0

Tue Dec 21 09:01:55 1999 SITE: Local DEVICE: HELTHCH LEVEL: 2

Health Check Diagnostics - Rtus   (trials due to busy in transmit)

SiteId	Status	PingTrials	MaxPingTrials
100	alive	1	1
101	alive	1	1
102	alive	1	1
103	alive	1	1
104	alive	1	1
105	alive	1	1
106	alive	0	1
107	alive	1	1
108	alive	1	1
109	alive	1	1

Tue Dec 21 09:02:01 1999 SITE: Local DEVICE: HELTHCH LEVEL: 3

Health Check Diagnostics - Rtus   (times are in seconds)

SiteId	Status	DeadTime	QuietTime	BetwTime
100	alive	300	200	50
101	alive	300	200	50
102	alive	300	200	50
103	alive	300	200	50
104	alive	300	200	50
105	alive	300	200	50
106	alive	300	200	50
107	alive	300	200	50
108	alive	300	200	50
109	alive	300	200	50

STBLA Sites Table Device

```
Tue Dec 21 09:02:44 1999  SITE: Local  DEVICE: STBLA  LEVEL: 0

Version of Site-Table Downloader      : 400
The Target Unit (1-VRM-100, 2-Gateway): 4
Size of Downloaded Site Table         : 101
Size of Learning   Site Table         : 100



Tue Dec 21 09:03:19 1999  SITE: Local  DEVICE: STBLA  LEVEL: 1

Learning Site-Table:

 Site-ID   Link-ID
========   =======

   0        0
   0        0
   0        0
   0        0



Tue Dec 21 09:03:25 1999  SITE: Local  DEVICE: STBLA  LEVEL: 2

Downloaded Site-Table:

 Site-ID   Link-ID  Retries  Timeout
========   =======  =======  =======
  65533  1    30    254  300            254  300
  100    1    30    51   300            51   300
  101    1    30    51   300            51   300
  102    1    30    51   300            51   300
  103    1    30    51   300            51   300
  104    1    30    51   300            51   300
  105    1    30    51   300            51   300
  106    1    30    51   300            51   300
  107    1    30    51   300            51   300
  108    1    30    51   300            51   300
  109    1    30    51   300            51   300
```

Start

The Start command begins retrieval of error logger or diagnostics information from the IP Gateway. The information is displayed in the appropriate logger window. When the ToolBox is communicating with the IP Gateway, the Start icon and command will be dimmed. While the SW Diagnostics & Loggers utility is communicating with the IP Gateway, the icon at the top right hand corner of the SW Diagnostics & Loggers window will be animated.

Device List

(SW Diagnostics only) A basic device list is available when you open the SW Diagnostics tool. The Device List command updates the device list with all the devices actually residing in the IP Gateway.

Abort

The Abort command terminates retrieval of error logger or diagnostics information from the IP Gateway.

View Menu

The following views are available to the user. Click on an entry to select it, and a check mark will appear on the menu. The associated view will be displayed on the SW Diagnostics & Loggers window. Those views which are specific to a given logger, are marked accordingly below. Note that during execution, the icons displayed in the toolbars relate to the active tool.

Toolbar

The Toolbar displays the icons described under.

Status bar

The Status bar displays the status messages at the bottom edge of the SW Diagnostics & Loggers window. This message area is read-only.

Site bar

The Site bar dialog enables the user to specify the location of the IP Gateway with which the current logger tool communicates. The logger tool runs can be connected locally to an IP Gateway or over a network to a remote IP Gateway in order to retrieve error or diagnostics information. If you are connected locally to the IP Gateway, make sure that Local is selected. If you are connected remotely, unselect Local and specify the Site ID and Link ID.

By default, the Site bar is displayed at the top of the SW Diagnostics & Loggers window. To remove the bar, unselect it in the View menu.

Dialog box parameters

Local
When this box is checked, the logging is done for the locally connected IP Gateway. The default setting for communication is Local.

Link ID
When the Local box is not checked, the logging is done for a remote IP Gateway connected to the PC via the specified Link ID.

Site ID
When the Local box is not checked, the logging is done for the remote IP Gateway at the specified Site ID connected to the PC via the above Link ID.

Loggers Bar

The Loggers Bar enables the user to launch a new logger tool and set it as the active tool.

Device Bar

(Available for the SW Diagnostics tool only). The Device Bar enables the user to select the name and level of breakdown for whose data is to be reported.

Window Menu

The Window menu enables the user to arrange the various logger screens within the Logger window. The logger screens can also be moved, resized or closed as standard Windows. In addition to the commands below, the Window menu lists the currently open screens. The checked name is the active logger. By clicking on another name, the user can change the active logger.

Cascade

The Cascade command arranges the various screens in cascade style.

Tile

The Tile command arranges the various screens in tiled style.

Arrange Icons

The Arrange Icons command arranges any minimized screens on the bottom of the window.

Fonts

The Fonts command enables the user to change the font name, font style, size and script used in the screens.

Help Menu

The Help menu enables the user to view the version information and help files which relate to the SW Diagnostics & Loggers utility.

Contents

The Contents opens the help files which describe the SW Diagnostics & Loggers utility and other IP Gateway ToolBox utilities.

How to Use Help

The How to Use Help explains to the user how the IP Gateway ToolBox help is used.

About

The About displays the version information for the SW Diagnostics & Loggers utility.

Advanced Features

The IP Gateway system includes several advanced features which are described below. These often require special setup and configuration procedures.

HealthCheck Mechanism

General

The IP Gateway system includes a HealthCheck mechanism which manages the MDLC connectivity to the sites. Associated with each site are two links, through which the site can be reached. A background Ping Pong mechanism in both the IP Gateway and the MOSCAD units constantly verifies which links are available. .

The HealthCheck mechanism uses the site table as the basis for its operations. As the IP Gateway identifies which links are available, it can reduce communication overhead by routing frames destined to sites through their operational links.

MDLC Infrastructure

MDLC provides a frame-sequence service for healthcheck mechanism. Specifically – a dedicated channel is allocated for this activity at both the RTU and the IP Gateway. All HealthCheck messages are transmitted and received through this channel. Being a frame-sequence channel, the healthcheck MDLC channel (Application ID 24) is both reliable and low-resource consumer at the same time.

The implementation a healthcheck protocol is user-defined. Thus – the MDLC provides a framework for two entities to maintain this mechanism but does not set any rules as to neither the data being communicated over this channel nor to timing and policy. For a healthcheck mechanism to operate properly, both the IP Gateway and RTU should have some protocol implemented over this infrastructure. Activation and deactivation of this infrastructure is done through site configuration (refer to MOSCAD site configuration/MOSCAD-L and IP Gateway site configuration).

Mechanism

In the IP Gateway, the HealthCheck mechanism relies on the MDLC infrastructure denoted above. Thus, once activated it captures the dedicated healthcheck channel provided by MDLC and uses the site table as a source for all sites to be managed. For each site the HealthCheck performs the following process:

Upon a predefined interval, it sends a Ping frame to each site, one through each of the site's links. It then expects to receive a Pong frame for each Ping sent. A Ping arriving from a certain site through a certain link, will set the communication status of that link to OK A site that possesses at least one link in OK status is considered reachable. This process, done in background, constantly monitors the status of each site's links, providing the IP Gateway with an updated status of all sites in the field.

In order to preserve system resources, the HealthCheck protocol is very minimal in terms of length of data and timing upon which it operates.

In the RTU, the HealthCheck mechanism relies on the MDLC infrastructure denoted above. It operates in slave mode. Thus, once a Ping frame arrives at the RTU, the RTU HealthCheck mechanism replies with an echo of that frame. The RTU transmits a Pong back to the

IP Gateway through the same link the Ping arrived. Unless being pinged, the RTU HealthCheck mechanism will not initiate any communication.

Disabled HealthCheck

When HealthCheck is disabled in the IP Gateway, the IP Gateway will assume that all sites registered in the site table are reachable. However – since SNMP proxy operation relies on HealthCheck, disabling this mechanism will disable any SNMP proxy operation (MCPS).

When HealthCheck is disabled in the RTU, the RTU MDLC stack will not allow the incoming of any HealthCheck messages. Instead, an automatic response indicating that HealthCheck application is blocked will be communicated back to the originator of an incoming ping frame. The IP Gateway HealthCheck, though, is capable of handling such cases by assuming the link is OK if such a response is received. However, the indications received from the HealthCheck mechanism may not be accurate, as the path the response traveled through cannot be determined.

HealthCheck Setup

Setting up the Site Table

The IP Gateway site-table should contain all the sites upon which the HealthCheck is requested to operate. Each site is associated with two links, one primary and one secondary. Additionally, each link is given a time parameter – Link validity interval. For each link, the HealthCheck mechanism uses the Link validity interval for calculating the time basis for the Ping-Pong mechanism to operate. Further – this parameter also determines the maximum time to wait for a Pong to arrive back at the IP Gateway before declaring a link to be in a failure condition. . .

When defining primary and secondary links, one should pay attention to the following:

- Primary and secondary links may be identical. In this case, the HealthCheck mechanism will assume the site possesses only one link and thus will not ping the same site twice.

- Primary and secondary links may not be identical. However in this case – the two paths to the site (one through each link) should not overlap any part of the route. If two different paths to the same RTU do indeed overlap part of the route, the indications received from the HealthCheck mechanism may not be accurate.

For more information, see the description of the IP Gateway Toolbox Site Table utility above.

Site Configuration

The IP Gateway HealthCheck mechanism is activated through IP Gateway Toolbox Site Configuration utility. In order to activate it,

1. Run the Site Configuration utility from the IP Gateway Toolbox.

2. Click on the Advanced tab in the workspace bar.

3. Open the Message Oriented Service advanced parameters screen.

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4. Set the 'Health-check application support' parameter to Yes.

By default, the HealthCheck mechanism is enabled. For more details refer to the Health-check (application) support parameter under Advanced Parameters in the Site Configuration chapter above.

The RTU HealthCheck mechanism is activated through MOSCAD Programming ToolBox Site Configuration utility. In order to activate it,

1. Run the Site Configuration utility from the MOSCAD Programming ToolBox.

2. Click on the Advanced tab in the workspace bar.

3. Open the Message Oriented Service advanced parameters screen.

4. Set the 'Health-check application support' parameter to Yes.

By default, the HealthCheck mechanism is enabled. For more details, refer to the Site Configuration chapter in the MOSCAD Programming ToolBox manual.

HealthCheck Diagnostics

Two sets of diagnostics are relevant to the HealthCheck mechanism, the IP Gateway site table and the HealthCheck device.

To retrieve the downloaded IP Gateway site table,

1. Run the SW Diagnostics & Loggers utility from the IP Gateway Toolbox.

2. Select device STBLA from the pull-down menu into the Device Name field in the Device toolbar or type in STBLA. If the Device toolbar is not shown, select it from the View menu.

3. Enter 2 in the Level field.

4. Click on the Start Communications button in the icon bar or select Start from the Loggers menu. The site table will be displayed in the output window.

The same diagnostics can be retrieved via the Web Server (See below.)

To retrieve the current HealthCheck status of each of the links for a site,

1. Run the SW Diagnostics & Loggers utility from the IP Gateway Toolbox.

2. Select device HELTHCH from the pull-down menu into the Device Name field in the Device toolbar or type in HELTHCH. If the Device toolbar is not shown, select it from the View menu.

3. Enter 1 in the Level field.

4. Click on the Start Communications button in the icon bar or select Start from the Loggers menu. The current HealthCheck status will be displayed in the output window.

The same diagnostics can be retrieved via the Web Server (See below.)

Adding Terminal Server Ports

General

The IP Gateway supports on board 4 ports for MDLC communication. In case more ports are required for MDLC communications external hardware is needed. The Standard hardware for Ports extensions is a Terminal Server.

The Terminal Server has an Ethernet port and many RS232 ports. It conveys communication traffic from IP to the RS232 ports and the other way around.

The IP Gateway establishes a connection to the Terminal Server over the LAN and establishes IP sessions for each RS232 port that's utilized for MDLC communication. The connection remains opened even if there is no data to transmit/receive. Every connection is associated with an IP address (of the Terminal Server) and a TCP port id (associated with the specific RS232 port in that specific Terminal Server).

IP Gateway is designed to support up to 32 ports connected to one or more Terminal Servers.

IP Gateway is designed to be able to communicate with any TCP\IP Terminal Server that is implemented over TELNET. The IP Gateway was tested with several Terminal Servers. In this book we will elaborate the use of Equinox Terminal Servers.

IP Gateway Site Configuration and Terminal Server configuration must be defined in order to support external Terminal Server ports.
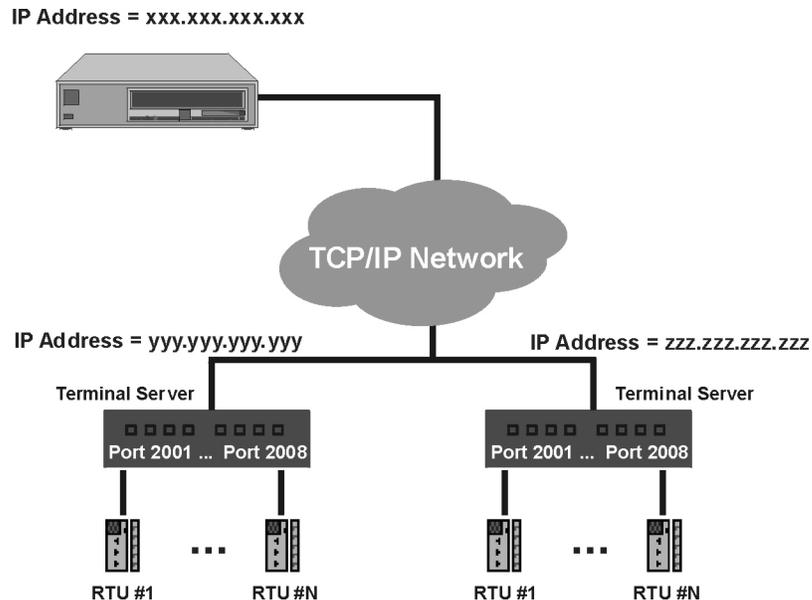
- The maximum number of ports connecting to RTUs in the network is 32.

- The IP Gateway can work with up to 32 Terminal Server IP addresses.

- Two RS232 ports can have the same TCP port ID only if they reside in different Terminal Servers.

Site Configuration for Terminal Server

In order for the IP Gateway to be able to work with Terminal Server the following configuration should be applied:

1. Click on the IP port tab in the IP Gateway Site Configuration.
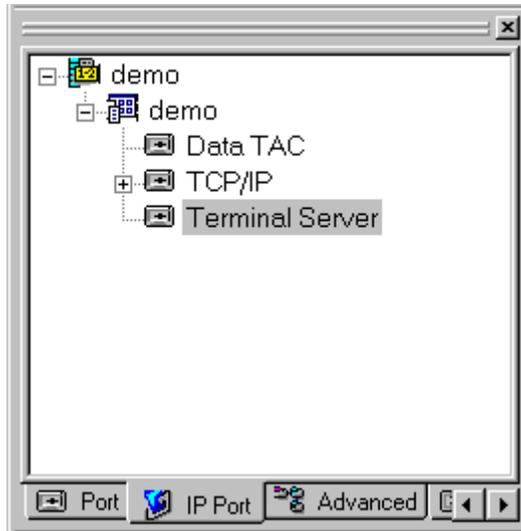
2. Right click on the Terminal Server and select 'Define'. The Ports Overview item will be displayed.

3. Double-click on the Ports Overview item. The Terminal Server Definition window will be displayed, as shown below.
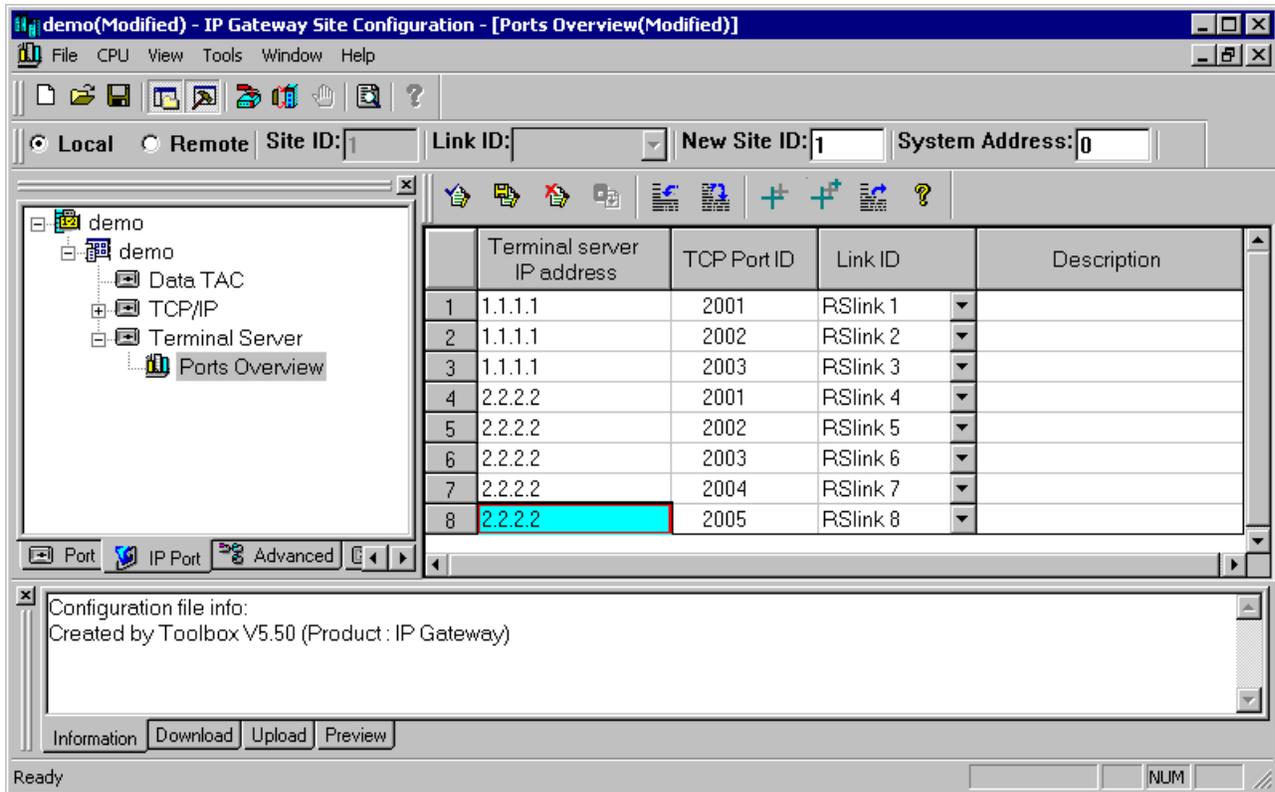
4. Define the Terminal Server ports. Every definition includes the Terminal Server IP address, the specific TCP port assignment for every physical port, and the MDLC link ID for that port.

5. Click on the 'Ok' button to save the Terminal Server ports.

Configuring Terminal Server to work with IP Gateway

Configuration

Configure the Terminal Server to meet the needs of TELNET TCP\IP based connection.

Assign an IP address to the Terminal Server, and define each port allocated to MDLC as a TELNET listener, or in some cases as a SERVICE with a unique TCP port ID.

Activate TELNET in a binary profile, and disable all control characters, TELNET commands and options.

Disable flow control, and do not log out of the port under any condition.

Applying the configuration will allow the IP gateway to establish connection with all of its Terminal Server ports right after power up, even if there are no RTUs attached to them.

The following sections contain a configuration example for the Equinox Terminal Server. However, following the guidelines described in this section should enable configuring every Terminal Server.

Wiring

The 8-pin connector used by the Terminal Server contains all necessary RS232 signals, but in a non standard format, Each user might output them in different pins. In most cases there is a need for an adapter, so that signals coming from the Terminal Server will be in the pins they are expected to be in.

The wiring description for the Equinox Terminal Server is described below.

Example: EQUINOX ELS16 Terminal Server Wiring and Configuration

General

The EQUINOX ELS16 is a 16 port Terminal Server.

1. Plug the machine to a 220v AC. The machine will perform a Self Boot Process, which takes about 15 seconds. While booting up, the LEDs in the front panel will blink. When Self Boot Process finishes, the READY led should be the only one lit.

   The default console port is 1.

2. Attach a terminal (or a terminal emulator) to port 1, with a cable wired as described in the next section. The terminal should be configured as follows:

Input	=	9600bps
Output	=	9600bps
Stop Bits	=	1
Character Size	=	8
Parity	=	NONE

Wiring

Wiring PC to Terminal Server

For a PC HyperTerminal connection, use the Standard Connector and cable to connect the PC 'COM1' to the Serial port of the Terminal Server. No other adapters are needed.

Wiring a MOSCAD to EQUINOX ELS-16 Using a Cable

The pins in the ELS16 ports are numbered from the right to the left. The rightmost pin is the first one, and the left most is the eighth.)

The numbering of the 8 pin connectors follows the MOSCAD convention.

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MOSCAD 8 Pin Connector RJ 45 Connector	EQUINOX 8 Pin Connector RJ 45 connector
1 (TXD)	6 (RxD)
2 (RXD)	4 (TxD)
3 (CTS)	7 (DTR)
4 (GND)	3 (GND)
5 (CD)	8 (RTS)
6 (RTS)	2 (DCD)
(*) 7 (12V)	N.C
8 (DTR)	1 (CTS)

Configuration

General notes:

- The commands to be entered were given under the assumption that the ELS16 is performing a 'self boot'. In case of a boot server, please refer to EQUINOX documentation.

- Commands can be typed in lower case or in upper case letters.

- After each command, press the <Return>key. If the command was entered legally, then ELS16 prompts: "Local>"

- N represents a port number. It can be any number in the range of 1 to16

- t represents a value in seconds between 10 and 180

- a and m represents a number in the range of 0..255

- SOCKET_NUMBER represent a TCP socket. Each port must have a deferent TCP socket number, which must be greater than 2001 or equal.

- SERVICE_NAME is a string given to a service as its' name.

- The first command to be entered will allow the user access to EQUINOX configuration. The default password is SYSTEM.

After attaching a console terminal (usually at port 1), type in the following commands.

SET PRIV < return>

SYSTEM   <return>

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CHANGE SERVER SUBNET MASK m.m.m.m

CHANGE SERVER IP a.a.a.a

CHANGE SERVER GATEWAY IP a.a.a.a NETWORK a.a.a

CHANGE SERVER TCPIP KEEPALIVE TIMER t

DEFINE SERVICE LOCAL "SERVICE_NAME" SOCKET_NUMBER PORTS N ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE PORT N ACCESS REMOTE

DEFINE PORT N CHARACTER 8

DEFINE PORT N PARITY NONE

DEFINE PORT N FLOW DIS

DEFINE PORT N AUTOCONNECT DIS

DEFINE PORT N BACKWARDS SWITCH NONE

DEFINE PORT N BREAK DIS

DEFINE PORT N BROADCAST DIS

DEFINE PORT N DEDICATED SERVICE NONE

DEFINE PORT N DEFAULT PROTOCOL TELNET

DEFINE PORT N DEVICE DATAONLY

DEFINE PORT N INACTIVITY LOGOUT DIS

DEFINE PORT N INTERRUPTS DIS

DEFINE PORT N SESSION LIMIT 1

CHANGE PORT N TELNET AO NONE

CHANGE PORT N TELNET AYT NONE

CHANGE PORT N TELNET BRK NONE

CHANGE PORT N TELNET EC NONE

CHANGE PORT N TELNET EL NONE

CHANGE PORT N TELNET GA NONE

CHANGE PORT N TELNET IP NONE

CHANGE PORT N TELNET SYN NONE

CHANGE PORT N TELNET ICRLF ENABLED

CHANGE PORT N TELNET OCRLF ENABLED

CHANGE PORT N TELNET VERBOSE DIS

CHANGE PORT N TELNET BINARY WILL BINARY DO

CHANGE PORT N TELNET ECHO WONT ECHO DONT

CHANGE PORT N TELNET SUPPRESS WILL SUPPRESS DO

INIT

At this point, the ELS16 will reboot itself. The 'self boot' process will take about 15 seconds.

Example: Setting 14 Ports (port 3 to 16) of ELS16 to the IP Gateway:

Terminal Server definition

Type in the following commands:

DEFINE PORT 3-16 AUTOCONNECT DIS

DEFINE PORT 3-16 ACCESS REMOTE

DEFINE PORT 3-16 CHARACTER 8

DEFINE PORT 3-16 PARITY NONE

DEFINE PORT 3-16 FLOW DIS

DEFINE PORT 3-16 BACKWARDS SWITCH NONE

DEFINE PORT 3-16 BREAK DIS

DEFINE PORT 3-16 BROADCAST DIS

DEFINE PORT 3-16 DEDICATED SERVICE NONE

DEFINE PORT 3-16 DEFAULT PROTOCOL TELNET

DEFINE PORT 3-16 DEVICE DATAONLY

DEFINE PORT 3-16 INACTIVITY LOGOUT DIS

DEFINE PORT 3-16 INTERRUPTS DIS

DEFINE PORT 3-16 SESSION LIMIT 1

DEFINE PORT 3-16 TELNET AO NONE

DEFINE PORT 3-16 TELNET AYT NONE

DEFINE PORT 3-16 TELNET BRK NONE

DEFINE PORT 3-16 TELNET EC NONE

DEFINE PORT 3-16 TELNET EL NONE

DEFINE PORT 3-16 TELNET GA NONE

DEFINE PORT 3-16 TELNET IP NONE

DEFINE PORT 3-16 TELNET SYN NONE

DEFINE PORT 3-16 TELNET ICRLF ENABLED

DEFINE PORT 3-16 TELNET OCRLF ENABLED

DEFINE PORT 3-16 TELNET VERBOSE DIS

DEFINE PORT 3-16 TELNET BINARY WILL BINARY DO

DEFINE PORT 3-16 TELNET ECHO WONT ECHO DONT

DEFINE PORT 3-16 TELNET SUPPRESS WILL SUPPRESS DO

DEFINE SERVICE LOCAL PORT3 3003 PORT 3 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT4 3004 PORT 4 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT5 3005 PORT 5 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT6 3006 PORT 6 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT7 3007 PORT 7 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT8 3008 PORT 8 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT9 3009 PORT 9 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT10 3010 PORT 10 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT11 3011 PORT 11 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT12 3012 PORT 12 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT13 3013 PORT 13 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT14 3014 PORT 14 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT15 3015 PORT 15 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVICE LOCAL PORT16 3016 PORT 16 ENABLED CONNECTIONS ENABLED TELNET ENABLED

DEFINE SERVER IP 155.155.155.155

DEFINE SERVER SUBNET 255.255.0.0

DEFINE SERVER GATEWAY NONE

DEFINE SERVER TCPIP KEEPALIVE TIMER 120

INIT

IP Gateway definition

The Site Configuration for this setting is shown below:

IP Gateway Redundancy

A redundant IP Gateway can be configured to minimize the risk of a SCADA control center losing contact with sites, and to ensure high availability for its applications. Two IP Gateways are set up with similar configurations, except that one is designated as the primary and the other is designated as the secondary. When the primary IP Gateway becomes unavailable, the secondary (similarly configured) IP Gateway takes over. To increase the availability of the LAN network, dual Ethernet segments can be used, and each IP Gateway can be connected to a different segment.

When the IP Gateway is configured for redundancy, the NFM application will not operate.

Initially, the IP Gateway Redundancy Mode is set to 'Secondary'. In this state:

- The IP Gateway does not ack any frame received by the MDLC communication (except local connection).

- The requests queued in the IP Gateway will return errors once activated. (In most cases this will be immediately. However, in some cases it could take as long as the longest MDLC session timeout defined.)

- The IP Gateway disconnects from all the Terminal Server ports defined in the Site Configuration.

The SCADA driver is responsible for changing the IP Gateway Redundancy Mode to 'Primary'. In this state, the IP Gateway communicates properly over MDLC communication and over the SCADA channels.

When the IP Gateway is configured for redundancy, it checks each of the channels to the unit. If all the channels to the unit are disconnected or unavailable, the unit automatically switches to 'Secondary' mode.

When the SCADA establishes connections to the IP Gateway, it should change the redundancy mode of the IP Gateway to 'Primary'. Only one IP Gateway should be in 'Primary' mode at any time. 'Primary' mode of the IP Gateway allows bi-directional transfer of both SCADA application messages and IP Gateway management messages. 'Secondary' mode allows transferring of IP Gateway management messages only. (It does not send or receive any MDLC messages, since it is logically disconnected from the link.)

Redundant IP Gateway Configurations

There are several possible options for Redundant IP Gateway system configuration:

1. Both IP Gateways are connected to the MOSCAD system over the same many-to-many media (i.e. RS485/Radio). In this configuration, when the secondary IP Gateway becomes primary, the IP Gateway's mode changes take effect immediately.

2. Both IP Gateways are connected to the MOSCAD system over the same Terminal Sessions. In this configuration, the 'old primary' IP Gateway must close all of the Terminal Server connections, the terminal server must end its sessions with the 'old primary' IP Gateway and

then the 'new primary' IP Gateway must establish connection with the Terminal server. In this configuration, several minutes may elapse before the IP Gateway's mode changes take effect.

3. Both IP Gateways are connected to the MOSCAD system over an IP network. Using this configuration, the IP Gateway's mode change takes effect immediately for requests going from the IP Gateway to the RTUs. The SCADA should initiate a communication to the RTU through the 'new' primary IP Gateway in order for the RTU being able to send Bursts to it.

Site Configuration

The IP Gateway is configured for redundancy through the IP Gateway Toolbox Site Configuration utility.

To set up the site configuration,

1. Run the Site Configuration utility from the IP Gateway Toolbox.

2. Click on the SCADA tab in the workspace bar.

3. Under General System settings, set the 'Startup mode' parameter for the primary IP Gateway to 'Redundant GW1'.

4. Save the site configuration file and download it to the primary IP Gateway.

5. Under General System settings, set the 'Startup mode' parameter for the secondary IP Gateway to 'Redundant GW2'.

6. Make sure that the Site ID of the secondary IP Gateway is identical to the Site ID of the primary IP Gateway.

7. Save the site configuration file and download it to the secondary IP Gateway.

IP Gateway Web Operation

General

The IP Gateway, version 4.0 and higher, includes a built-in Web Server. The Web server enables users to perform certain Toolbox operations and to convey site information to and from the technicians, regardless of where they are located, over the World Wide Web.

Equipment technicians can verify functionality of their equipment and to receive information about the status of similar or related equipment in other sites. MOSCAD technicians can gather information about faults at the site and to download IP interface systems.

In the Web Server, the site layout is presented as an array of maps that reflect the site hierarchy and denote the type of device or object using different graphic icons. Faults are displayed visually, and the technician can easily access fault information as well as site, device and object properties.

Using the Web Server, technicians can remotely:

- Monitor all devices in the site.

- Retrieve events and alarms from the NFM RTU buffer.

- Configure SNMP settings online.

- Download IP System Firmware.

- Perform online site IP diagnostics.

- Define three access password levels for security.

The MOSCAD tools on the Web Server (SW Diagnostics & Loggers, SNMP Configurator, Downloader for upgrading system software) are identical to the tools with the same names in the IP Gateway Toolbox

For detailed descriptions of the tools, see the relevant sections of the *IP Gateway Toolbox* documentation above.

Site Map

The Site Map displays a set of icons, which represent sites, devices in the site or objects under the device. The name of the item appears beneath the icon. The color of the icon frame indicates the severity of events related to that object, or to an object nested under a site or device.

When you move the mouse over the icon, you are presented with item properties such as ID, severity, software version, last site build, etc. (depending on the type of item).

To go down in the hierarchy: in the map, click any item (site or device) to open view of all components under that item. To go up in the hierarchy: click the relevant part of the PATH in the upper left corner of the screen.

The TIPS box provides useful, context-sensitive tips for using the Web Server.

The LEGEND box explains the object types and fault severity levels.

The Search function enables the user to search for items within the current view level.

The Sort function enables the user to sort all items within the current view level according to Severity or ID (name). Sites can also be sorted according to MOSCAD State.

An Event Log lists all NFM RTU events, regardless of your location in the site map. Events appear in chronological order with the most recent alarm at the bottom of the list. Events include all bursts sent out from the site, such as equipment and environmental alarms, status changes, link up or down etc.

Security

The Web Server is password-protected to restrict access to the system to authorized personnel.

For each IP address there are three security levels, each with a different password: Read-Only, Read&Configure or Read&Permits.

Typically, equipment technicians have Read-Only rights, MOSCAD technicians have Read&Configure rights, and the Web Server Administrator has Read&Permits rights.

All security levels enable viewing the site maps, properties, the Event Log, and the MOSCAD Tools: Error Logger and Software Diagnostics.

Accessing the Web Server

1. Connect the host computer to the IP network with IP route to the IP Gateway.

2. Open a web browser (Internet Explorer or Netscape Navigator) and enter the IP Gateway URL address. An Entry Page similar to the one pictured below will be displayed.
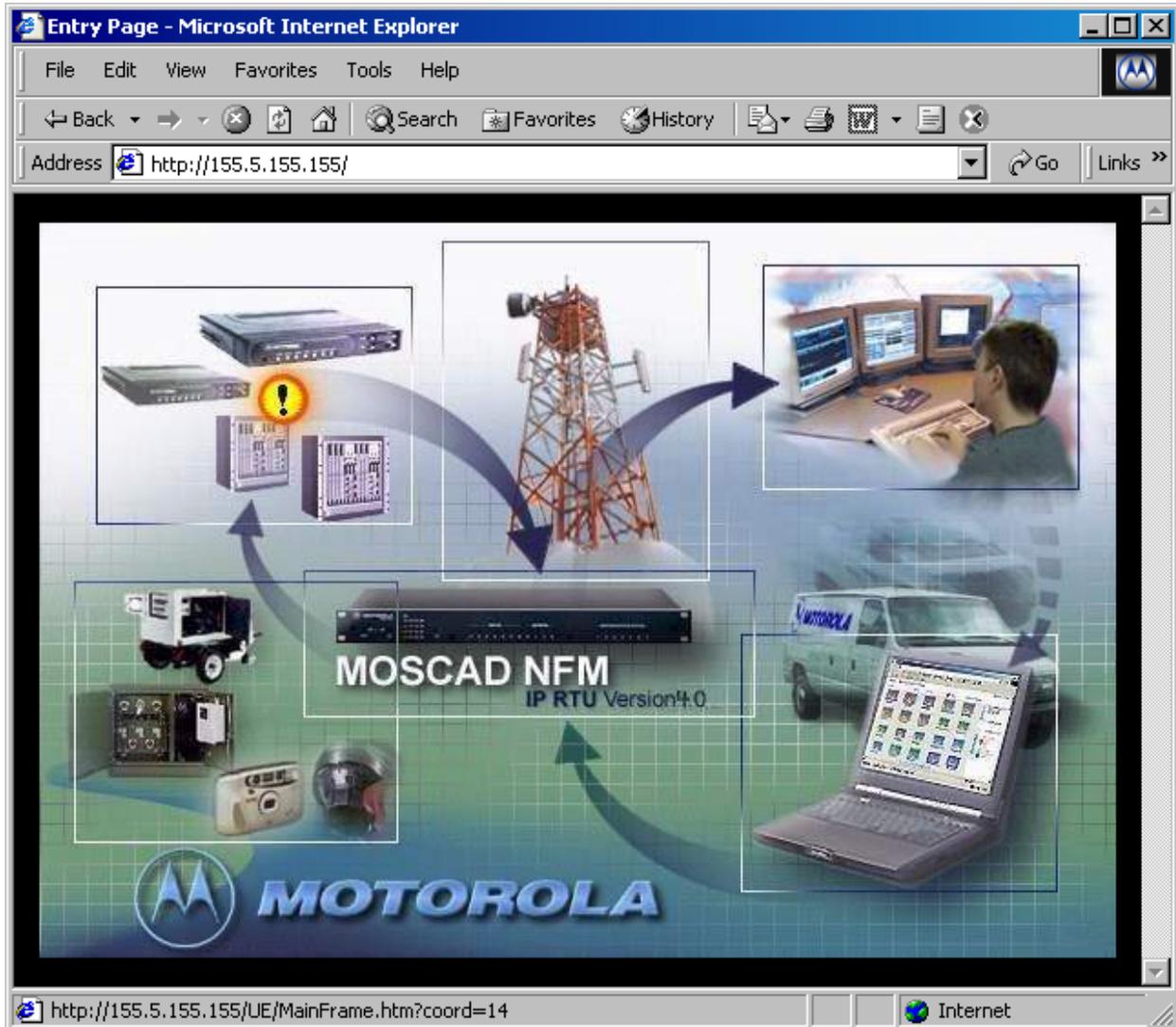
3. Click on the picture and the user logon dialog will be displayed, as shown below.

4. Log in to the system, with the default username 'User' and the password 'moscad'. Note that the default authentications can be changed. See the Web Server Administrator Tools section of the MOSCAD NFM Web Server 4.0 User Guide for details. A graphic desktop similar to the one pictured below will be displayed.
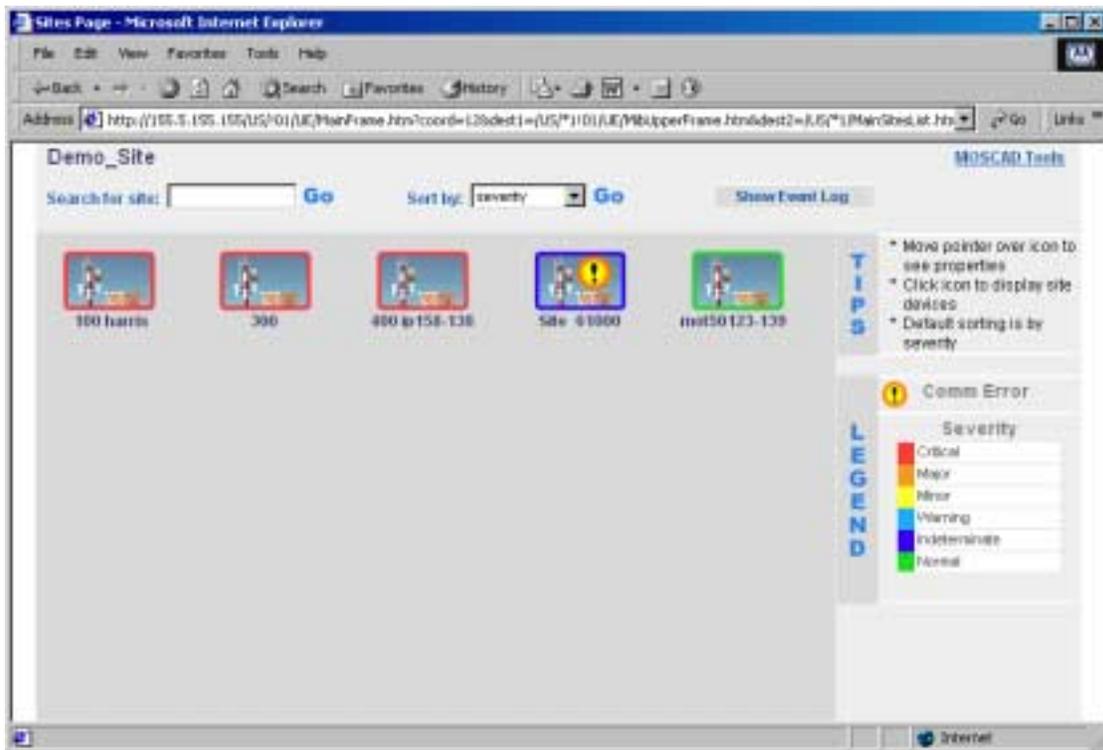
Note that the main screen can differ from system to system.

5. To run a Toolbox utility, click on the MOSCAD Tools link. Links to several MOSCAD tools will be displayed. Choose the desired link.

The Tools

Downloading System Software using the Web Server

The Web server enables the user to upgrade system firmware remotely, over the web.

Before upgrading the IP Gateway firmware, verify that the new firmware version is not higher than the IP Gateway Site Configuration version. (If the configuration version is unknown, upload it using the IP Gateway Site Configuration utility.)

If the IP Gateway's Site Configuration version is lower than the new upgraded firmware version, it should be upgraded and downloaded using a Site Configuration utility with a higher version than the new firmware version.

Make sure that the IP Gateway's Web server should be running. The Web server should work as long as the IP Gateway is up and running with the assigned IP address (assigned by IP Gateway Site Configuration).

Make sure that the host computer used to download the IP Gateway system firmware is connected to the same IP network as the IP gateway and has IP (HTTP) connectivity.

To download the new system firmware, do the following:

1. Follow the instructions under the *Accessing the Web Server* section above.

2. Click on the System Download link from the list of MOSCAD Tools. The following screen will be displayed.
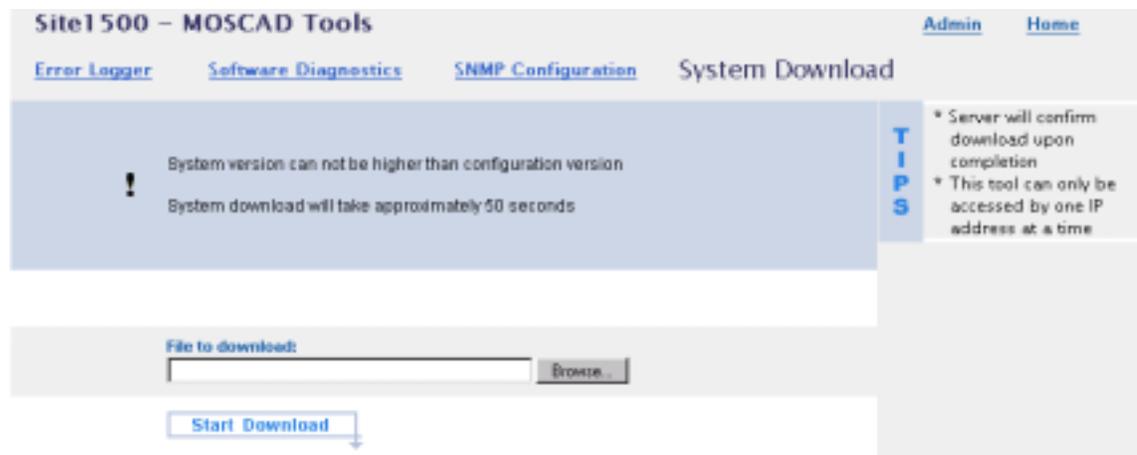
3. Use the Browse button to select the .krl file which contains the new version of the MOSCAD IP Gateway firmware.

4. Click on the 'Start Download' button. The download will take approximately one minute.

The firmware will be downloaded to the IP Gateway. After successful validation of the firmware, the following screen will be displayed and the IP Gateway will restart (after a short delay of approximately 30 seconds).

Note: Do not confuse IP Gateway firmware files and IP Interface firmware files. IP Gateway files are named ipgw_xxx.bin and IP Interface files are named ipp_xxx.bin.

In case of firmware mismatch an error screen will be displayed.

Retrieving Errors using the Web Server

The Web server enables the user to retrieve error information (hardware or software malfunctions) from any IP Gateway remotely, over the web.

To read errors from the IP Gateway, do the following:

1. Follow the instructions under the *Accessing the Web Server* section above.

2. Click on the <u>Error Logger</u> link from the list of MOSCAD Tools. The following screen will be displayed.
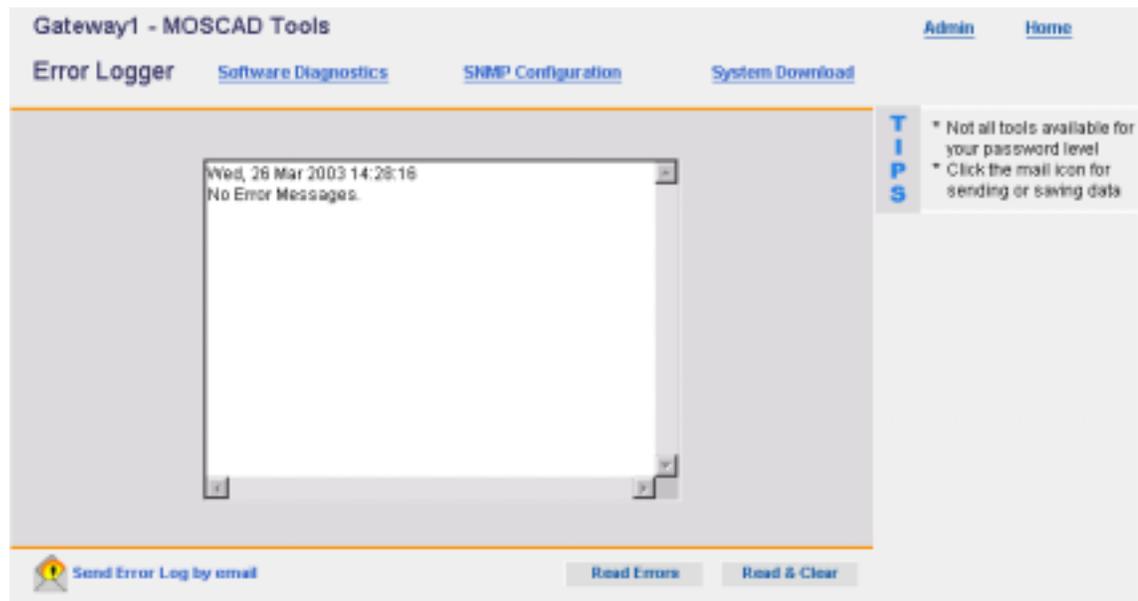
3. To retrieve the errors from the site, click on the Read Errors button. To retrieve the errors from the site and clear the logger messages, click on the Read & Clear button. The errors will be displayed in the message area of the window.

4. To send the Error Logger messages from the screen via email, click on the Send Error Log by Email icon in the bottom left-hand corner of the screen. A new mail message will be opened in the PC's mail program and all errors retrieved from the site in the last session will be copied to the body of the message. Type in the destination address and send the message.

For a full description of the IP Gateway Toolbox Error Logger, see the *SW Diagnostics & Loggers* section above. For a full list of the Error Logger messages, see the *Error Messages* section below.

Retrieving Software Diagnostics using the Web Server

The Software Diagnostics program allows access to each of the modules (or "devices") that handle the various tasks of the MOSCAD RTU according to their logical names. The Software Diagnostics program provides reports on the status of each device at different levels of breakdown. It also provides historical and statistical data on the device activities. The Software Diagnostics data is useful for system maintenance, problem identification for remote services and statistics data on the communication system performance. The Web server enables the user to retrieve software diagnostics from the IP Gateway remotely, over the web.

To read software diagnostics from the IP Gateway, do the following:

1. Follow the instructions under the *Accessing the Web Server* section above.

2. Click on the <u>Software Diagnostics</u> link from the list of MOSCAD Tools. The following screen will be displayed.
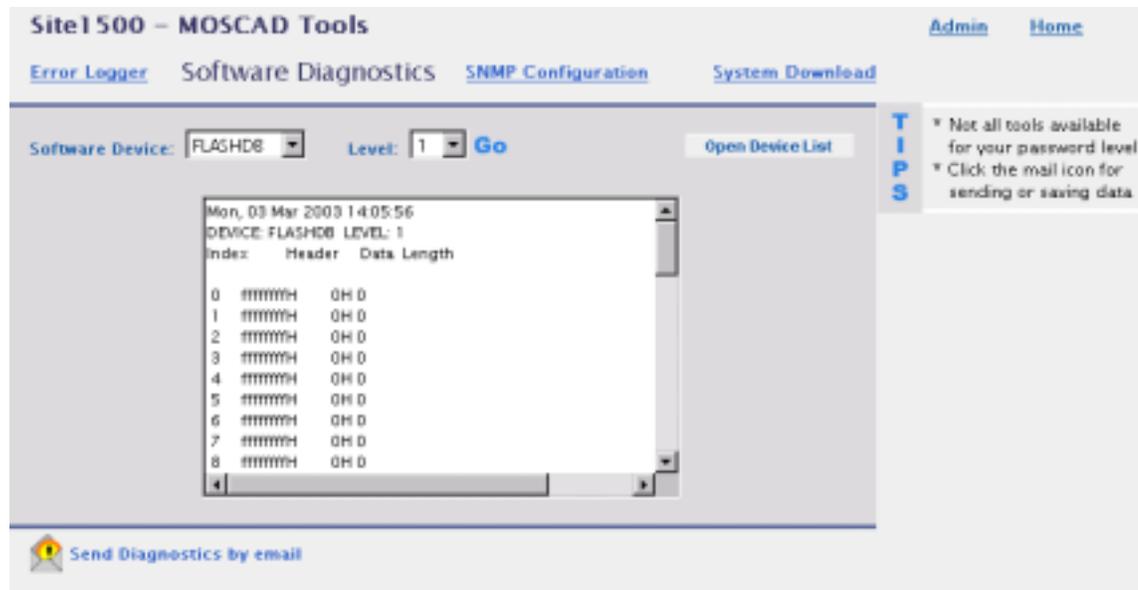
3. Select the device name from the Device pull-down menu. If the device name does not appear on the list, click on the Open Device List button. This retrieves the full list of devices from the site.

4. Next enter the Level at which the diagnostics will be performed. All devices in the system have a level of request, starting from Level 0. Level 10 gets the data and resets all

counters. Level 11 gets the data without resetting the counters. For details on the devices and levels, see the *Software Diagnostics Output* section below.

5. To retrieve the diagnostics from the site, click on the GO button. The diagnostic messages will be displayed in the message area of the window.

6. To send the software diagnostics from the screen via email, click on the Send Diagnostics by Email icon in the bottom left-hand corner of the screen. A new mail message will be opened in the PC's mail program and all diagnostics retrieved from the site in the last session will be copied to the body of the message. Type in the destination address and send the message.

For more information on the IP Gateway ToolBox Software Diagnostics, see the *SW Diagnostics & Loggers* section above. For a detailed list of software diagnostic messages, see the *Software Diagnostics Output* section below.

Setting SNMP Configuration using the Web Server

The Web server enables the user to define SNMP and Motorola SSC parameters for the IP Gateway remotely, over the web.

To set the SNMP Configuration for the IP Gateway, do the following:

1. Follow the instructions under the *Accessing the Web Server* section above.

2. Click on the <u>SNMP Configuration</u> link from the list of MOSCAD Tools. The following screen will be displayed.

3. Enter values for each field, as described in the *SNMP Configurator* section above.

4. To download the SNMP configuration to the site, click on the Set Configuration button.

5. To refresh the data received from the sites in the internal IP Gateway cache, click on the Reload button.

6-25

For more information on the IP Gateway ToolBox SNMP Configurator, see the *SNMP Configurator* section above.

Sending Email to the Web Server Administrator

To send an email message to the Web Server system administrator, click on the Admin icon in the upper right-hand corner of the screen. A new mail message will be opened in the PC's mail program. Type in the message and send.

IP Gateway Telnet Application

General

The Telnet protocol is a standard protocol that provides virtual terminal communication, passing data from a remote Telnet host to the IP Gateway Telnet application.

In NFM systems, the IP Gateway Telnet application allows authorized users to access any communication devices that support an interactive interface.

Authorized users can establish connections with the IP Gateway from a Telnet window from any workstation (PC, UNIX, etc.) by using the IP Gateway Telnet Shell (user interface), to establish interactive session(s) with end devices.

The following figure shows the data passing from the Telnet hosts to the end devices.

Telnet User Interface

The IP Gateway Telnet Shell provides the following functionality:

- Telnet application administration - including password handling, adding and deleting new users, displaying a list of users and active sessions, etc.

- Listing the sites and network elements in the system.

- Performing terminal emulation to a network element device.

The IP Gateway Telnet interface supports multiple window sessions simultaneously, thus allowing parallel connection to the IP Gateway from different computers by different users.

The IP Gateway Telnet Shell is case sensitive.

The IP Gateway is organized hierarchically; zones contains sites which contain devices.

Connecting to the IP Gateway

To connect to the IP Gateway, perform the following steps on your host computer:

Type: **telnet <IP Gateway IP Address>**

At the Login prompt, enter your **<login name>.**
At the Password prompt, enter your **<password>.**

At the first startup, the only valid login name is root (generally the name of the superuser or system administrator.) The password for the superuser for the first startup is the existing MDLC password of the IP Gateway.

Upon entering the IP Gateway shell, the prompt becomes **Gateway_Name>** .

Telnet Command Summary

Command Format	Description
adduser \<username\>	Adds a user to the list of valid IP Gateway users. Enter the superuser password at the prompt. If the password is valid, the IP Gateway prompts for the initial password for the new user. At the prompt, confirm the initial password for the new user. The new user name and password are saved in the IP Gateway. If the superuser password entered is not valid, the IP Gateway prompts for the superuser password again. This command can be performed by the superuser (admin) only.
rmvuser \<username\>	Removes a user from the list of valid IP Gateway users. Enter the superuser password at the prompt. If the password is valid, the user name and password are removed from the IP Gateway. If not, the IP Gateway prompts for the superuser password. This command can be performed by the superuser (admin) only.
help **help \<command\>**	Displays the list of telnet commands. Describes the specified command.
who	Displays the list of Telnet sessions and the names of users who are currently logged on, including the corresponding terminal emulation (TE) connection (e.g. SC_01/Quantar0) and TE channel ID (e.g. 1245). ***** under a TE connection signifies that the terminal emulation is not active for this window. (*) indicates that the current Telnet session is marked. If TE is performed, the name of the site/device are displayed in the TE connection column. If the entry in the TE connection column is of the form: **/s=n1, /l=n2, /p=n3, /m=n4 | N/A**, this indicates that the connect command was activated with the '/s=n1, /l=n2, /p=n3, /m=n4' or with the '/s=n1, /l=n2, /p=n3' parameters option. This indicates that terminal emulation is performed to a device that is connected to an Element Management Unit (EMU) with the following specifications:

Command Format	Description
	Site ID of EMU = n1 Link ID of EMU = n2 Port ID of EMU = n3 Port mux # = n3 | N/A where n1, n2, n3, n4 are numbers.
whoami	Displays the login name used in the current telnet session.
users	Displays the list of valid IP Gateway users.
passwd	Changes the password of the current telnet user. 1. At the prompt, enter the current password. 2. Enter the new password. 3. Confirm the new password. All users, including the superuser, may perform the passwd command.
cd **cd <site_name>** **cd <device_name>** **cd /** **cd ..**	Changes directory to the site or device level. Takes you to the site level. The prompt changes to **Gateway_Name/site_name>** . This command may be activated at the zone level. Takes you from the site level to the device level. The prompt changes to **Gateway_Name/site_name/device_name>** . This command may be activated at the site level. Takes you to the zone level. The prompt changes to **Gateway_Name>** . This command may be activated at both the site and device levels. Takes you back to the previous level. The prompt changes (e.g. from **Gateway_Name/site_name/device_name>** to **Gateway_Name/site_name>** . This command may be activated at both the site and device levels.
dir	Displays the site list or the device list of a site and may be activated from the site or device level. **dir** (at site level) lists all sites in a zone. (Site Name, Site ID) **dir** (at device level) lists all devices in a site.(Device Name, CPU ID, Port ID, Mux Port #) **dir /t=<NE type name>** lists all devices of the specified type in a site.(Device Name, CPU ID, Port ID, Mux Port #)

Command Format	Description
parms all	Displays or changes the IP Gateway Telnet application configurable parameters.

parms	Lists the Telnet and terminal emulation configuration parameters one by one. CR on input shows the next parameter. Any other input resets (changes) the parameter.
	
	   Inactivity timeout (msec) = 300000
	
	   Max transmission delay (msec) = 300000
	
	   Terminal emulation break character (ascii) = 03
	
	   Inactivity timeout in msec – maximum activity timeout to close the Telnet or terminal emulation session.
	
	   Max transmission delay in msec – maximum delay of buffering.
	
	   Terminal emulation break character in ascii – the character to break the terminal emulation.

connect	Connects to a device and performs remote terminal emulation. This form of connection may be accomplished from the device level only.
connect /s=\<site id\> /l=\<link id\> /p=\<port id\> {/m=\<mux port#\>}	Connects to a device specified by \<site ID of EMU\>, \<link ID of EMU\>, \<port ID of EMU\>, \<mux port # of device\> and performs terminal emulation to a device. The mux port # is only specified when applicable. This command may be useful when the name of the device is not known or when there are multiple devices with the same name within the site. This form of connection may be activated at any level.
quit	Quits the Telnet session.

Example Output

The chart below depicts a list of users and sessions which might be displayed by the **who** command.

Gateway Name	User Name	TE Connection	TE Channel
	Bill	******	*****
	George	(*) ******	*****
	Paul	SC_01/Quantar0	1245
	George	******	*****
	Mike	SC_01/Quantar1	1246
	Jim	SC_02/Quantar2	1247
	Bob	******	*****
	Charles	s=1, l=2, p=3, m=N/A	*****
	Charles	s=2, l=2, p=3, m=1	*****

The chart below depicts a list of devices in a site which might be displayed by the **dir** command.

Device Name	CPU ID	Port ID	Mux Port #
Quantar01	2	1	1
Quantar02	3	1	1
Cal. Microwave01	4	1	N/A

APPENDIX A:
RS232 Adapter Cables

This appendix provides the information required for connecting an RTU RS232 port to various units, as detailed below:

- Connection to a computer/terminal (MDLC protocol or User Port)
- Connection to a modem (MDLC protocol or User Port)
- Connection to a radio (MDLC protocol)
- RTU-to-RTU connection using MDLC protocol through RS232 ports (RS-Link)

Connection to a Computer or Terminal

To connect one of the RTU RS232 Ports to a computer/terminal, you should use the FLN6457 adapter, which ends with the <u>female</u> 25-pin or 9-pin, D-type connector. The port may be defined either as a MDLC protocol port or as a User Port.

The signals that appear on the <u>female</u> 25-pin or 9-pin D-type connector are according to the RS232 standard – see the following table. In this case, the RTU serves as DCE (Data Communication Equipment).

RS232 Function	8-pin Connector (on RTU)	25-pin Female	9-pin <u>Female</u>	Direction
TX-DATA	2 ←	2	3	from DTE
RX-DATA	1 →	3	2	to DTE
RTS	5 ←	4	7	from DTE
CTS	8 →	5	8	to DTE
DSR	7 →	6	6	to DTE
GND	4	7	5	-
DTR	3 ←	20	4	from DTE
DCD (Rec line)	6 →	8	1	to DTE

To extend the cable, you may use any extension cable with male and female D-type connectors (connected pin-to-pin, not crossed).

Note: When a User Port is defined as Computer/Terminal with DTR support:

1) The RTU will not transmit unless it receives DTR=ON from the computer/terminal.

2) The RTU will not receive unless it receives RTS=ON from the computer/terminal.

Connection to a Modem

To connect one of the RTU RS232 Ports to a Modem, you should use the FLN6458 adapter, which ends with the <u>male</u> 25-pin or 9-pin D-type connector. The port may be defined either as a MDLC protocol port or as a User Port.

The signals that appear on the <u>male</u> 25-pin, or 9-pin D-type connector are according to the RS232 standard – see the following table. In this case, the RTU serves as DTE (Data Terminal Equipment).

RS232 Function	8-pin Connector (on RTU)	25-pin Male	9-pin Male	Direction
TX-DATA	1 →	2	3	from RTU
RX-DATA	2 ←	3	2	to RTU
RTS	6 →	4	7	from RTU
CTS	3 ←	5	8	to RTU
GND	4	7	5	-
DTR	8 →	20	4	from RTU
DCD (Rec line)	5 ←	8	1	to RTU

To extend the cable, you may use any extension cable with male and female D-type connectors (connected pin-to-pin, not crossed).

Before transmitting, the RTU sends RTS=ON to the modem, and waits for CTS=ON from the modem as a condition for transmitting.

The RTU will receive data from the modem <u>only</u> when DCD=ON.

When using a modem in auto-answer mode (connected to a Computer port) for remote service, the RTU does not support RTS/CTS protocol since the port is designated to operate with a local computer as well as with a modem.

Connection to a Radio

Note: On all of the Motorola RJ45 connector heads, the numbering of the pins is different than the standard, as shown in the figure below. Pin 1-8 are left to right rather than right to left, as shown below. Therefore, only original Motorola cables should be used.
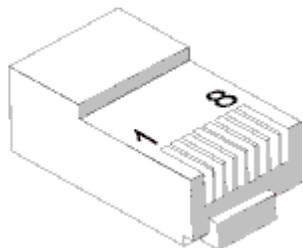
Connection to VRM650/VRM660 radio

To connect the RTU (via Port 2 or Port 3) to a VRM650/VRM660 radio, you should use the FKN4895A adapter, which ends with the <u>male</u> 9-pin, D-type connector. The port should be defined as **RS232, Async, External Modem, RD-LAP, RTU (LineX)**.

RS232 Function	8-pin Connector (on RTU)	9-pin Male	Direction
TX-DATA	1 →	3	from RTU
RX-DATA	2 ←	2	to RTU
CTS	3 ←	8	to RTU
GND	4	5	-
CD (Rec line)	5 ←	1	to RTU
RTS	6 →	7	from RTU
DTR	8 →	4	from RTU

Connection to Conventional Astro radio

To connect the RTU (via Port 2 or Port 3) to a Conventional Astro radio, you should use the FKN4905A adapter, which ends with the <u>male</u> 15-pin, D-type connector. The port should be defined as **RS-232, Async, SLIP, ASTRO SPECTRA, MDLC over IP**.

RS232 Function	8-pin Connector (on RTU)	15-pin Male	Direction
TX-DATA	1 →	13	from RTU
RX-DATA	2 ←	11	to RTU
CTS	3 ←	1	to RTU
GND	4	8 RADIO_GND/ EMERGENCY	-
DTR	8 →	15	from RTU

Optional Function	Description	15-pin Male
SPKR+	SPKR+	6
SPKR-	SPKR-	7
SWB+	Shrink Tube (Ext. +12V DC)	4

RTU-to-RTU Connection Using MDLC Protocol through RS232

To establish a link between two RTUs using MDLC protocol, the ports of both RTUs should be defined as RS232 **RTU-to-RTU** (RS-Link). The ports of the two RTUs should be connected by the FLN6457 **and** FLN6458 adapters, when the adapters are connected.

> **! IMPORTANT**
>
> Do not connect between RTUs without the adapter cables. A direct connection will cause a short circuit between the pins that have the same function.

RTU-to-RTU Synchronous Communication Using Port 3, 4

The pin assignment of the cable to be used for RTU-to-RTU synchronous communication (using Port 3, 4) is given below.
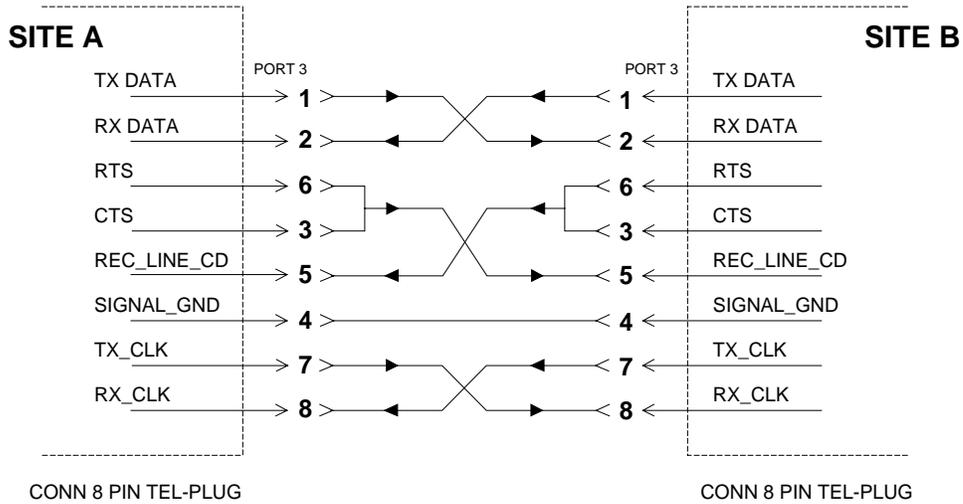
APPENDIX B:
Remote ToolBox Modem Setup

Hayes ACCURA 144 + FAX 144

Modem   **Hayes ACCURA 144 + FAX 144**
Type   External
Model   5611US
Version   2.20E

Configuration (9600 Baud)

at&v
ACTIVE PROFILE:
B0 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D0 &G0 &J0 &K0 &Q6 &R1 &S0 &T5 &X0 &Y0
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:050 S08:002 S09:006
S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S36:007 S37:009 S38:020 S44:020
S46:136 S48:007 S95:000

STORED PROFILE 0:
B0 E1 L1 M1 N0 Q0 T V1 W0 X4 Y0 &C1 &D0 &G0 &J0 &K0 &Q6 &R1 &S0 &T5 &X0
S00:001 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000
S36:007 S37:009 S40:104 S41:192 S46:136 S95:000

STORED PROFILE 1:
B1 E1 L1 M1 N1 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0 &T5 &X0
S00:000 S02:043 S06:002 S07:050 S08:002 S09:006 S10:014 S11:095 S12:050 S18:000
S36:007 S37:000 S40:104 S41:195 S46:138 S95:000

TELEPHONE NUMBERS:
0=   1=
2=   3=

Modem Settings

AT&F0
ATB0
ATN0
AT&D0
AT&K0
ATS0=1
ATS37=9
AT&W0
AT&Y0

Command Summary
(* indicates a change from the default)

*	B0	ITU-T answer sequence
*	E1	Enable local echo
		(Must be set to E0 when modem is connected directly to the RTU as opposed to the PC.)
	L1	Low volume
	M1	Speaker ON until CONNECT
*	N0	Automode is disabled. The handshake will occur based on the value of S37.
	Q0	Display result codes
	T	Use tone dialing
	V1	Verbal codes
	W0	Report DTE speed
	X4	Report all messages
	Y0	Turns off long space disconnect
	&C1	Normal CD operations (RLSD follows whatever the carrier is set to.)
*	&D0	DTR override
		(This is necessary for the calling modem so that ESC doesn't hang up.)
	&G0	Disable guard tone
	&J0	telephone jack, sets value for S21
*	&K0	Disables flow control
	&Q#	not listed in help, don't change
	&R1	Ignore RTS
	&S0	DSR override; always ON
	&T5	Prohibits Remote Digital Loopback
	&X0	Internal timing
	&Y0	Resets with profile 0

S-Registers
(* indicates a change from default)

*	S00=001	sets the number of rings before modem answers
*	S037=009	Desired DCE Line Speed

(This information is according to the standard Hayes Command Set.
This was not in this modem's documentation. Use with caution.)

0	Use Last AT Speed
1	Reserved (75)
2	Reserved (110)
3	300
4	Reserved (600)
5	1200
6	2400
7	4800
8	7200
9	9600
10	12000
11	14400
26	16800
12	19200
33	21600
29	24000
34	26400
15	28800

Motorola OnlineSURFR 28.8

Modem   **Motorola OnlineSURFR**
Type   External
Model   MODEMSURFR 28.8 EXT
Date Code: 3696

Configuration (9600 Baud)

at&v
ACTIVE PROFILE:
B0 E1 L2 M1 Q0 V1 W0 X4 &B1 &C1 &D0 &G0 &L0 &P0 &Q0 &R1 &S0 &X0 &Y0
%A013 %C0 %G0 \A3 \C0 \G0 \J0 \K5 \N0 \Q0 \T000 \V1 \X0 -J0 "H0 "O032
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060 S08:002
S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S37:009 S72:000

STORED PROFILE 0:
B0 E1 L2 M1 Q0 V1 W0 X4 &B1 &C1 &D0 &G0 &L0 &P0 &Q0 &R1 &S0 &X0
%A013 %C0 %G0 \A3 \C0 \G0 \J0 \K5 \N0 \Q0 \T000 \V1 \X0 -J0 "H0 "O032
S00:001 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060 S08:002
S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S37:009 S72:000

TELEPHONE NUMBERS:
&Z0=
&Z1=
&Z2=
&Z3=

Modem Settings
AT&F0
ATB0
AT&D0
AT&R1
AT%C0
AT%G0
AT\N0
AT\Q0
AT\V1
AT-J0
AT"H0
ATS0=1
ATS37=9
AT&W0
AT&Y0

Command Summary
(* indicates a change from the default)

*	B0	ITU-T answer sequence
*	E1	Enable local echo
		(Must be set to E0 when modem is connected directly to the RTU as opposed to the PC.)
	L2	Speaker volume medium
	M1	Speaker OFF when carrier is present
	Q0	Response messages ON
	V1	Response messages as words (Verbal codes)
	W0	CONNECT response message with computer-to-modem speed
	X4	CONNECT message as set by W and \V commands, wait for dial tone check for busy signal,
	&B1	not listed in manual (common use: Fixed serial port rate)
	&C1	DCD on while carrier is present
*	&D0	DTR (Data Terminal Ready signal) ignored
		(This is necessary for the calling modem so that ESC doesn't hangup)
	&G0	No guard tone
	&L0	not listed in manual
	&P0	39/61 pulse make/break ratio (US)
	&Q0	not listed in manual
*	&R1	not listed in manual (common use: Modem ignores RTS)
	&S0	DSR (Data Set Ready) always ON
	&X0	not listed in manual (common use: Internal timing)
	&Y0	Powerup with user option set #0
	%A013	Set auto-reliable fallback character to n (n = ASCII 1-127)
*	%C0	Compression disabled
*	%G0	Disable auto fallforward / fallback
	\A3	Maximum block size of 256 characters
	\C0	Disable auto-reliable buffer
	\G0	Disable modem port flow control
	\J0	Modem-to-modem speed & computer-to-computer speeds are independent
	\K5	not listed in manual
*	\N0	Normal mode
*	\Q0	Disable computer flow control
	\T000	Disable inactivity timer
*	\V1	Enable protocol result code
	\X0	No XON/XOFF characters to remote modem
*	-J0	Disable detection of type of V.42 error correction
*	"H0	Disable V.42 bis data compression control
	"O032	not listed in manual

S-Registers

(* indicates a change from default)

| * | S00=001 | sets the number of rings before modem answers |
| * | S037=009 | Desired DCE Line Speed |

(This information is according to the standard Hayes Command Set.
This was not in this modem's documentation. Use with caution.)

0	Use Last AT Speed
1	Reserved (75)
2	Reserved (110)
3	300
4	Reserved (600)
5	1200
6	2400
7	4800
8	7200
9	9600
10	12000
11	14400
26	16800
12	19200
33	21600
29	24000
34	26400
15	28800

Motorola OnlineSURFR 33.6

Modem   **Motorola OnlineSURFR**
Type   External
Model   MODEMSURFR 33.6 EXT
Date Code: 0597

Configuration (9600 Baud)

at&v
ACTIVE PROFILE:
B0 E1 L2 M1 Q0 V1 W0 X4 &B1 &C1 &D0 &G0 &L0 &P0 &Q0 &R1 &S0 &X0 &Y0
%A013 %C0 %G0 \A3 \C0 \G0 \J0 \K5 \N0 \Q0 \T000 \V1 \X0 -J0 "H0 "O032
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060 S08:002
S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S37:009 S72:000

STORED PROFILE 0:
B0 E1 L2 M1 Q0 V1 W0 X4 &B1 &C1 &D0 &G0 &L0 &P0 &Q0 &R1 &S0 &X0
%A013 %C0 %G0 \A3 \C0 \G0 \J0 \K5 \N0 \Q0 \T000 \V1 \X0 -J0 "H0 "O032
S00:001 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060 S08:002
S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S37:009 S72:000

TELEPHONE NUMBERS:
&Z0=
&Z1=
&Z2=
&Z3=

Modem Settings
AT&F0
ATB0
AT&D0
AT&R1
AT%C0
AT%G0
AT\N0
AT\Q0
AT\V1
AT-J0
AT"H0
ATS0=1
ATS37=9
AT&W0
AT&Y0

Motorola OnlineSURFR 56K

Modem   **Motorola OnlineSURFR**
Type   External
Model   MODEMSURFR 56K EXT
Date Code: 0598
Serial No.:   90709647 (Sayreville staging)

Configuration (9600 Baud)

at&v
ACTIVE PROFILE:
B0 E1 L2 M1 Q0 V1 W0 X4 &B1 &C1 &D0 &G0 &L0 &P0 &Q0 &R1 &S0 &X0 &Y0
%A013 %C0 %G0 \A3 \C0 \G0 \J0 \K5 \N0 \Q0 \T000 \V1 \X0 -J0 "H0 "O032
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060 S08:002
S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S37:009 S72:000

STORED PROFILE 0:
B0 E1 L2 M1 Q0 V1 W0 X4 &B1 &C1 &D0 &G0 &L0 &P0 &Q0 &R1 &S0 &X0
%A013 %C0 %G0 \A3 \C0 \G0 \J0 \K5 \N0 \Q0 \T000 \V1 \X0 -J0 "H0 "O032
S00:001 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060 S08:002
S09:006 S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S37:009 S72:000

TELEPHONE NUMBERS:
&Z0=
&Z1=
&Z2=
&Z3=

Modem Settings
AT&F0 Restore factory configuration 0
AT+MS=9,0,9600,9600 Modulation mode (9=V.32, 9600 or 4800), 0=forced, min speed=9600, max speed=9600
AT&D0 Modem ignores DTR
ATE0 Turn off command echo
AT&R1 CTS is always active
AT&K0 Disable computer/modem flow control
AT\N1 Normal speed buffered mode (no error correction)
AT%C0 Disable data compression
ATS0=1 Rings to autoanswer = 1
AT\V1 Connect messages displayed in single line format
ATW2 Report modem-to-modem speed in error correction mode
AT&W0 Store active profile in NVRAM profile 0
AT&Y0 Recall stored profile 0 upon power up

UDS V.3225

Modem   **UDS V.3225**
Type   External
Model   V.3225 LCD MINI SA
Version

Configuration (9600 Baud)

at&v
ACTIVE PROFILE
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030
S08:002 S09:006 S10:014 S12:050 S14:8AH S16:00H S18:000 S21:84H
S22:46H S23:00H S25:005 S26:000 S27:08H S28:015 S29:000 S32:06H
S34:00H S52:000 S53:00H S54:01H S57:00H S58:000 S59:005 S60:41H
S61:1EH S62:000 S63:255 S67:005 S69:005 S70:001 S71:00H S72:00H
S78:030 S79:035

OK

Modem Settings

Instructions to load Factory Option Set #2 (Asynchronous Dial-up without MNP)
(Settings are made from front panel of modem.)

- [V.32 9600 TALK]   Press NO
- [DIAL STORED NUMBER ?]   Press NO
- [DISPLAY STATUS ?]   Press NO
- [SELECT TEST ?]   Press NO
- [MODIFY CONFIGURATION ?]   Press YES
- [CHANGE MODEM PARAMETERS ?]   Press NO
- [CHANGE MNP PARAMETERS ?]   Press NO
- [CHANGE DTE PARAMETERS ?]   Press NO
- [CHANGE TEST PARAMETERS ?]   Press NO
- [CHANGE DIAL LINE PARAMETERS ?]   Press NO
- [CHANGE SPEAKER OPERATION ?]   Press NO
- [LOAD OR STORE OPTION SET ?]   Press YES
- [LOAD FACTORY OPTION SET ?]   Press YES
- [ARE YOU SURE ?]   Press YES
- [LOAD FACTORY OPTION SET #1 ?]   Press NO
- [LOAD FACTORY OPTION SET #2 ?]   Press YES
- (Brief message will be displayed)
- [STORE PRESENT OPTIONS ?]   Press YES
- [ARE YOU SURE ?]   Press YES
- (Brief message will be displayed)
- [MODIFY CONFIGURATION ?]   Press TALK/DATA

Factory Option Set #2 (Asynchronous Dial-up without MNP)

- MODEM PARAMETERS
  DCE RATE = DTE RATE
  NORMAL ORIGINATE
  FAST TRAIN DISABLED
  AUTO RETRAIN ENABLED
  TRANSMIT CLOCK INTERNAL
  DIAL LINE
  JACK TYPE RJ11 (PERMISSIVE)
  LINE CURRENT DISCONNECT LONG ENABLED
  LONG SPACE DISCONNECT ENABLED
  V.22 GUARD TONE DISABLED

- MNP PARAMETERS
  MNP PROTOCOL DISABLED *
  DTE SPEED = DCE SPEED *
  FLOW CONTROL DISABLED *
  XON/XOFF PASS THROUGH DISABLED
  DATA COM   PRESSION ENABLED *
  MNP ACTIVITY TIMER OFF
  MNP BREAK CONTROL 0 *

- DTE PARAMETERS
  ASYNC DATA
  DTE RATE = 9600
  8 BIT
  NO PARITY
  AT COMMAND SET ENABLED
  IGNORES DTR
  DSR FORCED HIGH
  DCD FORCED HIGH
  CTS FORCED HIGH
  DTE FALLBACK DISABLED
  OPTIONS RETAINED AT DISCONNECT

- TEST PARAMETERS
  BILATERAL ANALOG LOOP DISABLED
  BILATERAL DIGITAL LOOP DISABLED
  DTE LOCAL TEST DISABLED
  DTE REMOTE TEST DISABLED
  REMOTE COMMANDED TEST ENABLED
  TEST TIMEOUT OFF

- DIAL/DBU PARAMETERS
  TONE DIAL
  AUTO DIAL #1
  WAIT FOR DIAL TONE
  WAIT DELAY 2 SECONDS
  PAUSE DELAY 2 SECONDS
  CALL TIMEOUT 30 SECONDS
  ANSWER ON 1 RING

- SPEAKER OPTION
  VOLUME MEDIUM
  ON UNTIL CARRIER DETECT

* Indicates variation from factory option set #1 (Information taken directly from manual)

USRobotics Sportster 14400 Fax

Modem   **USRobotics Sportster 14400 Fax**
Type   External
Model
Version

Configuration (9600 Baud)
ati4
USRobotics Sportster 14400 Fax Settings...

  B0 E1 F1 M1 Q0 V1 X4 Y0
  BAUD=9600 PARITY=N WORDLEN=8
  DIAL=HUNT ON HOOK

  &A1 &B1 &C1 &D0 &G0 &H0 &I0 &K0
  &M0 &N6 &P0 &R1 &S0 &T5 &Y1

  S00=001 S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
  S07=060 S08=002 S09=006 S10=007 S11=070 S12=050 S13=000
  S14=000 S15=000 S16=000 S17=000 S18=000 S19=000 S20=000
  S21=010 S22=017 S23=019 S24=000 S25=005 S26=000 S27=000
  S28=008 S29=020 S30=000 S31=000 S32=000 S33=000 S34=006
  S35=000 S36=014 S37=009 S38=000 S44=015 S51=000

  LAST DIALED #:

(IMPORTANT NOTE: **dip switch settings can overwrite internal parameters)**

Modem Settings
AT&F0
AT&A1
AT&D0
AT&H0
AT&K0
AT&N6
AT&R1
ATS0=1
ATS37=9
AT&W0
ATY0

Command Summary
(* indicates a change from the default)

	B0	ITU-T answer sequence
*	E1	Enable local echo
		(Must be set to E0 when modem is connected directly to the RTU as
		opposed to the PC.)
	F1	Online local echo OFF
	M1	Speaker ON until CONNECT
	Q0	Display result codes
	V1	Verbal codes
	X4	Report all messages
	Y0	Default is profile 0 setting in NVRAM
*	&A1	ARQ result codes enabled
	&B1	Fixed serial port rate
	&C1	Normal CD operations
*	&D0	DTR override
		(This is necessary for the calling modem so that ESC doesn't hang up.)
	&G0	No guard tone, U.S. and Canada
*	&H0	Flow control disabled
	&I0	Software flow control disabled
*	&K0	Data Compression disabled
	&M0	Normal mode, error contron disabled
*	&N6	9600 bps
		(&N0=Variable rate; &N1=300 bps; &N2=1200 bps; &N3=2400 bps; &N4=4800;
		&N5=7200 bps; &N6=9600 bps; &N7=12,000 bps; &N8=14,400 bps;
		&N9=16,800 bps; &N10=19,200 bps; &N11=21,600 bps; &N12=24,000;
		&N13=26,400; &N14=28,800 bps)
	&P0	U.S./Canada ratio, 39%/61%
*	&R1	Modem ignores RTS
	&S0	DSR override; always ON
	&T5	Prohibits Remote Digital Loopback
	&Y1	Sets break handling to Nondestructive, expedited

S-Registers

(* indicates a change from default)

*	S00=001	sets the number of rings before modem answers
*	S037=009	Desired DCE Line Speed

      (This information is according to the standard Hayes Command Set.
      This was not in this modem's documentation. Use with caution.)

0	Use Last AT Speed
1	Reserved (75)
2	Reserved (110)
3	300
4	Reserved (600)
5	1200
6	2400
7	4800
8	7200
9	9600
10	12000
11	14400
26	16800
12	19200
33	21600
29	24000
34	26400
15	28800

USRobotics Sportster 28800 Fax

Modem   **USRobotics Sportster 28800 Fax**
Type   External
Model
Version

Configuration (9600 Baud)

Use the following dip switch settings on the back of the modem:
1. Down (Ignore DTR)
2. Up (Verbal result codes)
3. Down (display result codes)
4. Up (echo off line commands)
5. Up (auto ans first ring)
6. Up (CD normal)
7. Up (upload at powerup)
8. Down (smart mode)

(**IMPORTANT NOTE:**   **dip switch settings can overwrite internal parameters**)

Modem Settings
AT&F0
AT&A1 (Enables ARQ codes)
AT&D0 (DTR ignored)
AT&H0 (Flow control disabled)
AT&K0 (Data compression disabled)
AT&N6 (Forces connection at 9600 baud or modem hangs up)
AT&R1 (Modem ignores RTS)
ATS0=1 (Answer on first ring)
ATS37=9 (no effect)
AT&W0 (store to NVRAM 0)
ATY0 (defaults to profile 0 at power up)

Command Summary
(* indicates a change from the default)

	B0	ITU-T answer sequence
*	E1	Enable local echo
		(Must be set to E0 when modem is connected directly to the RTU as
		opposed to the PC.)
	F1	Online local echo OFF
	M1	Speaker ON until CONNECT
	Q0	Display result codes
	V1	Verbal codes
	X4	Report all messages
	Y0	Default is profile 0 setting in NVRAM
*	&A1	ARQ result codes enabled
	&B1	Fixed serial port rate
	&C1	Normal CD operations
*	&D0	DTR override
		(This is necessary for the calling modem so that ESC doesn't hang up.)
	&G0	No guard tone, U.S. and Canada
*	&H0	Flow control disabled
	&I0	Software flow control disabled
*	&K0	Data Compression disabled
	&M0	Normal mode, error contron disabled
*	&N6	9600 bps
		(&N0=Variable rate; &N1=300 bps; &N2=1200 bps; &N3=2400 bps; &N4=4800;
		&N5=7200 bps; &N6=9600 bps; &N7=12,000 bps; &N8=14,400 bps;
		&N9=16,800 bps; &N10=19,200 bps; &N11=21,600 bps; &N12=24,000;
		&N13=26,400; &N14=28,800 bps)
	&P0	U.S./Canada ratio, 39%/61%
*	&R1	Modem ignores RTS
	&S0	DSR override; always ON
	&T5	Prohibits Remote Digital Loopback
	&Y1	Sets break handling to Nondestructive, expedited

S-Registers

(* indicates a change from default)

*	S00=001	sets the number of rings before modem answers
*	S037=009	Desired DCE Line Speed

(This information is according to the standard Hayes Command Set. This was not in this modem's documentation. Use with caution.)

0	Use Last AT Speed
1	Reserved (75)
2	Reserved (110)
3	300
4	Reserved (600)
5	1200
6	2400
7	4800
8	7200
9	9600
10	12000
11	14400
26	16800
12	19200
33	21600
29	24000
34	26400
15	28800

USRobotics Sportster 56K Fax

Modem   **USRobotics Sportster 56K Fax**
Type   External
Model
Version

Configuration (9600 Baud)

Use the following dip switch settings on the back of the modem:
9.   Down (Ignore DTR)
10. Up (Verbal result codes)
11. Down (display result codes)
12. Up (echo off line commands)
13. Up (auto ans first ring)
14. Up (CD normal)
15. Up (upload at powerup)
16. Down (smart mode)

Modem Settings
AT&F0
AT&A1 (Enables ARQ codes)
AT&D0 (DTR ignored)
AT&H0 (Flow control disabled)
AT&K0 (Data compression disabled)
AT&N6 (Forces connection at 9600 baud or modem hangs up)
AT&R1 (Modem ignores RTS)
ATS0=1 (Answer on first ring)
ATS37=9 (no effect)
AT&W0 (store to NVRAM 0)
ATY0 (defaults to profile 0 at power up)

Intel SatisFAXtion Modem/400e

Modem **Intel SatisFAXtion Modem/400e**
Type External
Model PCFM6501
Version UNKNOWN

ACTIVE PROFILE:
B0 E1 L0 M1 T Q0 V1 X4 Y0 &C1 &D0 &G0 &L0 &P0 &Q0 &R0 &S0 &X0 &Y0
\A3 %A013 \C0 %C1 %E1 \G0 \J0 \K5 \N3 \Q0 \T00 \V2 \X0 -J1 "H3 "S0 "O250
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:060
S08:002 S09:006 S10:014 S11:070 S12:050 S18:000 S25:005 S26:001 S31:000

STORED PROFILE 0:
B0 E1 L0 M1 T Q0 V1 X4 Y0 &C1 &D0 &G0 &L0 &P0 &Q0 &R0 &S0 &X0
\A3 %A013 \C0 %C1 %E1 \G0 \J0 \K5 \N3 \Q0 \T00 \V2 \X0 -J1 "H3 "S0
S00:001 S07:060 S11:070 S18:000 S23:027 S25:005 S26:001 S27:000 S31:000

STORED PROFILE 1:
B1 E1 L2 M1 T Q0 V1 X4 Y0 &C1 &D2 &G0 &L0 &P0 &Q0 &R0 &S0 &X0
\A3 %A013 \C0 %C1 %E1 \G0 \J0 \K5 \N3 \Q3 \T00 \V2 \X0 -J1 "H3 "S0
S00:000 S07:060 S11:070 S18:000 S23:011 S25:005 S26:001 S27:064 S31:000

TELEPHONE NUMBERS:
&Z0
&Z1
&Z2
&Z3

OK

Modem Settings
AT&F
ATB0
ATT
AT&C1
AT&D0
AT&K0
ATS0=1
AT&W0
AT&Y0

Command Summary
(* indicates a change from the default)

*	B0	ITU-T answer sequence
*	E1	Enable local echo
		(Must be set to E0 when modem is connected directly to the RTU as opposed to the PC.)
	L1	Low volume
	M1	Speaker ON until CONNECT
*	N0	Automode is disabled. The handshake will occur based on the value of S37.
	Q0	Display result codes
	T	Use tone dialing
	V1	Verbal codes
	W0	Report DTE speed
	X4	Report all messages
	Y0	Turns off long space disconnect
	&C1	Normal CD operations (RLSD follows whatever the carrier is set to.)
*	&D0	DTR override
		(This is necessary for the calling modem so that ESC doesn't hang up.)
	&G0	Disable guard tone
	&J0	telephone jack, sets value for S21
*	&K0	Disables flow control
	&Q#	not listed in help, don't change
	&R1	Ignore RTS
	&S0	DSR override; always ON
	&T5	Prohibits Remote Digital Loopback
	&X0	Internal timing
	&Y0	Resets with profile 0

S-Registers

(* indicates a change from default)

*	S00=001	sets the number of rings before modem answers
*	S037=009	Desired DCE Line Speed

(This information is according to the standard Hayes Command Set. This was not in this modem's documentation. Use with caution.)

0	Use Last AT Speed
1	Reserved (75)
2	Reserved (110)
3	300
4	Reserved (600)
5	1200
6	2400
7	4800
8	7200
9	9600
10	12000
11	14400
26	16800
12	19200
33	21600
29	24000
34	26400
15	28800

Software Diagnostics Output

This section lists the diagnostics which are available for the various MOSCAD RTU devices. The messages are listed as they appear on the screen, with %% signs in the text to represent the device's current alphanumeric values.

The description which follows the diagnostics messages, provides an explanation for the variables.

Terms that are used frequently in diagnostics are described below:

Term	Explanation
Device	A MOSCAD/MOSCAD-L software module.
Instance (of a device)	A device may appear more than once in MOSCAD/MOSCAD-L, each carrying a unique name.
Level	A group of diagnostic checks. Up to 100 (0 through 99) levels can be custom-defined for each device.
PIN table	A pointer which allows "cabling" between two devices during run time.
Address	Numeric sum of Site ID and System Address.
Tick	Time measurement unit, equal to 10 ms.

TRANSPORT MUX   DEVICE = TRNINT

16   LEVEL = 0

```
Mini Session Channels                                        : %% 1
Master Channels                                              : %% 2
Slave Channels                                               : %% 3
```

1. Number of logical mini-sessions that serve the RTU applications. A mini-session is an API layer that serves the RTU-to-RTU communications, event bursts, and setcall.

2. The number of logical channels above the Presentation layer from which the RTU can initiate communications. In an RTU there are no such logical channels as there is no application that can initiate a call. Control centers (e.g. MCP-M) do have such applications such as schedulers and command dispatchers.

3. The number of logical channels above the Presentation layer through which the RTU reacts to calls simultaneously (such as error logger, diagnostics, D.B. monitor, process monitor, date and time, download). The RTU does not need more than 2-4 channels for regular and orderly activity.

17   LEVEL = 1

```
                     Minisession Channels
                     --------------------
              Minisession Key          Application ID
              --------------           -----------------
```

This is the applications table that uses the mini-session API for communication purposes. For each application this table records the key for the instance of the mini-session, and the application ID.

18   LEVEL = 2

```
                  Master      Channels
                  -------------------
Transport Key     Slave: Site     Port      Link
-------------            ----      ----      ----
```

This table defines the logical channels located above the Presentation layer, and capable of initiating communications. For each channel the table records the call destination. The destination address consists of the site ID, the port ID, and the link ID.

19   LEVEL = 3

```
                        Slave Channels
                        --------------
Transport Key     Master: Site     Port      Link      Channel Id
-------------             ----      ----      ----      ----------
```

This table defines the active logical channels that can react to communications from ToolBox, the control center, MCP-M, or MCP-T. For each logical channel, the table records information about the SRC that initiated the call, namely, the site ID, link ID, Port ID and the identification number of the logical channel that was used for the call.

20   LEVEL = 4

```
                       Frame Sequence Channels
                       -----------------------
                     Frame Seq Key  Application Id
                     -------------  --------------
```

The Frame Seq Key field holds the key of the application that should receive the frames originating from the corresponding application on the transmitting side, specified in the Application ID field.

21   LEVEL = 5

```
Exp  Send  L_dup  State  T_reset   T_dup  T_hole    B_reset  B_ack
```

Exp   The expected sequence number.

Send   The sequence number of the next frame sent.

L_dup   The last sequence number that can be accepted as the sequence of a duplicated frame.

State   The status registered in the internal status engine.

T_reset   The amount of time a unit waits after having acknowledged repeated reset requests, before sending its own reset frame.

T_dup   The amount of time a unit, which has received frames with identical numbers, considers them as duplicates instead of new transmissions.

T_hole   The amount of time a unit, which has received frames with holes in the sequence numbers, still expects to receiving the missing frames.

B_reset   1 means that the frame contains a reset bit.

B_ack   1 means that the frame contains a reset ACK bit.

23

```
Curr      Since Last Diagnostic:  Max       #     #      Max      #
Waiting                           Waiting  Range  Time   Hole   Resets
Buffers                           Buffers  Holes  Holes  Len
```

Current Waiting Buffers   Number of frames held in Waiting Queue.

Max Waiting Buffers   Maximum number of frames in Waiting Queue.

Range Holes   The number of range "holes" found since the last diagnostic.

Time Holes   The number of time "holes" found since the last diagnostic.

Max Hole Len   The maximum length of time "holes."

Resets   The number of resets/rejects since the last diagnostic.

HEAP   DEVICE = HP_F_TX, HP_F_RX, HP_UF_A, HP_UF_U

HP_F_TX, HP_F_RX	MDLC Formatted
HP_UF_A	MDLC adapter (unformatted)
HP_UF_U	USER Port

32   LEVEL = 0

```
# of buffers in heap                                        : %% 1
# of buffers left in heap                                   : %% 2
The minimum # of buffers left
  in heap from last diagnostic                              : %% 3
# of times the heap was empty
  since last diagnostic                                     : %% 4
Size of one buffer in bytes                                 : %% 5
During init flag                                            : %% 6
Bad heap flag                                               : %% 7
Unit time for freeing by force                              : %% 8
Pointer to start chain                                      : %% 9
Pointer to current chain                                    : %% 10
Pointer to end chain                                        : %% 11
```

1. Number of buffers in heap instance

2. Number of free buffers in heap.

3. Minimum number of free buffers left in heap since the last diagnostic. This information reflects the extent to which the heap is capable of meeting RTU needs under heavy traffic.

4. The number of times, since the last diagnostic, the RTU software detected an empty heap. A large number of times points to incorrect allocation of memory resources.

5. Size of buffer including the overhead for managing a single buffer.

6. The flag that indicates that the RTU is in startup stage.

7. The flag that points to memory overwrite in the memory area allocated to the heap.

8. Unit of time to be measure how long a buffer is out of the heap (used by other parts of the system).

9. 10. and 11. The heap consists of a chain of joined buffers. For chain management purposes, a key holds pointers to the beginning of the chain, the end of the chain, and to the next buffer that will be taken from the chain. The P_current_chain value must be (numerically) between the start and end values.

32   LEVEL = 1

```
Buf      Key    Next      Cntr      #FF
---------------------------------------
```

Buf   Address of the buffer in the memory.

Key   Handle (identifier) of the heap. (If =0, buffer is in heap. Otherwise buffer is in use by system.)

Next   Next buffer in heap to be allocated. (Meaningful only if key=0.)

Cntr   Counts intervals of time that the buffer is out of the heap. (Meaningful only if key ≠ 0)

#FF   Forced free. (Meaningful only if key ≠ 0.) Indicates the total number of units that the buffer was in use out of the heap. Set back to zero when heap is returned to heap. If this value is greater than 3, there may be a memory leak problem. Please consult product group.

ADAPTER   DEVICE = COM1A,RTU1A, LIN1A,…

48   LEVEL = 0

```
Physical device key                                        : %% 1
Physical PIN's table                                       : %% 2
Heap key, to be used by the receive function               : %% 3
Heap key, to be used by the transmit function              : %% 4
Mask address (ignore addresses or not)                     : %% 5
System address                                             : %% 6
Specific logical address (site id)                         : %% 7
Extra address 1                                            : %% 8
Extra address 2                                            : %% 9
Mode of operation                                          : %% 10
TimeAuth device key (HEX)                                  : %% 11
TimeAuth handle                                            : %% 12
Authentication stamp offset                                : %% 13
```

General - The adapter is the layer which coordinates the transmission / reception of the MDLC frame above Asynchronous Port.

1. The physical asynchronous key.

2. PIN Table - A pointer which allows "cabling" during run time to the physical asynchronous layer selected in Site Configuration.

3. The Rx Heap key - This is the key to the formatted buffer Heap HP_F_RX to be used to collect the stream of bytes which is received in the Asynchronous Port in the MDLC Frame.

4. The Tx Heap key - This is the key to the unformatted buffer Heap HP_UF_A to be used to convert the MDLC frame into a stream of bytes for transmitting through the Asynchronous Port.

5. 0XFFFF - means receiving every MDLC frame regardless of its address. (used for the Protocol Analyzer)

6. The System address - In the local port (not above radio) the value is zero , even if the user chooses a different value.

7. The Site ID.

8. Used for transmissions in the local address (-2).

9. Used as a default router address

10. Whether or not to allow reception of SYNC frames.

11. TimeAuth device key in Hexadecimal form.

12. TimeAuth identifier.

13. Offset of Authentication stamp within the buffer for authenticated SYNC frames only.

49   LEVEL = 10,11

```
# of transmitted frames                                   : %% 1
# of transmission fails                                   : %% 2
# of received frames                                      : %% 3
# of received frames (with error)                         : %% 4
Mask of errors (receive)                                  : %% 5
Number of non-properly authenticated SYNC frames          : %% 6
```

1. The number of unformatted frames that have been transmitted.

2. The number of unformatted frames that have been transmitted and for which the physical layer
    returned a fail signal.

3. The number of received frames includes only correct frames (including acknowledgment frames).

4. The number of unformatted frames that have been received with some error.

5. The following figure illustrates the mask:

6. Number of synchronization frames which were not properly authenticated.

b15	. . . .	b8	b7	b6	b5	b4	b3	b2	b1	b0

Reserved

- b0 ..... unformatted buffer heap is empty
- b1 ..... inverse byte, end of frame
- b2 ..... empty frame received
- b3 ..... invalid destination
- b4 ..... frame, more than 200 bytes
- b5 ..... inverse byte, inverse byte
- b6 ..... invalid byte after inverse byte
- b7 ..... CRC error
- b8 ..... Recovery of UF heap
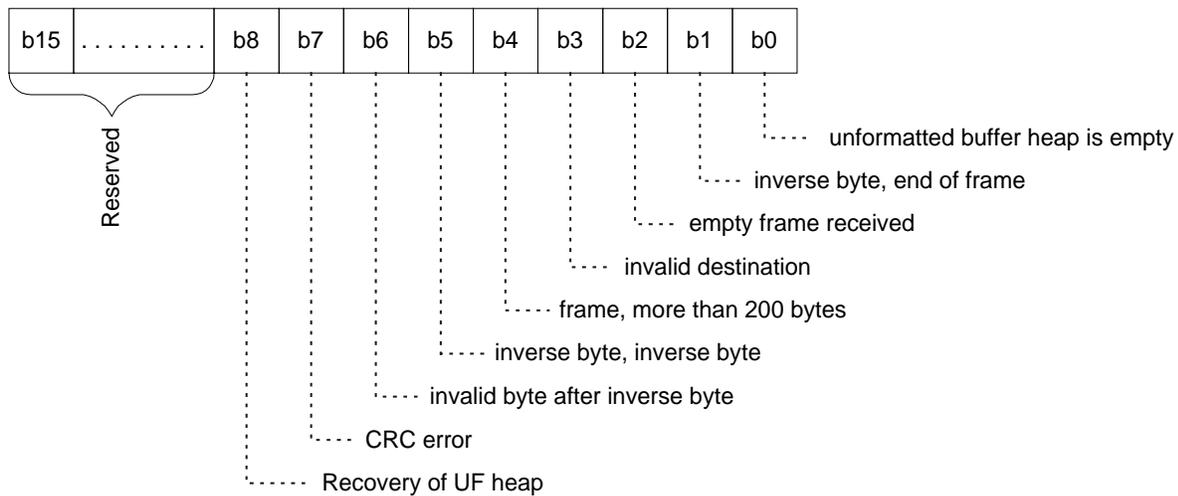
TRANSPORT   DEVICE = TRANS1, TRANS2,...

64   LEVEL = 0

```
Logical  channel no.                                      : %% 1
Timeout between Tx  retries                               : %% 2
Timeout between channel busy retries                      : %% 3
Timeout between Rx frames                                 : %% 4
Timeout of Rx wait  (till session chk)                    : %% 5
Current timeout between Tx retries                        : %% 6
Current timeout between channel busy retries              : %% 7
Current timeout between Rx frames                         : %% 8
Current timeout of Rx waiting                             : %% 9
No. of  Tx  retries                                       : %% 10
No. of  channel busy retries                              : %% 11
Current no. of Tx retries                                 : %% 12
```

```
Current no. of  channel busy retries                        : %% 13
Sequence of master session                                  : %% 14
No. of  frames in burst                                     : %% 15
No. of  frames in current burst                             : %% 16
Size of Tx queue                                            : %% 17
Index in Tx queue of first buffer                           : %% 18
Index in Tx queue of next free place for buffer             : %% 19
Sequence of first frame in Tx queue                         : %% 20
Sequence of last frame in Tx queue                          : %% 20
Size of Rx queue                                            : %% 21
Index in Rx queue of first frame                            : %% 22
Sequence of first frame in Rx queue                         : %% 23
Sequence of first expected frame                            : %% 24
Index in Rx queue of for expected frame                     : %% 25
Size of temp queue                                          : %% 26
Index in temp queue of first frame                          : %% 26
Index in temp queue of next free place for frame            : %% 26
(flag) should start session frames to be expected           : %% 27
(flag) is ack required ?                                    : %% 28
(flag) is sync ack arrived ?                                : %% 29
(flag) was sync ack sent ?                                  : %% 30
(flag) has new data arrived ?                               : %% 30
(flag) is it a master device ?                              : %% 31
(flag) is device in Tx state ?                              : %% 32
(flag) has reset by master occurred ?                       : %% 33
(flag) was session aborted ?                                : %% 34
(flag) first ack with burst in msg ?                        : %% 35
(flag) is it first Tx burst in session ?                    : %% 36
In_retry                                                    : %% 37
```

1. The logical channel number.
2. The number of seconds between transmission attempts when ACK is not received at the Transport layer.
3. The number of seconds between transmission attempts when a Busy ACK is received. (not enough logical channels on the answering site).
4. The preset time that the site will wait until it issues its ACK to a partial reception.
5. The preset time that the site will wait for the first time until it asks the other site "is session on?"
6. The current number of seconds between transmission attempts.
7. The current number of seconds between transmission attempts in case of Busy ACK.
8. The actual time that the site waits until it issues its ACK to a partial reception.
9. The actual time that the site will wait for the first time until it asks the other site "is session on?"
10. Number of transmission attempts.
11. Number of transmission attempts in case of Busy ACK.
12. The current number of transmission attempts.
13. The current number of transmission attempts in case of Busy ACK.
14. The sequence number of the master session at the initiator's site.
15. The current number of frames in a single transmission while waiting for ACK on the receiving site.

16. The total number of frames in a single transmission while waiting for ACK on the receiving site.

17. The size of the Tx queue until the Transport layer suspends the application.

18. The index of the next buffer to be transmitted. (beginning of queue).

19. The index of the next buffer to be added to the queue. (end of queue).

20. The sequence number of the first frame and last frame in the queue.

21. The size of the Rx queue.

22. The next frame to be received by the Rx queue.

23. The sequence number of the frame to be received.

24. The expected sequence number of the next frame to be received.

25. The location of the next frame to be received in the Rx queue.

26. A temporary queue in case of holes in reception (the receiving sequence number is different from expected). The data is similar to the Rx queue

27. Does Transport expect start session in the next frame to be received?

28. Is Sync ACK required?

29. Has Sync ACK arrived?

30. Was Sync ACK transmitted? Have new frames been received?

31. Is this Instance master or slave?

32. Is this Instance in Tx state?

33. Has a Reset been sent from the Master?

34. Has the current session been aborted?

35. Send ACK in next transmission?

36. Is this the first burst in the current transmission for sending Start Session?

37. Is the Transport layer retrying?

65   LEVEL = 1
```
no. of  buffers in Tx queue                          :   %%
no. of  buffers in Rx queue                          :   %%
no. of  buffers in temp queue                        :   %%
```

The number of MDLC frames in each queue in this instance of the Transport layer.

66   LEVEL = 10/11

```
# of transmitted frames                              : %% 1
# of received frames                                 : %% 2
# of re-transmitted frames                           : %% 3
# of received frames (with error)                    : %%
# of frames in Tx queue                              : %%
# of frames in Rx queue                              : %%
# of frames in Tx queue (held by link layer)         : %%
# of frames in Tx queue (held by physical layer)     : %%
```

1. The # of Transmitted Frames (does not include retransmission and acknowledgment frames.)

2. The # of Received Frames (includes only correct frames.)

3. The # of Re-transmitted Frames represents only frames rejected by the physical layer (do not use this number; use the # of Re-transmitted Frames in the Link device).

MTE

80   LEVEL = 0

```
Unused RAM memory                                    : %% 1
Total RAM  handled by MTE                            : %% 2
Number of created tasks                              : %% 3
Number of created devices                            : %% 4
Spare stack for each task stack                      : %% 5
Spare stack for sup. stack                           : %% 5
Length of sup. stack (without spare)                 : %% 6
Unused sup. stack (without spare)                    : %% 7
Length of 1 task control block  (tcb)                : %% 8
Length of 1 device control block (dcb)               : %% 8
Address of mt_curtaskid                              : %% 9
Address of mt_curprio                                : %% 9
Maximum allowed value for low task watchdog          : %% 10
Maximum allowed value for high task watchdog         : %% 10
Maximum reached value of low task watchdog           : %% 11
Maximum reached value of high task watchdog          : %% 11
```

1. The amount of unused memory in bytes.

2. The amount of memory that the MTE (the operating system) received at startup and distributed among all of the instances that were created in the system.

3. The number of tasks (infinite threads) that were created according to the site configuration.

4. The total number of instances created by the MTE according to the site configuration.

5. The number of extra bytes for each stack. These bytes are designed to detect memory corruption.

6. The length in bytes of the supervisor stack.

7. The amount of unused bytes in the supervisor stack.

8. The length in bytes in the MTE structures — TCB (Task Control Block) and DCB (Device Control Block).

9. Data on the current task (the task ID and the task priority).

10. The RTU tasks are wrapped by two inner tasks (high, low) which are to be reached by the CPU every so and so ticks (the numbers are defined).

11. These two numbers are the maximum reached by the two tasks above.

81   LEVEL = 1

The list of all of the instances created, the key of each one of them and its address in memory.

82   LEVEL = 2

The list of all of the tasks created in the system, the stack address of each one of them, and the current number of unused bytes.

LINK

112   LEVEL = 0

```
Number of boxes in table (size of Tx queue)            : %% 1
Number of ack buffers to alloc                         : %% 2
Sequence (most + least - up to 13 bits)                : %% 3
Number of retries until positive ack received          : %% 4
Number of retries for negative ack (busy)              : %% 5
Interval until next retry in case of busy              : %% 6
Number of retries for setcall frame                    : %% 7
Simultaneous (4 channel priority)                      : %% 8
Specific logical address                               : %% 9
System address                                         : %% 10
Number of holds                                        : %% 11
Interval between holds                                 : %% 12
All RTU range response                                 : %% 13
Stop using AUTH TX state (flag, 1=YES)                 : %% 14
Start using AUTH TX state (flag, 1=YES)                : %% 14
Stop using AUTH RX state (flag, 1=YES)                 : %% 15
Start using AUTH RX state (flag, 1=YES)                : %% 15
Stop obeying AUTH TX (flag, 1=YES)                     : %% 18
Start obeying AUTH TX (flag, 1=YES)                    : %% 19
Stop obeying AUTH RX (flag, 1=YES)                     : %% 10
Start obeying AUTH RX (flag, 1=YES)                    : %% 11
Is AUTH active TX (flag, 1=YES)                        : %% 12
Is AUTH active RX (flag, 1=YES)                        : %% 13
Obeying AUTH TX (flag, 1=YES)                          : %% 14
Obeying AUTH RX (flag, 1=YES)                          : %% 15
TimeAuth handle:                                       : %% 16
TimeAuth device key (HEX):                             : %% 17
```

1. The number of MDLC frames that the Link layer can handle simultaneously.

2. The number of ACK frames that are available to the instance Link for transmitting ACK for the receiving MDLC frames.

3. The number of bits reserved for the sequence number in the Link layer protocol of the MDLC Frame.

4. The number of times the MDLC frame was retried without receiving ACK.

5. The number of MDLC frame retries that received Busy ACK. (The receiving site does not have enough room to handle it because of overload).

6. The number of seconds between transmission attempts in case of Busy ACK.

7. The number of times the broadcast frame was retried.

8. The number of different addresses the Link will transmit to simultaneously.

9. The RTU Site ID.

10. The RTU System address.

11. The time that the Link layer waits when the Physical layer returns Busy to the transmission attempts of the Link layer in "private conversation", until it retries.

12. The number of times the Link layer will try to transmit to the Physical layer, if the latter returns Busy in "private conversation".

13. The Link layer is capable of answering a range of addresses. This number is the upper bound that the RTU reacts to, whereas the lower bound is the Site ID.

14. Flag which indicates AUTH TX state (1=YES, 0=NO)

15. Flag which indicates AUTH RX state (1=YES, 0=NO)

16. Flag which indicates Stop obeying AUTH TX (1=YES, 0=NO)

17. Flag which indicates Start obeying AUTH TX (1=YES, 0=NO)

18. Flag which indicates Stop obeying AUTH RX (1=YES, 0=NO)

19. Flag which indicates Start obeying AUTH RX (1=YES, 0=NO)

20. Flag which indicates that AUTH is active for TX (1=YES, 0=NO)

21. Flag which indicates that AUTH is active for RX (1=YES, 0=NO)

22. Flag which indicates Obeying AUTH TX (1=YES, 0=NO)

23. Flag which indicates Obeying AUTH RX (1=YES, 0=NO)

24. TimeAuth identifier

25. TimeAuth device key (HEX)

113   LEVEL = 1

```
Address 0 to transmit in same snapshot                    : %% 1
Address 1 to transmit in same snapshot                    : %% 1
Address 2 to transmit in same snapshot                    : %% 1
Address 3 to transmit in same snapshot                    : %% 1
Network device key                                        : %% 2
Physical device key                                       : %% 3
Physical pin's table                                      : %% 3
Last reported station in fail                             : %% 4
Port fail flag                                            : %% 5
'one to one' flag                                         : %% 6
Full duplex flag                                          : %% 7
# of frames in Tx queue                                   : %% 8
# of frames in 'wait for ack' queue                       : %% 9
# of frames in 'busy & setcall' queue                     : %% 10
# of frames in 'busy & finish' queue                      : %% 11
'private conversation' flag                               : %% 12
```

1. The Link layer is capable of sending to up to four different addresses simultaneously. These fields contain the last four target addresses transmitted in the same transmission.

2. The Network layer key.

3. The pins table and key of the Physical layer below link. The Link layer is capable of connecting to any of the different physical media.

4. The last unit that has been reported to be in fail state.

5. The physical port in fail.

6. Mark if the link answers to the local address.

7. Mark if the link is full duplex.

8. The number of frames currently in the Tx queue.

9. The number of frames currently in the Wait for ACK queue .

10. The number of frames currently in the Busy and Broadcast queue that are waiting for the timeout between retries.

11. The number of frames waiting for the timeout between retries to be over and to be transmitted before new data frames waiting in the Tx queue.

12. Whether link functions in the private conversation mode (not in use in RTU).

115   LEVEL = 10/11

```
# of transmitted frames                                   : %% 1
# of re-transmitted frames                                : %% 2
# of  received frames                                     : %% 3
# of received frames (with error)                         : %%
```

1. The # of Transmitted Frames does not include retransmission and acknowledgment frames.

2. The # of Re-transmitted Frames represents only frames rejected by the physical layer (do not use this number; use the # of Re-transmitted Frames in the Link device).

3. The # of Received Frames includes only correct frames.

NETWORK STOCK   (NSTOCK)

144   LEVEL = 0

```
RAM sock size                                         : %% 1
RAM stock length                                      : %% 2
Network configuration size                            : %% 3
Was network configuration downloaded ?                : %% 4
Used site id for download                             : %% 5
Used link id for download                             : %% 6
Is it a node ?                                        : %% 7
```

1. The bank size of learned paths by the Network program.

2. The number of learned paths currently in the bank.

3. The number of paths in the network loaded by the RTU.

4. Whether the Network configuration was loaded to the flash memory.

5. The Site ID which was used for loading the network (must be the same as the self site ID).

6. The Link ID which was used for loading the network (must be one of the RTU links).

7. Whether the RTU is a node in the network.

145   LEVEL = 1

```
Nothing in stock *
```

Marked with * if no path was learned, otherwise a table of the learned paths appears:

```
      Dest Link        Via Site        Thru Link
```

146   LEVEL = 2

```
Nothing in scf *
```

Marked with * if no network was downloaded, otherwise as in ## 145.

151   LEVEL = 4

```
Pointer to authentication information header %% 1
```

1. Points to the header of the authentication information.

NETWORK (NETWRK)

180   LEVEL = 0

```
# of links actually connected to network layer      : %% 1
Transport interface key                             : %% 2
Formatted buffers heap key 1                         : %% 3
Formatted buffers heap key 2                         : %% 3
Network stock key                                   : %% 4
Default central link key                            : %% 5
Default central via link-id                         : %% 6
Default central thru site-id                        : %% 7
The unit site-id                                    : %% 8
The default central flag                            : %% 9
The network transparent flag                        : %% 10
```

1. The number of links registered on the network layer, when each zone is considered a separate link.

2. The Transport Multiplex layer key.

3. Heap keys. Identifier of heap from which to take buffers for the Network to transmit Default central location, and also to duplicate MDLC frame, if needed.

4. The network bank key.

5. The link key through which MDLC frames should be channeled in case of Dest = default central.

6. The link ID of the Default control path in the unit.

7. The site ID where the MDLC frame is directed towards the Default Central.

8. The unit site ID.

9. This parameter determines whether this site is the Default Central.

10. Is the Network "transparent," i.e. is there only a single path for transmission?

181   LEVEL = 10/11

```
# of transmitted frames                             : %% 1
# of received frames                                : %% 2
# of received frames (with error)                   : %%
```

1. The # of Transmitted Frames does not include retransmission and acknowledgment frames.

2. The # of Received Frames includes only correct frames.

MINISESSION   (EVNT , STCL)

EVNT	Event & Burst device
STCL	Broadcast reception device

200   LEVEL = 0

```
Application id                                             : %% 1
No. of boxes in device                                    : %% 2
No. of retries                                            : %% 3
Interval between retries                                  : %% 4
Time till flushing rcv frames                             : %% 5
Protocol flags                                            : %% 6
Does task exist ?                                         : %% 7
Is flushing needed ?                                      : %% 8
Heap key                                                  : %% 9
Index of first box in free queue                          : %% 10
Index of first box in "wait for answ" queue              : %% 11
Index of first box in "answers from outside" queue       : %% 12
Index of first box in "request to applic" queue          : %% 13
Index of first box in "waiting for applic answer" queue  : %% 14
Index of first box in "originate from applic" queue      : %% 15
Index of first box in "setcall from applic" queue        : %% 16
Index of first box in "answers from applic" queue        : %% 17
```

1. The application ID.

2. The number of frames to be managed simultaneously in the device instance.

3. The number of Tx retries.

4. Timeout in seconds between TX retries.

5. The time in seconds until the system discards the MDLC frames not solicited by the Application layer (Ladder or "C" application)

6. Instance internal signals.

7. Whether the instance functions with task.

8. Mark if queues should be cleared.

9. Heap key used for transmission.

10. The next index of free boxes.

11. The next index of frames awaiting answer.

12. The next index of slave answer.

13. The next index of incoming frames.

14. The next index of incoming "originate" frames.

15. The next index of outbound "originate" frames.

16. The next index of broadcast frames to be issued.

17. The next index of answer frames to be issued.

201   LEVEL = 1

```
Boxes_nr                                                   : %% 1
Boxes in free queue                                        : %% 2
Boxes in wait_for_outside_answr queue                      : %% 3
Boxes in outside_answrs queue                              : %% 4
Boxes in requests_from_applic queue                        : %% 5
Boxes in wait_for_applic_answr queue                       : %% 6
Boxes in originate queue                                   : %% 7
Boxes in setcall queue                                     : %% 8
Boxes in answer queue                                      : %% 9
```

1. Total number of boxes to be handled by this instance. Each box handles one MDLC frame.

2. Current number of free boxes.

3. Current number of boxes waiting for answer.

4. Current number of boxes that are slave-answers.

5. Current number of frame boxes that arrived.

6. Number of originate boxes that arrived.

7. Number of originate boxes to be sent.

8. Number of broadcast boxes to be sent.

9. Number of answer boxes to be sent.

202   LEVEL = 2

```
      "waiting for outside answer queue"
      ------------------------------------------
buf   site  port  link  retries  ret_time  indx  p_indx  _indx  q_nr
--------------------------------------------------------------------
 %%    %%    %%    %%     %%        %%        %%     %%     %%     %%
 1     2     3     4      5         6         7      8      9      10
```

1. Frame address.

2. Destination site ID.

3. Destination port ID.

4. Destination link ID.

5. Number of retries left.

6. Amount of time left until the next retry.

7. Box index.

8. Previous box index.

9. Next box index.

10. The internal queue ID.

203   LEVEL = 3

```
     "outside answers queue"
     ------------------------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9       10
```

See #202 above.

204   LEVEL = 4

```
     "requests from application queue"
     -------------------------------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9       10
```

See #202 above.

205   LEVEL = 5

```
     "waiting for application queue"
     ----------------------------------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9       10
```

206   LEVEL = 6

```
     "originate queue"
     --------------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9       10
```

207   LEVEL = 7

```
     "setcall queue"
     -----------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9       10
```

See #202 above.

208   LEVEL = 8

```
      "answers queue"
      --------------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9      10
```

See #202 above.

209   LEVEL = 9

```
      "free queue"
      ---------------
buf   site   port   link   retries   ret_time   indx   p_indx   _indx   q_nr
---------------------------------------------------------------------------
 %%    %%     %%     %%      %%         %%         %%      %%       %%      %%
 1     2      3      4       5          6          7       8        9      10
```

See #202 above.

210   LEVEL = 10/11

```
# of transmitted frames as originate              : %%
# of transmitted frames as groupcall              : %%
# of transmitted frames as answer                 : %%
# of transmitted frames as message                : %%
# of re-transmitted frames originate              : %%
# of received frames as originate                 : %%
# of received frames as groupcall                 : %%
# of received frames as answer                    : %%
# of received frames as message                   : %%
# of received frames (with error)                 : %%
```

See *Diagnostics* in the *System Setup and Diagnostics Tools* manual.

HDLC   (RAD1P, RAD2P,...)

260   LEVEL = 0

```
HDLC hardware/software last status :-
Internal software data (key)    (DATA)             : %% 1
Internal hardware registers      (IREG)            : %% 2
Internal hardware parameters    (IRAM)             : %% 3
Current channel port   (HDLC_PORT)                 : %% 4
Reception data lock     (RXBD_LOCK)                : %% 5
Transmission data lock  (TXBD_LOCK)                : %% 6
Reception data header   (RXBD_HEAD)                : %% 7
Reception data tail     (RXBD_TAIL)                : %% 8
Transmission data header  (TXBD_HEAD)              : %% 9
Transmission data tail   (TXBD_TAIL)               : %% 10
Communication signals  (HDLC_SIGNAL)               : %% 11
Communication buffers   (HDLC_TYPE)                : %% 12
Discard frame counter   (DISFC)                    : %% 13
Crc error counter   (CRCEC)                        : %% 14
Abort sequence counter    (ABTSC)                  : %% 15
Non matching address counter  (NMARC)              : %% 16
Frame retransmit counter    (RETRC)                : %% 17
Current reception empty buffers                    : %% 18
Current reception ready buffers                    : %% 19
Current transmission ready buffers                 : %% 20
Current transmission empty buffers                 : %% 21
```

1. Device key address.

2. Address of H-W registers.

3. Address of H-W parameters.

4. The port number.

5. Semaphore of the reception function.

6. Semaphore of the transmission function.

7. Offset in RX_QUEUE (descriptors) for the entry of the new frame that has been received in port.

8. Offset in RX_QUEUE for moving the next frame to upper layers.

9. Offset in TX_QUEUE for moving a new frame to transmission, by upper layers.

10. Offset in TX_QUEUE from where this device takes the next frame for transmission.

11. MTE signal of events that took place.

12. Whether the frame is formatted/unformatted.

13. The number of discarded frames.

14. The number of CRC-error frames.

15. The number of abort-sequence frames.

16. The number of nonmatching address frames.

17. The number of retransmitted frames.

18. The number of empty frames ready to be received.

19. The number of frames received.

20. The number of frames transmitted.

21. The number of empty frames directed to transmission.

261   LEVEL = 1

```
HDLC hardware control and status :-
Internal software data (key)      (DATA)            : %% 1
Internal hardware registers    (IREG)              : %% 2
Internal hardware parameters   (IRAM)              : %% 3
Scc configuration register   (SCON)                : %% 4
Scc mode register    (SCM)                         : %% 5
Scc data sync. register     (DSR)                  : %% 6
Scc event register          (SCCE)                 : %% 7
Scc mask register        (SCCM)                    : %% 8
Scc status register       (SCCS)                   : %% 9
Temp receive crc          (RCRC_L/H)               : %%  %% 10
Crc polynom mask        (C_MASK_L/H)               : %%  %% 10
Temp transmit crc          (TCRC_L/H)              : %%  %% 10
Discard frame counter      (DISFC)                 : %% 10
Crc error counter            (CRCEC)               : %% 10
Abort sequence counter     (ABTSC)                 : %% 10
Nonmatch address counter   (NMARC)                 : %% 10
Frame retransmit counter    (RETRC)                : %% 10
Receive frame maximum length      (MFLR)           : %% 10
Receive frame length counter  (MAX_CNT)            : %% 10
User define frame address mask  (HMASK)            : %% 11
User define frame addresses (HADDRX)               : %% %% %% %% 12
```

1. Device key address.

2. Address of H-W registers.

3. Address of H-W parameters.

4. Determines the clock direction (Rx or Tx) and the baud rate

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. Not in use.

11. Mask of received addresses.

12. The addresses to which this site responds via this port.

262   LEVEL = 2

```
HDLC hardware data buffers status :-
Internal software data (key)     (DATA)  : %% 1
Internal hardware registers      (IREG)  : %% 2
Internal hardware parameters     (IRAM)  : %% 3
Receive buffer descriptor 0      (RXBD0) : %%  %%  %%  %% 4
Receive buffer descriptor 1      (RXBD1) : %%  %%  %%  %% 5
Receive buffer descriptor 2      (RXBD2) : %%  %%  %%  %% 6
Receive buffer descriptor 3      (RXBD3) : %%  %%  %%  %% 7
Receive buffer descriptor 4      (RXBD4) : %%  %%  %%  %% 8
Receive buffer descriptor 5      (RXBD5) : %%  %%  %%  %% 9
Receive buffer descriptor 6      (RXBD6) : %%  %%  %%  %% 10
Receive buffer descriptor 7      (RXBD7) : %%  %%  %%  %% 11
Transmit buffer descriptor 0     (TXBD0) : %%  %%  %%  %% 12
Transmit buffer descriptor 1     (TXBD1) : %%  %%  %%  %% 13
Transmit buffer descriptor 2     (TXBD2) : %%  %%  %%  %% 14
Transmit buffer descriptor 3     (TXBD3) : %%  %%  %%  %% 15
Transmit buffer descriptor 4     (TXBD4) : %%  %%  %%  %% 16
Transmit buffer descriptor 5     (TXBD5) : %%  %%  %%  %% 17
Transmit buffer descriptor 6     (TXBD6) : %%  %%  %%  %% 18
Transmit buffer descriptor 7     (TXBD7) : %%  %%  %%  %% 19
Rxd/Txd function code            (R/TFCR): %% 20
Maximum receive buffer length    (MRBLR) : %% 21
Current receive buffer status            : %% 22
Current receive buffer offset    (RBD#)  : %% 23
Current receive data pointer             : %% 24
Current receive byte counter             : %% 24
Current receive temp memory              : %% 24
Current transmit buffer status           : %% 25
Current transmit buffer offset   (TBD#)  : %% 26
Current transmit data pointer            : %% 27
Current transmit byte counter            : %% 27
Current transmit temp memory             : %% 27
```

1. Device key address.

2. Address of H-W registers.

3. Address of H-W parameters.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

263   LEVEL = 3

```
HDLC software control and status :-
Internal software data (key)     (DATA)        : %% 1
Internal hardware registers      (IREG)        : %% 2
Internal hardware parameters     (IRAM)        : %% 3
Current mode parameters          (MODE_BACKUP) : %% 4
Current rate parameters          (RATE_BACKUP) : %% 5
Current sync parameters          (SYNC_BACKUP) : %% 6
Address mask parameters          (MASK_BACKUP) : %% 7
Address data parameters          (ADRS_BACKUP) : %% %% %% %% 8
Current channel name             (CHAN_BACKUP) : %% 9
Current channel data             (CHAN_DATA)   : %% 10
Current channel code             (CHAN_CODE)   : %% 11
Current heap name                (HEAP_BACKUP) : %% 12
Current heap name                (HEAP_DATA)   : %% 13
Current heap data                (HEAP_CODE)   : %% 14
Current channel port             (HDLC_PORT)   : %% 15
Reception data lock              (RXBD_LOCK)   : %% 16
Transmission data lock           (TXBD_LOCK)   : %% 17
Reception next free              (RXBD_FREE)   : %% 18
Transmission next free           (TXBD_FREE)   : %% 19
Reception data header            (RXBD_HEAD)   : %% 20
Transmission data tail           (TXBD_TAIL)   : %% 21
Communication signals            (HDLC_SIGNAL) : %% 22
Communication buffer             (HDLC_TYPE)   : %% 23
Communication HDLC lock          (HDLC_LOCK)   : %% 24
Communication time lock          (TIME_LOCK)   : %% 25
Communication time data          (TIME_DATA)   : %% 26
Communication status             (NOISY)       : %% 27
                                 (QUIET)       : %% 28
Communication preset/timers      (GRANT)       : %% %% 29
                                 (QUIET)       : %% %% 30
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Not relevant.

8. The addresses to which this site will respond through this port.

9. The channel access name.

10. The channel access device key.

11. Channel access pin table.

12. The heap name (HP_F_RX).

13. The heap device key.

14. The heap pin table.

15. The Port number.

16. Semaphore of the reception function.

17. Semaphore of the transmission function.

18. Offset in Rx descriptors to the next free descriptor.

19. Offset in Tx descriptors to the next free descriptor.

20. Offset for Rx descriptors for receiving frame.

21. Offset for Tx descriptors for transmitting frame.

22. MTE signal of conditions that were met.

23. Whether the frame is formatted or unformatted.

24. Device semaphore.

25. Not in use.

26. Coded time stamp of last received frame (in ticks).

27. Current counter of noise.

28. Current counter of quiet.

29. GRANT-TIME for channel access: The time the site will wait to obtain a transmission channel until it decides that a channel is not available.

30. QUIET-TIME after transmission: The time to wait before a retry.

264   LEVEL = 4

```
Mode of operation                                          : %% 1
TimeAuth device key (HEX)                                  : %% 2
TimeAuth handle                                            : %% 3
Authentication stamp offset                                : %% 4
```

1. Whether or not to allow reception of SYNC frames.

2. TimeAuth device key in Hexadecimal form.

3. TimeAuth identifier.

4. Offset of Authentication stamp within the buffer for authenticated SYNC frames only.

270   LEVEL = 10/11

```
HDLC hardware/software last status :-
Discard frame counter                          (DISFC)   : %% 1
CRC error counter                              (CRCEC)   : %% 2
Abort sequence counter                         (ABTSC)   : %% 3
Non matching address counter                   (NMARK)   : %% 4
Frame retransmit counter                       (RETRC)   : %% 5
```

1. The number of discarded frames.

2. The number of CRC-error frames.

3. The number of abort-sequence frames.

4. The number of nonmatching address frames.

5. The number of retransmitted frames.

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```
HDLC hardware/software last status :-
Discard frame counter                          (DISFC)   : %% 1
CRC error counter                              (CRCEC)   : %% 2
Abort sequence counter                         (ABTSC)   : %% 3
Non matching address counter                   (NMARK)   : %% 4
Frame retransmit counter                       (RETRC)   : %% 5
```

1. The number of discarded frames.

2. The number of CRC-error frames.

3. The number of abort-sequence frames.

4. The number of nonmatching address frames.

5. The number of retransmitted frames.

UART

280

```
UART  hardware/software last status :-
Internal software data (key)          (DATA)       : %% 1
Internal hardware registers           (IREG)       : %% 2
Internal hardware parameters          (IRAM)       : %% 3
Current channel port                  (UART_PORT)  : %% 4
Reception data lock                   (RXBD_LOCK)  : %% 5
Transmission data lock                (TXBD_LOCK)  : %% 6
Reception data header                 (RXBD_HEAD)  : %% 7
Reception data tail                   (RXBD_TAIL)  : %% 8
Transmission data header              (TXBD_HEAD)  : %% 9
Transmission data tail                (TXBD_TAIL)  : %% 10
Communication signals                 (UART_SIGNAL): %% 11
Communication buffers                 (UART_TYPE)  : %% %% 12
Idle characters counter               (IDLC)       : %% 13
Parity error counter                  (PAREC)      : %% 14
Framing error counter                 (FRMEC)      : %% 15
Noise error counter                   (NOSEC)      : %% 16
Break error counter                   (BRKEC)      : %% 17
Current reception empty buffer                     : %% 18
Current reception ready buffers                    : %% 19
Current transmission ready buffers                 : %% 20
Current transmission empty buffers                 : %% 21
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. The Port number.

5. Semaphore of the reception function.

6. Semaphore of the transmission function.

7. Offset for Rx descriptors for receiving frame.

8. Offset in RX_QUEUE for moving the next frame to upper layers.

9. Offset in TX_QUEUE for moving a new frame to transmission, by upper layers.

10. Offset in TX_QUEUE from where this device takes the next frame for transmission.

11. MTE signal of events that took place.

12. Whether the frame is formatted/unformatted.

13. The actual counter that counts the number of idles since the last character was received. For example, the time that a character takes to arrive (corresponds to idle) at 9600 baud is 1 msec.

14. The number of times the parity error occurred during the reception of a single byte.

15. The number of times the framing error occurred during the reception of a single byte.

16. The number of times the noise error occurred during the reception of a single byte.

17. The number of times a break signal (end of reception) was received at the port.

18. The number of empty frames ready to be received.

19. The number of frames received.

20. The number of frames transmitted.

21. The number of empty frames directed to transmission.

281

```
UART hardware control and status :-
Internal software data (key)       (DATA)       : %% 1
Internal hardware registers        (IREG)       : %% 2
Internal hardware parameters       (IRAM)       : %% 3
Scc configuration register         (SCON)       : %% 4
Scc mode register                  (SCM)        : %% 5
Scc data sync. register            (DSR)        : %% 6
Scc event register                 (SCCE)       : %% 7
Scc mask register                  (SCCM)       : %% 8
Scc status register                (SCCS)       : %% 9
Idle characters maximum            (MAX_IDL)    : %% 10
Idle characters counter            (IDLC)       : %% 11
Break characters register          (BRKCR)      : %% 12
Parity error counter               (PAREC)      : %% 13
Framing error counter              (FRMEC)      : %% 14
Noise error counter                (NOSEC)      : %% 15
Break error counter                (BRKEC)      : %% 16
User defined UART addresses        (UADDRX)     : %% %% 17
Control character register         (RCCR)       : %% 18
Control character table            (CHARACTERX) : %% %% %% %% 19
                                                : %% %% %% %%
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. How many idles to wait before declaring that the transmission has ended.

11. The actual counter that counts the number of idles since the last character was received. For example, the time that a character takes to arrive (corresponds to idle) at 9600 baud is 1 msec.

12. Break register.

13. The number of times the parity error occurred during the reception of a single byte.

14. The number of times the framing error occurred during the reception of a single byte.

15. The number of times the noise error occurred during the reception of a single byte.

16. The number of times a break signal (end of reception) was received at the port.

17. Not in use.

18. Control character register.

19. The characters that are used to close a frame.

282

```
UART hardware data buffers status :-
Internal software data (key)        (DATA)  : %% 1
Internal hardware registers         (IREG)  : %% 2
Internal hardware parameters        (IRAM)  : %% 3
Receive buffer descriptor 0         (RXBD0) : %%  %%  %%  %% 4
Receive buffer descriptor 1         (RXBD1) : %%  %%  %%  %% 5
Receive buffer descriptor 2         (RXBD2) : %%  %%  %%  %% 6
Receive buffer descriptor 3         (RXBD3) : %%  %%  %%  %% 7
Receive buffer descriptor 4         (RXBD4) : %%  %%  %%  %% 8
Receive buffer descriptor 5         (RXBD5) : %%  %%  %%  %% 9
Receive buffer descriptor 6         (RXBD6) : %%  %%  %%  %% 10
Receive buffer descriptor 7         (RXBD7) : %%  %%  %%  %% 11
Transmit buffer descriptor 0        (TXBD0) : %%  %%  %%  %% 12
Transmit buffer descriptor 1        (TXBD1) : %%  %%  %%  %% 13
Transmit buffer descriptor 2        (TXBD2) : %%  %%  %%  %% 14
Transmit buffer descriptor 3        (TXBD3) : %%  %%  %%  %% 15
Transmit buffer descriptor 4        (TXBD4) : %%  %%  %%  %% 16
Transmit buffer descriptor 5        (TXBD5) : %%  %%  %%  %% 17
Transmit buffer descriptor 6        (TXBD6) : %%  %%  %%  %% 18
Transmit buffer descriptor 7        (TXBD7) : %%  %%  %%  %% 19
Rxd/Txd function code               (R/TFCR): %% 20
Maximum receive buffer length       (MRBLR) : %% 21
Current receive buffer status               : %% 22
Current receive buffer offset        (RBD#) : %% 23
Current receive data pointer                : %%  %% 24
Current receive byte counter                : %% 24
Current receive temp memory                 : %% 24
Current transmit buffer status              : %% 25
Current transmit buffer offset       (TBD#) : %% 26
Current transmit data pointer               : %%  %% 27
Current transmit byte counter               : %% 27
Current transmit temp memory                : %% 27
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

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```
UART software control and status :-
Internal software data (key)        (DATA)        : %% 1
Internal hardware registers         (IREG)        : %% 2
Internal hardware parameters        (IRAM)        : %% 3
Current mode parameters             (MODE_BACKUP): %% 4
Current rate parameters             (RATE_BACKUP): %% 5
Current sync parameters             (SYNC_BACKUP): %% 6
Address mask parameters             (MASK_BACKUP): %% 7
Address data parameters             (ADRS_BACKUP): %% %% %% %% 8
Current channel name                (CHAN_BACKUP): %% 9
Current channel data                (CHAN_DATA)  : %% 10
Current channel code                (CHAN_CODE)  : %% 11
Current heap name                   (HEAP_BACKUP): %% 12
Current heap name                   (HEAP_DATA)  : %% 13
Current heap data                   (HEAP_CODE)  : %% 14
Current channel port                (UART_PORT)  : %% 15
Reception data lock                 (RXBD_LOCK)  : %% 16
Transmission data lock              (TXBD_LOCK)  : %% 17
Reception next free                 (RXBD_FREE)  : %% 18
Transmission next free              (TXBD_FREE)  : %% 19
Reception data header               (RXBD_HEAD)  : %% 20
Transmission data tail              (TXBD_TAIL)  : %% 21
Communication signals               (UART_SIGNAL): %% 22
Communication buffer                (UART_TYPE)  : %% 23
Communication HDLC lock             (UART_LOCK)  : %% 24
Communication time lock             (TIME_LOCK)  : %% 25
Communication time data             (TIME_DATA)  : %% 26
Communication status                (NOISY)      : %% 27
                                    (QUIET)      : %% 28
Communication preset/timers         (GRANT)      : %%  %% 29
                                    (QUIET)      : %%  %% 30
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Not relevant.

8. The addresses to which this site will respond through this port.

9. The channel access name.

10. The channel access device key.

11. Channel access pin table.

12. The heap name (HP_F_RX).

13. The heap device key.

14. The heap pin table.

15. The Port number.

16. Semaphore of the reception function.

17. Semaphore of the transmission function.

18. Offset in Rx descriptors to the next free descriptor.

19. Offset in Tx descriptors to the next free descriptor.

20. Offset for Rx descriptors for receiving frame.

21. Offset for Tx descriptors for transmitting frame.

22. MTE signal of conditions that were met.

23. Whether the frame is formatted or unformatted.

24. Device semaphore.

25. Not in use.

26. Coded time stamp of last received frame (in ticks).

27. Current counter of noise.

28. Current counter of quiet.

29. GRANT-TIME for channel access: The time the site will wait to obtain a transmission channel until it decides that a channel is not available.

30. QUIET-TIME after transmission: The time to wait before a retry.

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```
UART hardware/software last status :-
Internal software data (key)        (DATA)       : %% 1
Internal hardware registers         (IREG)       : %% 2
Internal hardware parameters        (IRAM)       : %% 3
Current channel port                (UART_PORT)  : %% 4
Reception data lock                 (RXBD_LOCK)  : %% 5
Transmission data lock              (TXBD_LOCK)  : %% 6
Reception data header               (RXBD_HEAD)  : %% 7
Reception data tail                 (RXBD_TAIL)  : %% 8
Transmission data header            (TXBD_HEAD)  : %% 9
Transmission data tail              (TXBD_TAIL)  : %% 10
Communication signals               (UART_SIGNAL): %% 11
Communication buffers               (UART_TYPE)  : %%  %% 12
Idle characters counter             (IDLC)       : %% 13
Parity error counter                (PAREC)      : %% 14
Framing error counter               (FRMEC)      : %% 15
Noise error counter                 (NOSEC)      : %% 16
Break error counter                 (BRKEC)      : %% 17
Current reception empty buffers                  : %% 18
Current reception ready buffers                  : %% 19
Current transmission ready buffers               : %% 20
Current transmission empty buffers               : %% 21
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. The Port number.

5. Semaphore of the reception function.

6. Semaphore of the transmission function.

7. Offset for Rx descriptors for receiving frame.

8. Offset in RX_QUEUE for moving the next frame to upper layers.

9. Offset in TX_QUEUE for moving a new frame to transmission, by upper layers.

10. Offset in TX_QUEUE from where this device takes the next frame for transmission.

11. MTE signal of events that took place.

12. Whether the frame is formatted/unformatted.

13. The actual counter that counts the number of idles since the last character was received. For example, the time that a character takes to arrive (corresponds to idle) at 9600 baud is 1 msec.

14. The number of times the parity error occurred during the reception of a single byte.

15. The number of times the framing error occurred during the reception of a single byte.

16. The number of times the noise error occurred during the reception of a single byte.

17. The number of times a break signal (end of reception) was received at the port.

18. The number of empty frames ready to be received.

19. The number of frames received.

20. The number of frames transmitted.

21. The number of empty frames directed to transmission.

286

```
UART hardware control and status :-
Internal software data (key)     (DATA)       : %% 1
Internal hardware registers      (IREG)       : %% 2
Internal hardware parameters     (IRAM)       : %% 3
Scc configuration register       (SCON)       : %% 4
Scc mode register                (SCM)        : %% 5
Scc data sync. register          (DSR)        : %% 6
Scc event register               (SCCE)       : %% 7
Reserved register                (RES2)       : %% 8
Scc mask register                (SCCM)       : %% 9
Reserved register                (RES3)       : %% 10
Scc status register              (SCCS)       : %% 11
Idle characters maximum          (MAX_IDL)    : %% 12
Idle characters counter          (IDLC)       : %% 13
Break characters register        (BRKCR)      : %% 14
Parity error counter             (PAREC)      : %% 15
Framing error counter            (FRMEC)      : %% 16
Noise error counter              (NOSEC)      : %% 17
Break error counter              (BRKEC)      : %% 18
User defined UART addresses      (UADDRX)     : %%  %% 19
Control character register       (RCCR)       : %% 20
Control character table          (CHARACTERX) : %%  %%  %%  %% 21
                                              : %%  %%  %%  %%
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Reserved.

9. Mask to block the interrupt.

10. Reserved.

11. The CM (Channel Monitor) and TD (Tone Detect) statuses.

12. How many idles to wait before declaring that the transmission has ended.

13. The actual counter that counts the number of idles since the last character was received. For example, the time that a character takes to arrive (corresponds to idle) at 9600 baud is 1 msec.

14. Break register.

15. The number of times the parity error occurred during the reception of a single byte.

16. The number of times the framing error occurred during the reception of a single byte.

17. The number of times the noise error occurred during the reception of a single byte.

18. The number of times a break signal (end of reception) was received at the port.

19. Not in use.

20. Control character register

21. The characters that are used to close a frame.

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```
UART hardware data buffers status :-
Internal software data (key)           (DATA)  : %% 1
Internal hardware registers            (IREG)  : %% 2
Internal hardware parameters           (IRAM)  : %% 3
Receive buffer descriptor 0            (RXBD0) : %%  %%  %%  %% 4
Receive buffer descriptor 1            (RXBD1) : %%  %%  %%  %% 5
Receive buffer descriptor 2            (RXBD2) : %%  %%  %%  %% 6
Receive buffer descriptor 3            (RXBD3) : %%  %%  %%  %% 7
Receive buffer descriptor 4            (RXBD4) : %%  %%  %%  %% 8
Receive buffer descriptor 5            (RXBD5) : %%  %%  %%  %% 9
Receive buffer descriptor 6            (RXBD6) : %%  %%  %%  %% 10
Receive buffer descriptor 7            (RXBD7) : %%  %%  %%  %% 11
Transmit buffer descriptor 0           (TXBD0) : %%  %%  %%  %% 12
Transmit buffer descriptor 1           (TXBD1) : %%  %%  %%  %% 13
Transmit buffer descriptor 2           (TXBD2) : %%  %%  %%  %% 14
Transmit buffer descriptor 3           (TXBD3) : %%  %%  %%  %% 15
Transmit buffer descriptor 4           (TXBD4) : %%  %%  %%  %% 16
Transmit buffer descriptor 5           (TXBD5) : %%  %%  %%  %% 17
Transmit buffer descriptor 6           (TXBD6) : %%  %%  %%  %% 18
Transmit buffer descriptor 7           (TXBD7) : %%  %%  %%  %% 19
Rxd/Txd function code                  (R/TFCR): %% 20
Maximum receive buffer length          (MRBLR) : %% 21
Current receive buffer status                  : %% 22
Current receive buffer offset           (RBD#) : %% 23
Current receive data pointer                   : %%  %% 24
Current receive byte counter                   : %% 24
Current receive temp memory                    : %% 24
Current transmit buffer status                 : %% 25
Current transmit buffer offset          (TBD#) : %% 26
Current transmit data pointer                  : %%  %% 27
Current transmit byte counter                  : %% 27
Current transmit temp memory                   : %% 27
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

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```
UART software control and status :-
Internal software data (key)      (DATA)      : %% 1
Internal hardware registers       (IREG)      : %% 2
Internal hardware parameters      (IRAM)      : %% 3
Current mode parameters        (MODE_BACKUP): %% 4
Current rate parameters        (RATE_BACKUP): %% 5
Current sync parameters        (SYNC_BACKUP): %% 6
Address mask parameters        (MASK_BACKUP): %% 7
Address data parameters        (ADRS_BACKUP): %%  %%  %%  %% 8
Current heap name              (HEAP_KEY)   : %% 9
Current channel port           (DART_PORT)  : %% 10
Reception data lock            (RXBD_LOCK)  : %% 11
Transmission data lock         (TXBD_LOCK)  : %% 12
Reception next free            (RXBD_FREE)  : %% 13
Transmission next free         (TXBD_FREE)  : %% 14
Reception data header          (RXBD_HEAD)  : %% 15
Transmission data tail         (TXBD_TAIL)  : %% 16
Communication signals          (UART_SIGNAL): %% 17
Communication buffer           (DART_TYPE)  : %%  %% 18
Communication UART lock        (DART_LOCK)  : %% 19
Communication time lock        (TIME_LOCK)  : %% 20
Communication time data        (TIME_DATA)  : %% 21
Communication status           (NOISY)      : %% 22
                               (QUIET)      : %% 23
Communication preset/timers    (GRANT)      : %%  %% 24
                               (QUIET)      : %%  %% 25
Incoming Call flag                          : %% 26
Second counter                              : %% 27
```

1. Device key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Not relevant.

8. The addresses to which this site will respond through this port.

9. The heap device key.

10. The Port number.

11. Semaphore of the reception function.

12. Semaphore of the transmission function.

13. Offset in Rx descriptors to the next free descriptor.

14. Offset in Tx descriptors to the next free descriptor.

15. Offset for Rx descriptors for receiving frame.

16. Offset for Tx descriptors for transmitting frame.

17. MTE signal of conditions that were met.

18. Whether the frame is formatted or unformatted.

19. Internal variable that represents the device status.

20. Not in use.

21. Coded time stamp of last received frame (in ticks).

22. Current counter of noise.

23. Current counter of quiet.

24. GRANT-TIME for channel access: The time the site will wait to obtain a transmission channel until it decides that a channel is not available.

25. QUIET-TIME after transmission: The time to wait before a retry.

26. Internal device variable.

27. Internal device variable.

290
```
UART hardware/software last status :-
Parity error counter                            (PAREC) : %% 1
Framing error counter                           (FRMEC) : %% 2
Noise error counter                             (NOSEC) : %% 3
Break error counter                             (BRKEC) : %% 4
```

1. The number of times the parity error occurred during the reception of a single byte.

2. The number of times the framing error occurred during the reception of a single byte.

3. The number of times the noise error occurred during the reception of a single byte.

4. The number of times a break signal (end of reception) was received at the port.

291
```
UART hardware/software last status :-
Parity error counter                            (PAREC) : %% 1
Framing error counter                           (FRMEC) : %% 2
Noise error counter                             (NOSEC) : %% 3
Break error counter                             (BRKEC) : %% 4
```

1. The number of times the parity error occurred during the reception of a single byte.

2. The number of times the framing error occurred during the reception of a single byte.

3. The number of times the noise error occurred during the reception of a single byte.

4. The number of times a break signal (end of reception) was received at the port.

RADIO CHANNEL (RAD1C , RAD2C,…)

300   LEVEL = 0

```
Radio hardware/software last status :-
Internal software data (key)        (DATA)       : %% 1
Internal hardware registers         (IREG)       : %% 2
Internal hardware parameters        (IRAM)       : %% 3
Current channel port                (CHAN_PORT)  : %% 4
Channel status mode                 (CHAN_MODE)  : %% 5
Channel driver lock                 (CHAN_LOCK)  : %% 6
Channel signals                     (CHAN_SIGNAL): %% 7
Channel access type                 (CHAN_ACCESS): %%
Channel driver type                 (CHAN_TYPE)  : %% 8
Channel control register            (PBCNT)      : %% 9
Channel direction register          (PBDDR)      : %% 10
Channel data register               (PBDAT)      : %% 11
Current reception empty buffers                  : %% 12
Current reception ready buffer                   : %% 13
Current transmission ready buffers               : %% 14
Current transmission empty buffers               : %% 15
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Port number.

5. Configuration mode.

6. Channel access semaphore.

7. MTE signal on events that took place.

8. Whether FSK, DPSK or FSK.

9. Defines the functionality of port B in 68*xxx* (68000 family).

10. Determines whether the pin is for input or output.

11. Defines the value of the pin (previous parameter).

12. Number of empty Rx descriptors.

13. Number of busy Rx descriptors.

14. Number of busy Tx descriptors.

15. Number of empty Tx descriptors.

301

```
Radio hardware control and status :-
Internal software data (key)            (DATA)  : %% 1
Internal hardware registers             (IREG)  : %% 2
Internal hardware parameters            (IRAM)  : %% 3
Scc configuration register              (SCON)  : %% 4
Scc mode register                       (SCM)   : %% 5
Scc data sync. register                 (DSR)   : %% 6
Scc event register                      (SCCE)  : %% 7
Scc mask register                       (SCCM)  : %% 8
Scc status register                     (SCCS)  : %% 9
Channel control register                (PBCNT) : %% 10
Channel direction register              (PRDDR) : %% 11
Channel data register                   (PBDAT) : %% 12
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. Defines the functionality of port B in 68.

11. Determines whether the pin is for input or output.

12. Defines the value of the pin (previous parameter).

302   LEVEL = 2

```
Radio hardware data buffers status :-
Internal software data (key)            (DATA)  : %% 1
Internal hardware registers             (IREG)  : %% 2
Internal hardware parameters            (IRAM)  : %% 3
Receive buffer descriptor 0             (RXBD0) : %%  %%  %%  %% 4
Receive buffer descriptor 1             (RXBD1) : %%  %%  %%  %% 5
Receive buffer descriptor 2             (RXBD2) : %%  %%  %%  %% 6
Receive buffer descriptor 3             (RXBD3) : %%  %%  %%  %% 7
Receive buffer descriptor 4             (RXBD4) : %%  %%  %%  %% 8
Receive buffer descriptor 5             (RXBD5) : %%  %%  %%  %% 9
Receive buffer descriptor 6             (RXBD6) : %%  %%  %%  %% 10
Receive buffer descriptor 7             (RXBD7) : %%  %%  %%  %% 11
Transmit buffer descriptor 0            (TXBD0) : %%  %%  %%  %% 12
Transmit buffer descriptor 1            (TXBD1) : %%  %%  %%  %% 13
Transmit buffer descriptor 2            (TXBD2) : %%  %%  %%  %% 14
Transmit buffer descriptor 3            (TXBD3) : %%  %%  %%  %% 15
Transmit buffer descriptor 4            (TXBD4) : %%  %%  %%  %% 16
```

```
Transmit buffer descriptor 5          (TXBD5) : %%   %%   %%   %% 17
Transmit buffer descriptor 6          (TXBD6) : %%   %%   %%   %% 18
Transmit buffer descriptor 7          (TXBD7) : %%   %%   %%   %% 19
Rxd/Txd function code                 (R/TFCR): %% 20
Maximum receive buffer length         (MRBLR) : %% 21
Current receive buffer status                 : %% 22
Current receive buffer offset          (RBD#) : %% 23
Current receive data pointer                  : %%   %% 24
Current receive byte counter                  : %% 24
Current receive temp memory                   : %% 24
Current transmit buffer status                : %% 25
Current transmit buffer offset        (TBD#)  : %% 26
Current transmit data pointer                 : %%   %% 27
Current transmit byte counter                 : %% 27
Current transmit temp memory                  : %% 27
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

303   LEVEL = 3

```
Radio software control and status :-
Internal software data (key)      (DATA)            : %% 1
Internal hardware registers       (IREG)            : %% 2
Internal hardware parameters      (IRAM)            : %% 3
Current mode parameters           (MODE_BACKUP)     : %% 4
Current rate parameters           (RATE_BACKUP)     : %% 5
Current sync parameters           (SYNC_BACKUP)     : %% 6
Current channel port              (CHAN_PORT)       : %% 7
Channel status mode               (CHAN_MODE)       : %%  %% 8
Channel driver lock               (CHAN_LOCK)       : %% 9
Channel signals                   (CHAN_SIGNAL)     : %% 10
Channel access type               (CHAN_ACCESS)     : %%
Channel driver type               (CHAN_TYPE)       : %% 11
Channel addresses                 (CHAN/NEXT/MASK)  : %%  %%  %% 12
Channel status                    (NOISY)           : %% 13
                                  (QUIET)           : %%
Channel preset/timers             (OVERRIDE)        : %%  %% 14
                                  (RESOLUTE/QUIET)  : %%  %%
                                  (SHUTUP)          : %%  %%
                                  (GRANT)           : %%  %%
                                  (WARMUP)          : %%  %%
                                  (TRANSMIT)        : %%  %%
                                  (HOLDUP)          : %%  %%
                                  (RESPOND)         : %%  %%
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Port number.

8. Configuration mode.

9. Channel access semaphore.

10. MTE signal on events that took place.

11. Whether FSK, DPSK or FSK.

12. The address to which this site will respond through this port.

13. Actual channel access timers.

14. Preset timers for fields defined in the advanced parameters of Port 3.

TRUNK CHANNEL

320

```
Trunk radio hardware/software last status :-
Internal software data (key)              (DATA)       : %% 1
Internal hardware registers               (IREG)       : %% 2
Internal hardware parameters              (IRAM)       : %% 3
Current channel port                      (CHAN_PORT)  : %% 4
Channel status mode                       (CHAN_MODE)  : %% 5
Channel driver lock                       (CHAN_LOCK)  : %% 6
Channel signals                           (CHAN_SIGNAL): %% 7
Channel access type                       (CHAN_ACCESS): %%
Channel driver type                       (CHAN_TYPE)  : %% 8
Channel control register                  (PBCNT)      : %% 9
Channel direction register                (PBDDR)      : %% 10
Channel data register                     (PBDAT)      : %% 11
Current reception empty buffers                        : %% 12
Current reception ready buffers                        : %% 13
Current transmission ready buffers                     : %% 14
Current transmission empty buffers                     : %% 15
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Port number.

5. Configuration mode.

6. Channel access semaphore.

7. MTE signal on events that took place.

8. Whether FSK, DPSK or FSK.

9. Defines the functionality of port B in 68.

10. Determines whether the pin is for input or output.

11. Defines the value of the pin (previous parameter).

12. Number of empty Rx descriptors.

13. Number of busy Rx descriptors.

14. Number of busy Tx descriptors.

15. Number of empty Tx descriptors.

321

```
Trunk radio hardware control and status :-
Internal software data (key)                          (DATA) : %% 1
Internal hardware registers                           (IREG) : %% 2
Internal hardware parameters                          (IRAM) : %% 3
Scc configuration register                            (SCON) : %% 4
Scc mode register                                     (SCM)  : %% 5
Scc data sync. register                               (DSR)  : %% 6
Scc event register                                    (SCCE) : %% 7
Scc mask register                                     (SCCM) : %% 8
Scc status register                                   (SCCS) : %% 9
Channel control register                              (PBCNT): %% 10
Channel direction register                            (PRDDR): %% 11
Channel data register                                 (PBDAT): %% 12
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. Defines the functionality of port B in 68.

11. Determines whether the pin is for input or output.

12. Defines the value of the pin (previous parameter).

322

```
Trunk radio hardware data buffers status :-
Internal software data (key)          (DATA) : %% 1
Internal hardware registers           (IREG) : %% 2
Internal hardware parameters          (IRAM) : %% 3
Receive buffer descriptor 0           (RXBD0) : %%   %%   %%   %% 4
Receive buffer descriptor 1           (RXBD1) : %%   %%   %%   %% 5
Receive buffer descriptor 2           (RXBD2) : %%   %%   %%   %% 6
Receive buffer descriptor 3           (RXBD3) : %%   %%   %%   %% 7
Receive buffer descriptor 4           (RXBD4) : %%   %%   %%   %% 8
Receive buffer descriptor 5           (RXBD5) : %%   %%   %%   %% 9
Receive buffer descriptor 6           (RXBD6) : %%   %%   %%   %% 10
Receive buffer descriptor 7           (RXBD7) : %%   %%   %%   %% 11
```

C-43

```
Transmit buffer descriptor 0         (TXBD0) : %%   %%   %%   %% 12
Transmit buffer descriptor 1         (TXBD1) : %%   %%   %%   %% 13
Transmit buffer descriptor 2         (TXBD2) : %%   %%   %%   %% 14
Transmit buffer descriptor 3         (TXBD3) : %%   %%   %%   %% 15
Transmit buffer descriptor 4         (TXBD4) : %%   %%   %%   %% 16
Transmit buffer descriptor 5         (TXBD5) : %%   %%   %%   %% 17
Transmit buffer descriptor 6         (TXBD6) : %%   %%   %%   %% 18
Transmit buffer descriptor 7         (TXBD7) : %%   %%   %%   %% 19
Rxd/Txd function code                (R/TFCR): %% 20
Maximum receive buffer length        (MRBLR) : %% 21
Current receive buffer status                : %% 22
Current receive buffer offset         (RBD#) : %% 23
Current receive data pointer                 : %%  %% 24
Current receive byte counter                 : %% 24
Current receive temp memory                  : %% 24
Current transmit buffer status               : %% 25
Current transmit buffer offset        (TBD#) : %% 26
Current transmit data pointer                : %% %% 27
Current transmit byte counter                : %% 27
Current transmit temp memory                 : %% 27
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

323

```
Trunk radio software control and status :-
Internal software data (key)   (DATA)            : %% 1
Internal hardware registers    (IREG)            : %% 2
Internal hardware parameters   (IRAM)            : %% 3
Current mode parameters        (MODE_BACKUP)     : %% 4
Current rate parameters        (RATE_BACKUP)     : %% 5
Current sync parameters        (SYNC_BACKUP)     : %% 6
Current channel port           (CHAN_PORT)       : %% 7
Channel status mode            (CHAN_MODE)       : %%  %% 8
Channel driver lock            (CHAN_LOCK)       : %% 9
Channel signals                (CHAN_SIGNAL)     : %% 10
Channel access type            (CHAN_ACCESS)     : %%
Channel driver type            (CHAN_TYPE)       : %% 11
Channel addresses              (CHAN/NEXT/MASK)  : %%  %%  %% 12
Channel acks                   (ACK_SLOT)        : %% 13
Channel random                 (RANDOM_REGISTER) : %% 14
Channel status                 (NOISY)           : %% 15
                               (QUIET)           : %% 15
                               (LATCH)           : %% 15
                               (GRANT)           : %% 15
                               (ACTIVE)          : %% 15
                               (NOACTIVE)        : %% 15
Channel preset/timers          (OVERRIDE)        : %%  %% 16
                               (RESOLUTE/QUIET)  : %%  %% 16
                               (SHUTUP)          : %%  %% 16
                               (GRANT)           : %%  %% 16
                               (WARMUP)          : %%  %% 16
                               (TRANSMIT)        : %%  %% 16
                               (HOLDUP)          : %%  %% 16
                               (RESPOND)         : %%  %% 16
                               (RELEASE)         : %%  %% 16
                               (RECEIVE/CHECK)   : %%  %% 16
                               (REQUEST)         : %%  %% 16
                               (SHORT_WARMUP)    : %% 16
                               (SMART_MIN)       : %% 16
                               (SMART_LONG)      : %% 16
                               (SMART_WARM)      : %% 16
                               (OFF_SLOT)        : %% 16
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Port number.

8. Configuration mode.

9. Channel access semaphore.

10. MTE signal on events that took place.

11. Whether FSK, DPSK or FSK.

12. The address to which this site will respond through this port.

13. The ACK transmission slot.

14. Random value to obtain a channel during a retry.

15. Actual channel access timers.

16. Preset timers for fields defined in the advanced parameters of Port 3.

RS232 CHANNEL

340

```
Rs232 hardware/software last status :-
Internal software data (key)          (DATA)        : %% 1
Internal hardware registers           (IREG)        : %% 2
Internal hardware parameters          (IRAM)        : %% 3
Current channel port                  (CHAN_PORT)   : %% 4
Channel status mode                   (CHAN_MODE)   : %% 5
Channel driver lock                   (CHAN_LOCK)   : %% 6
Channel signals                       (CHAN_SIGNAL) : %% 7
Channel access type                   (CHAN_ACCESS) : %%
Channel driver type                   (CHAN_TYPE)   : %% 8
Channel control register              (PBCNT)       : %% 9
Channel direction register            (PBDDR)       : %% 10
Channel data register                 (PBDAT)       : %% 11
Current reception empty buffers                     : %% 12
Current reception ready buffers                     : %% 13
Current transmission ready buffers                  : %% 14
Current transmission empty buffers                  : %% 15
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Port number.

5. Configuration mode.

6. Channel access semaphore.

7. MTE signal on events that took place.

8. Whether FSK, DPSK or FSK.

9. Defines the functionality of port B in 68.

10. Determines whether the pin is for input or output.

11. Defines the value of the pin (previous parameter).

12. Number of empty Rx descriptors.

13. Number of busy Rx descriptors.

14. Number of busy Tx descriptors.

15. Number of empty Tx descriptors.

341
```
Rs232 hardware control and status :-
Internal software data (key)                        (DATA)  : %% 1
Internal hardware registers                         (IREG)  : %% 2
Internal hardware parameters                        (IRAM)  : %% 3
Scc configuration register                          (SCON)  : %% 4
Scc mode register                                   (SCM)   : %% 5
Scc data sync. register                             (DSR)   : %% 6
Scc event register                                  (SCCE)  : %% 7
Scc mask register                                   (SCCM)  : %% 8
Scc status register                                 (SCCS)  : %% 9
Channel control register                            (PBCNT) : %% 10
Channel direction register                          (PRDDR) : %% 11
Channel data register                               (PBDAT) : %% 12
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. Defines the functionality of port B in 68.

11. Determines whether the pin is for input or output.

12. Defines the value of the pin (previous parameter).

342

```
Rs232 hardware data buffers status :-
Internal software data (key)          (DATA)  : %% 1
Internal hardware registers           (IREG)  : %% 2
Internal hardware parameters          (IRAM)  : %% 3
Receive buffer descriptor 0           (RXBD0) : %%  %%  %%  %% 4
Receive buffer descriptor 1           (RXBD1) : %%  %%  %%  %% 5
Receive buffer descriptor 2           (RXBD2) : %%  %%  %%  %% 6
Receive buffer descriptor 3           (RXBD3) : %%  %%  %%  %% 7
Receive buffer descriptor 4           (RXBD4) : %%  %%  %%  %% 8
Receive buffer descriptor 5           (RXBD5) : %%  %%  %%  %% 9
Receive buffer descriptor 6           (RXBD6) : %%  %%  %%  %% 10
Receive buffer descriptor 7           (RXBD7) : %%  %%  %%  %% 11
Transmit buffer descriptor 0          (TXBD0) : %%  %%  %%  %% 12
Transmit buffer descriptor 1          (TXBD1) : %%  %%  %%  %% 13
Transmit buffer descriptor 2          (TXBD2) : %%  %%  %%  %% 14
Transmit buffer descriptor 3          (TXBD3) : %%  %%  %%  %% 15
Transmit buffer descriptor 4          (TXBD4) : %%  %%  %%  %% 16
Transmit buffer descriptor 5          (TXBD5) : %%  %%  %%  %% 17
Transmit buffer descriptor 6          (TXBD6) : %%  %%  %%  %% 18
Transmit buffer descriptor 7          (TXBD7) : %%  %%  %%  %% 19
Rxd/Txd function code                 (R/TFCR): %% 20
Maximum receive buffer length         (MRBLR) : %% 21
Current receive buffer status                 : %% 22
Current receive buffer offset         (RBD#)  : %% 23
Current receive data pointer                  : %%  %% 24
Current receive byte counter                  : %% 24
Current receive temp memory                   : %% 24
Current transmit buffer status                : %% 25
Current transmit buffer offset        (TBD#)  : %% 26
Current transmit data pointer                 : %%  %% 27
Current transmit byte counter                 : %% 27
Current transmit temp memory                  : %% 27
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

343

```
Rs232 software control and status :-
Internal software data (key)     (DATA)          : %% 1
Internal hardware registers      (IREG)          : %% 2
Internal hardware parameters     (IRAM)          : %% 3
Current mode parameters          (MODE_BACKUP)    : %% 4
Current rate parameters          (RATE_BACKUP)    : %% 5
Current sync parameters          (SYNC_BACKUP)    : %% 6
Current channel port             (CHAN_PORT)      : %% 7
Channel status mode              (CHAN_MODE)      : %%  %% 8
Channel driver lock              (CHAN_LOCK)      : %% 9
Channel signals                  (CHAN_SIGNAL)    : %% 10
Channel access type              (CHAN_ACCESS)    : %%
Channel driver type              (CHAN_TYPE)      : %% 11
Channel addresses                (CHAN/NEXT/MASK) : %%  %%  %% 12
Channel status                   (NOISY)          : %% 13
                                 (QUIET)          : %% 13
Channel preset/timers            (OVERRIDE)       : %%  %% 14
                                 (RESOLUTE/QUIET) : %%  %% 14
                                 (SHUTUP)         : %%  %% 14
                                 (GRANT)          : %%  %% 14
                                 (WARMUP)         : %%  %% 14
                                 (TRANSMIT)       : %%  %% 14
                                 (HOLDUP)         : %%  %% 14
                                 (RESPOND)        : %%  %% 14
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Port number.

8. Configuration mode.

9. Channel access semaphore.

10. MTE signal on events that took place.

11. Whether FSK, DPSK or FSK.

12. The address to which this site will respond through this port.

13. Actual channel access timers.

14. Preset timers for fields defined in the advanced parameters of Port 3.

MODEM CHANNEL

360

```
Modem hardware/software last status :-
Internal software data (key)        (DATA)       : %% 1
Internal hardware registers         (IREG)       : %% 2
Internal hardware parameters        (IRAM)       : %% 3
Current channel port                (CHAN_PORT)  : %% 4
Channel status mode                 (CHAN_MODE)  : %% 5
Channel driver lock                 (CHAN_LOCK)  : %% 6
Channel signals                     (CHAN_SIGNAL): %% 7
Channel access type                 (CHAN_ACCESS): %%
Channel driver type                 (CHAN_TYPE)  : %% 8
Channel control register            (PBCNT)      : %% 9
Channel direction register          (PBDDR)      : %% 10
Channel data register               (PBDAT)      : %% 11
Current reception empty buffers                  : %% 12
Current reception ready buffers                  : %% 13
Current transmission ready buffers               : %% 14
Current transmission empty buffers               : %% 15
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Port number.

5. Configuration mode.

6. Channel access semaphore.

7. MTE signal on events that took place.

8. Whether FSK, DPSK or FSK.

9. Defines the functionality of port B in 68.

10. Determines whether the pin is for input or output.

11. Defines the value of the pin (previous parameter).

12. Number of empty Rx descriptors.

13. Number of busy Rx descriptors.

14. Number of busy Tx descriptors.

15. Number of empty Tx descriptors.

361
```
Modem hardware control and status :-
Internal software data (key)                      (DATA) : %% 1
Internal hardware registers                       (IREG) : %% 2
Internal hardware parameters                      (IRAM) : %% 3
Scc configuration register                        (SCON) : %% 4
Scc mode register                                 (SCM)  : %% 5
Scc data sync. register                           (DSR)  : %% 6
Scc event register                                (SCCE) : %% 7
Scc mask register                                 (SCCM) : %% 8
Scc status register                               (SCCS) : %% 9
Channel control register                          (PBCNT): %% 10
Channel direction register                        (PRDDR): %% 11
Channel data register                             (PBDAT): %% 12
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate.

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. Defines the functionality of port B in 68.

11. Determines whether the pin is for input or output.

12. Defines the value of the pin (previous parameter).

362

```
Modem hardware data buffers status :-
Internal software data (key)          (DATA)  : %% 1
Internal hardware registers           (IREG)  : %% 2
Internal hardware parameters          (IRAM)  : %% 3
Receive buffer descriptor 0           (RXBD0) : %%  %%  %%  %% 4
Receive buffer descriptor 1           (RXBD1) : %%  %%  %%  %% 5
Receive buffer descriptor 2           (RXBD2) : %%  %%  %%  %% 6
Receive buffer descriptor 3           (RXBD3) : %%  %%  %%  %% 7
Receive buffer descriptor 4           (RXBD4) : %%  %%  %%  %% 8
Receive buffer descriptor 5           (RXBD5) : %%  %%  %%  %% 9
Receive buffer descriptor 6           (RXBD6) : %%  %%  %%  %% 10
Receive buffer descriptor 7           (RXBD7) : %%  %%  %%  %% 11
Transmit buffer descriptor 0          (TXBD0) : %%  %%  %%  %% 12
Transmit buffer descriptor 1          (TXBD1) : %%  %%  %%  %% 13
Transmit buffer descriptor 2          (TXBD2) : %%  %%  %%  %% 14
Transmit buffer descriptor 3          (TXBD3) : %%  %%  %%  %% 15
Transmit buffer descriptor 4          (TXBD4) : %%  %%  %%  %% 16
Transmit buffer descriptor 5          (TXBD5) : %%  %%  %%  %% 17
Transmit buffer descriptor 6          (TXBD6) : %%  %%  %%  %% 18
Transmit buffer descriptor 7          (TXBD7) : %%  %%  %%  %% 19
Rxd/Txd function code                 (R/TFCR): %% 20
Maximum receive buffer length         (MRBLR) : %% 21
Current receive buffer status                 : %% 22
Current receive buffer offset          (RBD#) : %% 23
Current receive data pointer                  : %%  %% 24
Current receive byte counter                  : %% 24
Current receive temp memory                   : %% 24
Current transmit buffer status                : %% 25
Current transmit buffer offset         (TBD#) : %% 26
Current transmit data pointer                 : %%  %% 27
Current transmit byte counter                 : %% 27
Current transmit temp memory                  : %% 27
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

363

```
Modem software control and status :-
Internal software data (key)(DATA)         : %% 1
Internal hardware registers  (IREG)        : %% 2
Internal hardware parameters(IRAM)         : %% 3
Current mode parameters     (MODE_BACKUP)  : %% %% %% %% %% %% %% %% 4
                                           : %% %% %% %% %% %% %% %%
Current rate parameters     (RATE_BACKUP)  : %% 5
Current sync parameters     (SYNC_BACKUP)  : %% 6
Current channel port        (CHAN_PORT)    : %% 7
Channel status mode         (CHAN_MODE)    : %%  %% 8
Channel driver lock         (CHAN_LOCK)    : %% 9
Channel signals             (CHAN_SIGNAL)  : %% 10
Channel access type         (CHAN_ACCESS)  : %%
Channel driver type         (CHAN_TYPE)    : %% 11
Channel addresses           (CHAN/NEXT/MASK): %%  %%  %% 12
Channel status              (NOISY)        : %% 13
                            (QUIET)        : %% 13
Channel preset/timers       (OVERRIDE)     : %%  %% 14
                            (RESOLUTE/QUIET): %%  %% 14
                            (SHUTUP)       : %%  %% 14
                            (GRANT)        : %%  %% 14
                            (WARMUP)       : %%  %% 14
                            (TRANSMIT)     : %%  %% 14
                            (HOLDUP)       : %%  %% 14
                            (RESPOND)      : %%  %% 14
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Port number.

8. Configuration mode.

9. Channel access semaphore.

10. MTE signal on events that took place.

11. Whether FSK, DPSK or FSK.

12. The address to which this site will respond through this port.

13. Actual channel access timers.

14. Preset timers for fields defined in the advanced parameters of Port 3.

TIMERS (10__MS , 100_MS , 1__SEC , 1__MIN)

380   LEVEL = 0

```
# of entries in the service table (actual)           : %% 1
Maximum # of entries in the service table            : %% 2
# of time units passed from last task running        : %% 3
The limit # of time units passed without activating task : %% 4
```

1. The number of timer services (in the specific Instance) currently in use.

2. The maximum number of timer services that can be used.

3. The number of time units (depending on the timer resolution) that have elapsed since the last execution.

4. The maximum number of time units that will elapse without activating the instance, until an error message reports instance timer delay.

RS485

520

```
Rs485 hardware/software last status :-
Internal software data (key)      (DATA)        : %% 1
Internal hardware registers       (IREG)        : %% 2
Internal hardware parameters      (IRAM)        : %% 3
Current channel port              (CHAN_PORT)   : %% 4
Channel status mode               (CHAN_MODE)   : %% 5
Channel driver lock               (CHAN_LOCK)   : %% 6
Channel signals                   (CHAN_SIGNAL) : %% 7
Channel access type               (CHAN_ACCESS) : %%
Channel driver type               (CHAN_TYPE)   : %% 8
Channel control register          (PBCNT)       : %% 9
Channel direction register        (PBDDR)       : %% 10
Channel data register             (PBDAT)       : %% 11
Current reception empty buffers                 : %% 12
Current reception ready buffers                 : %% 13
Current transmission ready buffers              : %% 14
Current transmission empty buffers              : %% 15
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Port number.

5. Configuration mode.

6. Channel access semaphore.

7. MTE signal on events that took place.

8. Whether FSK, DPSK or FSK.

9. Defines the functionality of port B in 68.

10. Determines whether the pin is for input or output.

11. Defines the value of the pin (previous parameter).

12. Number of empty Rx descriptors.

13. Number of busy Rx descriptors.

14. Number of busy Tx descriptors.

15. Number of empty Tx descriptors.

521
```
Rs485 hardware control and status :-
Internal software data (key)        (DATA)  : %% 1
Internal hardware registers         (IREG)  : %% 2
Internal hardware parameters        (IRAM)  : %% 3
Scc configuration register          (SCON)  : %% 4
Scc mode register                   (SCM)   : %% 5
Scc data sync. register             (DSR)   : %% 6
Scc event register                  (SCCE)  : %% 7
Scc mask register                   (SCCM)  : %% 8
Scc status register                 (SCCS)  : %% 9
Channel control register            (PBCNT) : %% 10
Channel direction register          (PRDDR) : %% 11
Channel data register               (PBDAT) : %% 12
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Determines the clock direction (Rx or Tx) and the baud rate.

5. Determines the work mode — HDLC or UART.

6. Determines the HDLC flags.

7. The events that generate the interrupt.

8. Mask to block the interrupt.

9. The CM (Channel Monitor) and TD (Tone Detect) statuses.

10. Defines the functionality of port B in 68.

11. Determines whether the pin is for input or output.

12. Defines the value of the pin (previous parameter).

522

```
Rs485 hardware data buffers status :-
Internal software data (key)          (DATA)  : %% 1
Internal hardware registers           (IREG)  : %% 2
Internal hardware parameters          (IRAM)  : %% 3
Receive buffer descriptor 0           (RXBD0) : %%   %%   %%   %% 4
Receive buffer descriptor 1           (RXBD1) : %%   %%   %%   %% 5
Receive buffer descriptor 2           (RXBD2) : %%   %%   %%   %% 6
Receive buffer descriptor 3           (RXBD3) : %%   %%   %%   %% 7
Receive buffer descriptor 4           (RXBD4) : %%   %%   %%   %% 8
Receive buffer descriptor 5           (RXBD5) : %%   %%   %%   %% 9
Receive buffer descriptor 6           (RXBD6) : %%   %%   %%   %% 10
Receive buffer descriptor 7           (RXBD7) : %%   %%   %%   %% 11
Transmit buffer descriptor 0          (TXBD0) : %%   %%   %%   %% 12
Transmit buffer descriptor 1          (TXBD1) : %%   %%   %%   %% 13
Transmit buffer descriptor 2          (TXBD2) : %%   %%   %%   %% 14
Transmit buffer descriptor 3          (TXBD3) : %%   %%   %%   %% 15
Transmit buffer descriptor 4          (TXBD4) : %%   %%   %%   %% 16
Transmit buffer descriptor 5          (TXBD5) : %%   %%   %%   %% 17
Transmit buffer descriptor 6          (TXBD6) : %%   %%   %%   %% 18
Transmit buffer descriptor 7          (TXBD7) : %%   %%   %%   %% 19
Rxd/Txd function code                 (R/TFCR): %% 20
Maximum receive buffer length         (MRBLR) : %% 21
Current receive buffer status                 : %% 22
Current receive buffer offset         (RBD#)  : %% 23
Current receive data pointer                  : %%   %% 24
Current receive byte counter                  : %% 24
Current receive temp memory                   : %% 24
Current transmit buffer status                : %% 25
Current transmit buffer offset        (TBD#)  : %% 26
Current transmit data pointer                 : %%   %% 27
Current transmit byte counter                 : %% 27
Current transmit temp memory                  : %% 27
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Address of frame in descriptor RX 0.

5. Address of frame in descriptor RX 1.

6. Address of frame in descriptor RX 2.

7. Address of frame in descriptor RX 3.

8. Address of frame in descriptor RX 4.

9. Address of frame in descriptor RX 5.

10. Address of frame in descriptor RX 6.

11. Address of frame in descriptor RX 7.

12. Address of frame for transmission in descriptor 0.

13. Address of frame for transmission in descriptor 1.

C-57

14. Address of frame for transmission in descriptor 2.

15. Address of frame for transmission in descriptor 3.

16. Address of frame for transmission in descriptor 4.

17. Address of frame for transmission in descriptor 5.

18. Address of frame for transmission in descriptor 6.

19. Address of frame for transmission in descriptor 7.

20. Rx and Tx function code.

21. Maximum received frame length.

22. The reception status of the last received frame.

23. The offset value in the descriptors of the last received frame.

24. Internal variable of 68302.

25. The status of the last transmitted frame.

26. The offset value in the descriptors of the last transmitted frame.

27. Internal variable of 68302.

523

```
Rs485 software control and status :-
Internal software data (key)     (DATA)            : %% 1
Internal hardware registers      (IREG)            : %% 2
Internal hardware parameters     (IRAM)            : %% 3
Current mode parameters          (MODE_BACKUP)     : %% 4
Current rate parameters          (RATE_BACKUP)     : %% 5
Current sync parameters          (SYNC_BACKUP)     : %% 6
Current channel port             (CHAN_PORT)       : %% 7
Channel status mode              (CHAN_MODE)       : %%  %% 8
Channel driver lock              (CHAN_LOCK)       : %% 9
Channel signals                  (CHAN_SIGNAL)     : %% 10
Channel access type              (CHAN_ACCESS)     : %%
Channel driver type              (CHAN_TYPE)       : %% 11
Channel addresses                (CHAN/NEXT/MASK)  : %%  %%  %% 12
Channel status                   (NOISY)           : %% 13
                                 (QUIET)           : %% 13
Channel preset/timers            (OVERRIDE)        : %%  %% 14
                                 (RESOLUTE/QUIET)  : %%  %% 14
                                 (SHUTUP)          : %%  %% 14
                                 (GRANT)           : %%  %% 14
                                 (WARMUP)          : %%  %% 14
                                 (TRANSMIT)        : %%  %% 14
                                 (HOLDUP)          : %%  %% 14
                                 (RESPOND)         : %%  %% 14
```

1. Device-key address.

2. H-W registers address.

3. H-W parameters address.

4. Working mode of the channel (synchronous, asynchronous, DTE, DCE).

5. Communication baud rate.

6. Not relevant.

7. Port number.

8. Configuration mode.

9. Channel access semaphore.

10. MTE signal on events that took place.

11. Whether FSK, DPSK or FSK.

12. The address to which this site will respond through this port.

13. Actual channel access timers.

14. Preset timers for fields defined in the advanced parameters of Port 3.

FLASH MEMORY (FLASHDB, FLSEXT1)

600   LEVEL = 0

```
Pointer to entries   :       %% 1
Number of entries    :       %% 2
Flash start address  :       %% 3
Flash end   address  :       %% 4
Flash length         :       %% 5
Flash number of burns:       %% 6
```

1. Pointer to block IDs address list.

2. Maximum number of different types of block ID.

3. The starting address of the flash memory.

4. The end of the flash memory.

5. The size of the flash memory in bytes.

6. The number of times the flash memory has been burned.

LEVEL = 2

```
Disabled blocks for type- %%1
Block- 0 : %%2
Block- 1 : %%2
```

1. The block type (block id). For the FLASHDB device (application flash), there can be up to 50 blocks . For FLSEXT1 (logging flash), the user can define up to five blocks (0-4).

2. The status of the blocks in the application or logging flash can be one of: 0 (block enabled) or 1 (block disabled).

601   LEVEL = 1, 20 , 21 , ... , 39

```
Pointer to version                                          : %% 1
Pointer to data                                             : %% 2
Length of data                                              : %% 3
```

1. Pointer to block's header.

2. Pointer to block's data.

3. Length of block's data.

- Supported only by versions < 3.70. Previous versions support 20 types of blocks.
  In order to receive diagnostics on block number 0 , use LEVEL = 20.
  In order to receive diagnostics on block number 5 , use LEVEL = 25.

- From versions ≥ V3.70 on, at LEVEL = 1 the system displays a table that includes all of this data for all block IDs.

620

```
Low byte                                            : %%
Message                                             : %%
'send message'                                      : %%
'comm established' flag                             : %%
'message exist' flag                                : %%
Warmup not done                                     : %%
Dial number                                         : %%
Physical key                                        : %%
Mini - session key                                  : %%
Unformatted heap key                                : %%
```

LDIALER   (DIL2D , DIL 3D)

640   LEVEL = 0

```
Physical device key                                 : %% 1
Physical pin's table                                : %% 2
Async dial physical device key                      : %% 3
Async dial physical pin's table                     : %% 4
Interval between phone call retries (sec)           : %% 5
# of phone call retries                             : %% 6
# of times to call the physical_receive
   before hanging up (indicator)                    : %% 7
# of times to call the physical_receive
   before hanging up (responser)                    : %% 8
'wait for call' interval in (milli - sec)           : %% 9
```

1. Adapter layer device key.

2. Adapter pin table.

3. Dial (DART) device key.

4. Dial (DART) PIN table.

5. Interval between two dialing attempts.

6. Number of phone call retries.

7. Quiet time, in seconds, before hanging up on the initiating site.

8. Quiet time, in seconds, before hanging up on the responding site.

9. Inner program waiting time for a new incoming call.

641   LEVEL = 1

```
Ldialer current state :                             : %% 1
Current hang up counter                             : %% 2
Last / current dialed phone number                  : %% 3
Previous dialed phone number                        : %% 4
Last / current partner site id                      : %% 5
Is initiator                                        : %% 6
```

1. Ldialer state: 0 - wait for new call, 1- communication established

2. Time counter until disconnection.

3. Last or current dialed number.

4. Previous number dialed.

5. Last site ID connected.

6. Whether initiator or responder.

(ML_DL)

645   LEVEL = 0

```
# of dial links (preset)                              : %% 1
Network key                                           : %% 2
Pointer to links table                                : %% 3
```

1. Number of dialing channels.

2. Network layer device key.

3. Pointer to Dial-type channels table

646   LEVEL = 1

```
# of dial links (current)                              : %% 1
Last failed link used                                  : %% 2
Port    status    partner    link_key    ldialer_key
-----------------------------------------------------
  3         4         5           6             7
```

1.   Number of dialing channels.

2.   The last failed channel used.

3.   The dialing line.

4.   The call status.

5.   The initiator site ID.

6.   The Link layer device key.

7.   The Ldialer layer device key.

TOPLC (PLC1L, PLC2L, PLC3L)

660   LEVEL = 0

```
Port name                                              : %% 1
Connection to                                          : %% 2
Appl. code area                                        : %% 3
Appl. code length                                      : %% 4
Appl RAM area                                          : %% 5
Appl. RAM len                                          : %% 6
Number of retries                                      : %% 7
Number of polls                                        : %% 8
No response timeout                                    : %% 9
# of idles timeout                                     : %% 10
# of diag errors                                       : %% 11
Load module vers                                       : %% 12
Load module rev                                        : %% 13
Load module name                                       : %% 14
Load module diag                                       : %% 15
```

Diagnostics for third party protocol port defined as connected 'TO PLC'.

1.   PLC1 / PLC2 / PLC3

2.   PLC   (slave)

3.   Address where the FLS file was downloaded.

4.   Length of the code that was downloaded.

5.   Start of RAM - used for the PLC PORT software.

6.   Length of RAM - used for the PLC PORT software.

7.   Maximum number of retries.

8.   Maximum number of pollings.

9. Maximum amount of time to announce no response.

10. Number of idles to announce end of RX.

11. Number of errors.

12. Downloadable module version.

13. Downloadable module revision.

14. Name of the downloadable module.

15. Diagnostic string given by the downloadable module.

661   LEVEL = 1

```
Parm 1                                                   : %%
Parm 2                                                   : %%
Parm 3                                                   : %%
Parm 4                                                   : %%
Parm 5                                                   : %%
Parm 6                                                   : %%
Parm 7                                                   : %%
Parm 8                                                   : %%
Parm 9                                                   : %%
Parm 10                                                  : %%
```

- Diagnostics for driver specific parameters for port connected 'TO PLC'

- These parameters are actually the driver specific parameters ('TO PLC' port). The parameters can be defined in the PLC expert parameter screen. Currently these parameters are not in use.

FRAME - SEQ

700

```
application identity                                     : %% 1
maximum buffers in ready queue                           : %% 2
Number of buffers in list                                : %% 3
Time (in sec) to flush rx frames                         : %% 4
# rx frames thrown under flush                           : %% 5
```

1. Application ID number.

2. Maximum number of frames allowed to be accumulated

3. Number of frames currently waiting in the queue.

4. The amount of time required to flush received frames.

5. The number of frames which were flushed from the received queue.

BURST - SEQ

710

```
application identity                              : %% 1
maximum buffers in ready queue                    : %% 2
Number of buffers in list                         : %% 3
```

1. Application ID number.

2. Maximum number of frames allowed to be accumulated.

3. Number of frames currently waiting in the queue.

PHONE BOOK   LEVEL = 0 PHNBK

940

```
Start at flash                                    : %% 1
Number of entries                                 : %% 2
```

 1. The phone book address in the flash.

 2. The number of entries in the phone book.

941

```
Site Id    Phone Numbers:
```

*   The contents of phone book in the flash is provided.

TIMER EVENT

960

```
Timers max. value (in 10msc units)                      : %% 1
Max. number of events / timers in buffer                : %% 2
Current number of events / timers in buffer             : %% 3
# of heap_aloc_buf failed                               : %% 4
```

1. The maximum number of timers that can be set by SetTmr to a specific event.

2. The maximum number of events and timers that can be managed simultaneously by the timer event device. (They are managed by the heap.)

3. The number of events and timers currently in the heap.

4. The number of failed attempts to allocate buffers from the events' and timers' heap. (Its size as in 2.)

961

```
Is device running ?                                     : %% 1
Events enabled ?                                        : %% 2
Last written heap buffer                                : %% 3
Current 10ms index                                      : %% 4
Last read index                                         : %% 5
```

1. Whether the device is running. (Does not run during load and reset load.)

2. Whether the events are enabled. (Controlled by Call StEvnt.)

3. The time index of the last logged event.

4. The time index of the current event.

5. The time index of the last read event.

- The above indexes are in a cyclic array that return a pointer per 10 msec. Every such pointer points to the list of events that were received in those last 10 msec.

STBLA (SITE TABLE)

1022   LEVEL = 2

```
Downloaded Site-Table:
 Site-ID   Link-ID  Retries  Timeout
========   =======  =======  =======

%1   %2 %3  %4 %5 %6 %7
```

1. The Site ID.

2. The number of attempts to be made to communicate with a non-responding site. (1-255)

3. The time (in seconds) to wait between communication retries. (1-255)

4. The Link ID of the link through which the site is connected to the network. (Primary)

5. Primary Link Validity - The time interval to wait when the IP Gateway tests communication with a site, after which the Primary link is considered unreachable.

6. The Link ID of the backup link through which the site is connected to the network. (Secondary)

7. Secondary Link Validity - The time interval to wait when the IP Gateway tests communication with a site, after which the Secondary link is considered unreachable.

POOLMNGR

1130

```
Pool address                                      : %% 1
Pool size (in bytes)                              : %% 2
Pool end address                                  : %% 3
First free chunk address                          : %% 4
Largest free chunk address                        : %% 5
Sum of all free memory                            : %% 6
# of times that allocation
    failed (from last diag)                       : %% 7
Was enough space for 2 aloc                       : %% 8
```

1. The pool address.
2. The size of the whole pool.
3. Pointer to the first byte after the pool.
4. Pointer to the first free chunk. Updated only by check validity function, thus might not be free.
5. Pointer to the largest free chunk. Updated only by check validity function, thus might not be free nor the largest one.
6. The sum size of all the free chunks.
7. The number of times that allocate failed.
8. The number of times that the function poolmngr_2_allocs_ok returned NO.

1131
```
Chunk address   Chunk size   Is free?
-------------   ----------   --------
      1              2           3
```

- A table of all of the chunks that were allocated in the pool (some were freed and therefore marked free).

1. The chunk address.
2. The chunk size.
3. Whether the chunk is occupied or free.

1132
```
                          Is    Check- Check-
Chunk addr  Chunk size  free? Bits    Word
----------  ----------  ----- -----  -----
     1           2        3     4      5
```

- A table of all of the chunks that were allocated in the pool manager (some were freed and therefore marked free).

1. The chunk address.
2. The chunk size.
3. Whether the chunk is occupied or free.
4. Status of Check-Bits - check chunk boundaries to see if part of this chunk is overlapped by another chunk.
5. Status of Check-Words - check chunk boundaries to see if part of this chunk is overlapped by another chunk.

1140
```
Is pool clobbered?  : %% 1
```

1. If Check-Bits or Check-Words are set, the validity check will report if one chunk in the pool has overlapped another's boundaries.

OCOMM   LEVEL = 0

1400

```
          ocomm key variables
          -------------------------
Heap device key                                        : %% 1
Physical device key                                    : %% 2
Rtu to RTU station address                             : %% 3
Rtu to RTU system address                              : %% 4
Rtu to RTU Rxlo                                         : %% 5
Rtu to RTU Rxhi                                         : %% 5
INTRAC Rxlo                                             : %% 6
INTRAC Rxhi                                             : %% 6
Maximum time units for a frame to be in reception queue [sec]: %% 7
Repeater mode                              (Yes / No): %% 8
Control opcode to execute by transmit thread           : %% 9
Answer of execution from receive thread                : %% 9
Pointer to plug-in diagnostic buffer                   : %% 10
```

General: Ocomm is the module in charge of transmission and reception of wide MEIC MDLC and INTRAC frames.

Type "OCOMM" in device name for general diagnostic.

Type "OCOMH" in device name for diagnostic of transmission heap.

Type "OCOMC" in device name for diagnostic of Channel Access.

1. The key to the heap from where buffers are taken for transmission.

2. The key to the physical layer that is used for transmission/reception (Adapter).

3. The Station Address of the unit in the wide MEIC MDLC network.

4. The System Address of the unit in the wide MEIC MDLC network.

5. The address range for wide MEIC MDLC frame reception.

6. The address range for INTRAC frame reception.

7. The amount of time a received frame (INTRAC or wide MEIC MDLC) can wait in the reception queue. If the Ladder or C application does not retrieve it from there (by RxIntr function or by RxWdth) the frame will be erased at the end of this time.

8. If Yes, then frames received by radio are transmitted to the line and vise versa.

9. The transmitting/receiving code to Piggyback used for configuration or diagnostics.

10. A pointer to the buffer received from Piggyback after being diagnosed (levels 41, 40 , 20).

1401   LEVEL = 1

```
             ocomm key variables (continue)
             ---------------------------------------
Radio transmit queue pointer                          : %% 1
Radio transmit queue size [frames]                    : %% 2
Line transmit queue pointer                           : %% 3
Line transmit queue size [frames]                     : %% 4
Rtu to RTU reception queue pointer                    : %% 5
Rtu to RTU reception queue size [frames]              : %% 6
INTRAC reception queue pointer                        : %% 7
INTRAC reception queue size [frames]                  : %% 8
Was RTU to RTU reception queue pulled ?      (Yes / No): %% 9
Was INTRAC reception queue pulled ?          (Yes / No): %% 10
Transmission state                                    : %% 11
Will radio transmit queue be first ?(Yes / No)        : %% 12
Is transmit thread at physical_transmit ( ) ?         : %% 13
Is transmit thread at physical_wait ( ) ?             : %% 13
Is transmit thread waiting for ack ?                  : %% 13
Was trunk radio configured                            : %% 14
Is trunk channel being warmed up with high priority ? : %% 15
```

1.   The memory address of the radio transmission queue.

2.   The number of frames in the radio transmission queue.

3.   The memory address of the line transmission queue.

4.   The number of frames in the line transmission queue.

5.   The memory address of the wide MEIC MDLC frame reception queue.

6.   The number of frames in the wide MEIC MDLC frame reception queue.

7.   The memory address of the INTRAC frame reception queue.

8.   The number of frames in the INTRAC frame reception queue.

9.   Yes - The application called the RxWdth (in Ladder language)

10. Yes - The application called the RxIntr/UpIntr (in Ladder language).

11. The transmission state (to line, radio, piggyback or not at all).

12. Yes - The next time transmission will be to radio.
     No - The next time transmission will be to line.

13. Waiting during transmission :
     - During the transmission itself.
     - Waiting for the end of transmission.
     - Waiting for ACK from piggyback (while executing diagnostics or configuration)

14. If Yes, then working with trunk radio.

15. If working with trunk radio, Yes means access to trunk channel in high priority, if Low access to
     trunk channel in low priority.

1410

```
The number of times the following operations were executed
LEVEL : 10    (zeros the counters after diagnostics)
LEVEL : 11    (does not zero the counters)

           ocomm key error counters
         ------------------------------
How many times did getting buffer fail ?                      : %% 1
How many times was a frame transmitted ?                      : %% 2
How many times did transmission fail ?                        : %% 3
How many times did warmup fail ?                              : %% 4
How many times was control frame received ?                   : %% 5
How many times was a frame received ?                         : %% 6
How many times was invalid frame received ?                   : %% 7
How many times was a frame with error status byte received    : %% 8
How many times was a frame with invalid crc received ?        : %% 9
How many times was a frame with irrelevant address received?  : %% 10
How many times was received frames ignored ?                  : %% 11
How many times was received frames flushed ?                  : %% 12
How many times was transmit frame as a repeater failed        : %% 13
```

1. The transmission was not carried out because there were no buffers in the transmission heap.

2. The number of times the frame was transmitted (to line/radio or piggyback).

3. The number of times the transmission failed.

4. The number of times warmup failed.

5. The number of times ACK (configuration/diagnostics) message or error was received from piggyback.

6. The number of times frame was received from radio/line.

7. The number of times invalid frame was received from radio/line.

8. The number of received frames with hardware error.

9. The number of received frames without hardware error but with invalid CRC.

10. The number of received invalid frames with addresses out of range (which were erased).

11. The number of received frames with valid addresses that were erased, because the application did not try to receive before that time.

12. The number of received frames with valid addresses, but were erased after timeout because the application did not try to receive during this time.

13. The number of times the transmission of a received frame (in repeater mode) failed because the heap was empty.

1420   LEVEL = 20

```
   plug - in modem config. parameters
Pre - emphasize enable                                  : %% 1
De - emphasize enable                                   : %% 2
Radio channel monitor or txen polarity                  : %% 3
Radio indication or Rxen polarity                       : %% 4
Radio reception condition                               : %% 5
Radio gain level                                        : %% 6
Line gain level                                         : %% 7
Maximum received frame size                             : %% 8
A.g.c enable                                            : %% 9
```

- FSK INTRAC Piggyback parameters :

1.   Yes - Execute pre-emphasis in transmission.

2.   Yes - Execute de-emphasis in reception.

3.   Comm. radio - The Channel Monitor polarity; Trunk - The TxEn polarity.

4.   Comm. radio - The RIND polarity; Trunk - The RxEn polarity.

5.   Reception conditions :
     Channel Monitor : Begin reception when C.M. active.
     Tone Detect : Begin reception when there is a tone from the radio.
     Channel Monitor and Tone Detect : Begin reception when both of the above occur.
       (in use for regular radio).
     RxEn and Tone Detect : Begin reception when there is an active RxEn and tone.
       (in use for Trunk radio only)

6.   Radio transmission level 0..7 (7 is maximum).

7.   Line transmission level 0..7 (7 is maximum, 0 means disconnect).

8.   The maximum length of a received frame. Longer frames are errors.

9.   Yes - Operate AGC in reception from line.

1430

```
Failed to communicate with plug-in modem
```

A ToolBox message shown when piggyback (level 41, 40, 20) diagnostics fail. The message means that communications with piggyback failed.

1431

```
Previous diagnostic operation to plug-in modem was not terminated - try again
```

A ToolBox message shown when piggyback diagnostics fail. The meaning of the message is that the diagnostics failed (levels 20, 40, 41) because of current transmission (or access) to channel, radio or line. Diagnostics will be allowed at the end of the current transmission.

1440

```
     plug-in modem statistical information
Number of spikes received at last reception            : %% 1
Total number of spikes received                        : %% 2
Number of illegal received frames    (till 225)        : %% 3
```

- Piggyback hardware statistics
  LEVEL : 40 - Execute statistics and zero counters.
  LEVEL : 41 - Execute statistics but do not zero counters.

1. The number of spikes received the last time reception was operated.

2. The total number of spikes received.

3. From piggyback version 1.2 and on, the size of the maximum transmission buffer of piggyback (up to 32 bits).

   FSKADP : Channel Access to INTRAC FSK Piggyback. (The transmission of lateral
            MDLC INTRAC frames to radio / line). The module is executed as a
            result of transmission from OCOMM module and is found under UART.

   Diagnostic operation : Operated by DEVICE NAME : OCOMM
        LEVEL : 0 , 1 , 2 , 3 , 4 , 10 , 11

FSKADP (OCOMC)

1500   LEVEL = 0

```
Line Configuration parameters :
Override Time on busy line-channel mS                  : %% 1
Quiet Time on free line-channel mS                     : %% 2
Wait for Channel-Access Timeout Sec                    : %% 3
Line-channel warmup Time mS                            : %% 4
Transmission Timeout Sec                               : %% 5
Wait for Holdup Timeout Sec                            : %% 6
Line-channel Holdup Time mS                            : %% 7
Line-channel Shutup Time mS                            : %% 8
Current status of line :
     Line-channel quiet time mS                        : %% 9
     Line-channel busy time mS                         : %% 10
```

Line channel access parameters:

1. During transmission, if "Channel busy" is detected, this parameter will determine the waiting time (in msec) before forcing transmission onto a channel (even if the channel is still busy). Setting this parameter to "0", will terminate the option.

2. Quiet channel period (in msec) before transmission. Setting this parameter to "0", will terminate the waiting time and transmission will start immediately after the "free channel" detection.

3. Maximum waiting time (in msec) for available channel for transmission. If at the end of this period, the channel is not available, the system provides a failure notice and the transmission attempts will be terminated.

4. Transmits a constant tone during this period (in msec), before data transmission starts.

5. The maximum time frame (in seconds) for data transmission. Transmission over this time will be terminated, and a failure will be declared. The transmission always ends (normally or forced) with a constant tone for holdup time.

6. During this period (in msec), the system allows the plug-in modem to transmit the contents of its internal buffer, after the MOSCAD RTU has finished data transmission. It is not recommended to change this parameter.

7. The amount of time (in msec) a constant tone transmission is continued after the end of transmission.

8. The minimum waiting time (in msec) between one frame transmission and the next. It is measured from the end of the constant tone of the last transmission.

- The receiving line status:

9. The amount of quiet time on the line (msec).

10. The amount of busy time on the line, meaning Line Tone Detect is active.

1501   LEVEL = 1

```
Radio Configuration parameters :
Override Time on busy radio-channel mS                   : %% 1
Quiet Time on free radio-channel mS                      : %% 2
Wait for radio-channel-access Timeout Sec                : %% 3
Radio-channel warmup time mS                             : %% 4
Transmission timeout Sec                                 : %% 5
Wait for Holdup timeout Sec                              : %% 6
Radio-channel Holdup Time mS                             : %% 7
Radio-channel Shutup Time mS                             : %% 8
Radio-channel is kept busy by                            : %% 9
Current status of radio :
    Radio-channel quiet time mS                          : %% 10
    Radio-channel busy time mS                           : %% 11
```

- Regular radio channel access parameters:

1. During transmission, if "Channel busy" is detected, this parameter will determine the waiting time (in msec) before forcing transmission onto a channel (even if the channel is still busy). Setting this parameter to "0", will terminate the option.

2. Quiet channel period (in msec) before transmission. Setting this parameter to "0", will terminate the waiting time and transmission will start immediately after the "free channel" detection.

3. Maximum waiting time (in msec) for available channel for transmission. If at the end of this period, the channel is not available, the system provides a failure notice and the transmission attempts will be terminated.

4. Transmits a constant tone during this period (in msec), before data transmission starts.

5. The maximum time frame (in seconds) for data transmission. Transmission over this time will be terminated, and a failure will be declared. The transmission always ends (normally or forced) with a constant tone for holdup time.

6. During this period (in msec), the system allows the plug-in modem to transmit the contents of its internal buffer, after the MOSCAD RTU has finished data transmission. It is not recommended to change this parameter.

7. The amount of time (in msec) a constant tone transmission is continued after the end of transmission.

8. The minimum waiting time (in msec) between one frame transmission and the next. It is measured from the end of the constant tone of the last transmission.

9. To detect a busy channel:
   Channel Monitor - The channel is busy when C.M. is active.
   Tone Detect - The channel is busy when there is tone on the channel.

10. The amount of quiet time on the radio (msec).

11. The amount of busy time on the radio, meaning Radio Tone Detect is active.

1502   LEVEL = 2

```
Trunk Radio Configuration parameters :
Is trunk radio configured ?                          : %% 1
No trunk-channel time before requesting TxEn  (Low)   : %% 2
No trunk-channel time before requesting TxEn  (High)  : %% 3
Quiet Trunk-channel time before requesting TxEn  (High) : %% 4
TxEn-request PTT active time mS                      : %% 5
TxEn-request PTT non-active time mS                  : %% 5
Wait for trunk-channel-access timeout Sec            : %% 6
Warmup trunk-channel time mS                         : %% 7
Transmission timeout Sec                             : %% 8
Wait for holdup timeout Sec                          : %% 9
Trunk-channel holdup time mS                         : %% 10
Trunk-channel shutup time mS                         : %% 11
Current status of trunk :
   Trunk-channel quiet time mS                       : %% 12
   Trunk-channel busy time mS                        : %% 13
   Channel does not exist time mS                    : %% 14
   Is txen active ?                                  : %% 15
   Is PTT pressed and txen requested ?               : %% 16
   Time remaining for PTT pressing or reset mS       : %% 17
```

1. YES - Trunk has been defined in configuration. Radio transmissions are via trunk.
   NO - Trunk not used (regular radio transmission).

2. When the channel does not exist, this parameter determines the allotted time (in msec), to ask for TxEn (transmit enable). This parameter is relevant if one of the functions, *TxWdth* or *TxIntr* was called with *Tx_Lnk=1* (*Tx_Lnk=LoTrnk* or *Radio).*

3. When the channel does not exist, this parameter determines the allotted time (in msec), to ask for TxEn (transmit enable). This parameter is relevant if one of the functions, *TxIntr* or *TxWdth* was called with *Tx_Lnk=11*.

4. When the channel exists and is quiet, this parameter determines the time (in msec) until asking for TxEn (transmit enable). This parameter is relevant if one of the functions, *TxWdth* or *TxIntr* has been called with *Tx_Lnk=11* (*Tx_Lnk=HiTrnk*).

5. These two parameters, are used to determine the PTT active time (pressed) and PTT release time after the transmit enable *TxEn* request (both in msec).

6. Maximum waiting time (in msec) for available channel for transmission. If at the end of this period, the channel is not available, the system provides a failure notice and the transmission attempts will be terminated.

7. Transmits a constant tone during this period (in msec), before data transmission starts.

8. The maximum time frame (in seconds) for data transmission. Transmission over this time will be terminated, and a failure will be declared. The transmission always ends (normally or forced) with a constant tone for holdup time.

9. During this period (in msec), the system allows the plug-in modem to transmit the contents of its internal buffer, after the MOSCAD RTU has finished data transmission. It is not recommended to change this parameter.

10. The amount of time (in msec) a constant tone transmission is continued after the end of transmission.

11. The minimum waiting time (in msec) between one frame transmission and the next. It is measured from the end of the constant tone of the last transmission.

12. Period (in msec) during which the trunk channel was quiet (RxEn but no tone),

13. Period (in msec) during which a transmission took place in trunk (both tone and RxEn).

14. Period (msec) during which a trunk channel was not available (no RxEn).

15. Whether the CPU is pressing TxEn now.

16. Whether PTT is pressed now and TxEn requested.

17. If TxEn is requested: The time (in msec) remaining for re-pressing/releasing the PTT. If TxEn was not requested, the value is 0.

The access to trunk channel:

- In order to begin transmission, the user should request TxEn from central unit. This is done by pressing PTT for 4 msec. and releasing it for 5 msec. If someone else is transmitting, this request interrupts the transmission, and therefore should be avoided.

- Access to channel is available in low priority and then the waiting time is 1 msec during which there is no channel (RxEn is not active and no one is transmitting) until requesting TxEn (for transmitting). If during this time someone receives permission to transmit, RxEn will become active and again the user should wait for it to become inactive.

- Access to channel is also available in high priority and then the waiting time is either 2 msec, as before, during which RxEn is not active until requesting TxEn, or 3 msec during which RxEn is active and the channel is quiet (there is no Tone) before requesting TxEn.

1503   LEVEL = 3

```
Control channel Configuration parameters:
Wait for control - channel - access timeout Sec       : %% 1
Warmup control - channel time mS                      : %% 1
Transmission timeout Sec                              : %% 1
Wait for holdup timeout Sec                           : %% 1
Holdup control - channel time mS                      : %% 1
Shutup control - channel time mS                      : %% 1
Current status of control channel : 2
     Is transmission enabled : %%                     : %% 2
```

1. The piggyback control channel access parameters used for its diagnostics and configuration. The meaning of the parameters is the same as in Line, Radio or Trunk.

The piggyback control channel current status:

2. Yes - Transmitting to the control channel is enabled.

1504   LEVEL = 4

```
      fskadp device - current state variables
Did plug - in modem fail test ?                       - %% 1
Is trunk radio configured ?                           - %% 2
Is channel monitor LED on ?                           - %% 3
Is driver waiting for CTS at grant state ?            - %% 4
Is task suspended on Tx_start_1 ?                     - %% 5
Is task suspended on Tx_start_2 ?                     - %% 6
Is task suspended on hc11_end_of_Tx ?                 - %% 7
Current module state                                  : %% 8
Time remaining for current state mS                   : %% 9
Current transmitted channel                           : %% 10
Current accessed channel                              : %% 11
Current channel quiet time mS                         : %% 12
Current channel busy time mS                          : %% 13
Trunk channel status :
      How long does channel not exist mS              : %% 14
      Is transmission enabled ?   (Is TxEn Active)    : %% 15
      Is PTT pressed when asking for TxEn             : %% 16
      How much time remains for PTT pressing or reset mS  : %% 17
Next warmup will be performed on channel              : %% 18
Next warmup will be performed with priority           : %% 19
```

- General parameters of FSKADP (or DEVICE OCOM) module state. Notice that parameters related to trunking are relavant if " Is trunk radio configured" is set to "Yes". :

1. Yes: Piggyback failed on first test; therefore cannot be transmitted to.

2. Yes: Radio trunk was defined in configuration.

3. Yes: LED, CM3 are on. (There is reception from one of the channels).

4. Yes: Waiting for CTS from piggyback, after completing Channel Access process, in order to begin transmitting.

5. Yes: OCOMM module is waiting in transmission until descriptor is available (TxBD).

6. Yes: OCOMM module is waiting in transmission until current transmission is over.

7. Yes: OCOMM module is waiting for end of current piggyback transmission. (UART of CPU has finished transmitting).

8. Transmission state: Init, Grant (executing Channel Access), Warmup (transmitting Tone) and so on.

9. The amount of timeout left for current state.

10. The name of the channel that is currently being transmitted to.

11. Current channel access priority.

12. The amount of time the current channel was quiet before transmission or channel access.

13. The amount of time the current channel was busy before transmission or channel access.

14. Period (msec) during which a trunk channel was not available (no RxEn).

15. Whether the CPU is pressing TxEn now.

16. Whether PTT is pressed now and TxEn requested.

17. If TxEn is requested: The time (in msec) remaining for re-pressing/releasing the PTT. If TxEn was not requested, the value is 0.

18. Next warmup will be performed on this channel.

19. Access priority of the channel that will execute Channel Access the next time. When executing Channel Access the channel has priority. That is because the access to trunk channel can be in high or low priority. Therefore when accessing other channels the following priorities are available: Conv. Radio, Line , Sci (internal). When not accessing channel, this field shows "No Channel Access".

1510

```
Transmission failure error counters
Number of times CTS signal was stuck                      : %% 1
Number of times channel was busy and could not be accessed : %% 2
Number of times transmission timeout occurred            : %% 3
Number of times 'Wait for Holdup' timeout occured         : %% 4
```

- The transmission failure statistics:
  - LEVEL : 10 - zero counters after diagnostics.
  - LEVEL : 11 - do not zero counters.

1. The number of times a channel was available for transmission (Channel Access ended successfully), but piggyback did not enable the beginning of transmission (did not execute CTS). This can occur because of hardware difficulties or because the transmission buffer was full for too long.

2. The number of times transmission failed because the channel was busy (Channel Access failed).

3. The number of times the transmission was stopped because it was too long.

4. The number of times the waiting for the end of piggyback modem transmission was stopped because it took too long.

GPS

1600

```
GPS module parameters
Heap key                                      : %% 1
UART key                                      : %% 2
Update System flags function pointer          : %% 3
Read Ladder time offset function pointer      : %% 4
Period to Get time from GPS [sec]             : %% 5
Local offset to UTS time                      : %% mSec.%%:%%:%%6
Local offset time at Reserved Values Table    : %% mSec 7
Last PPS occurred at                          : %% mSec.%%:%%:%% 8
Last PPS (before GPS - frame) occurred at     : %% mSec.%%:%%:%%9
Time sent from GPS                            : %% mSec.%%:%%:%% 10
Date sent from GPS                            : %%...%%:%%:%% 11
Elapsed time from last PPS when saving it     : %% mSec... %%:%%:%% 12
Time that GPS frame was encoded               : %% mSec... %%:%%:%% 13
Current calculated local time                 : %% mSec... %%:%%:%% 14
Current calculated local date                 : %% :%%:%% 15
Is GPS connected to MOSCAD CPU ?              : %% 16
Is GPS time valid ?                           : %% 17
Has GPS recovered from warm - restart         : %% 18
```

The GPS module works with the GPS receiver, configures it, receives its satellite timings and updates the DATE & TIME table accordingly. Works above UART.

For general diagnostics : Type GPS2 in name device.

For Heap diagnostics : Type GPS2H in name device.

For Uart diagnostics : Type GPS2P in name device.

1. Pointer to the Heap key for transmission and reception.

2. Pointer to the UART key that transmits and receives with GPS.

3. Pointer to the function that updates the System Flags table.

4. Pointer to the function that returns time offset from System Values.

5. Frequency (seconds) at which GPS time is received.

6. Satellite time offset from configuration.

7. Time offset from System Values table.

8. The MOSCAD time when there is an event 1pps (every second) from GPS.

9. When a frame is received, saves the last of the 1pps event time (what was in 8).

10. The time received from GPS.

11. The date received from GPS.

12. The amount of time that passed between frame receiving event to 9 (less than a second).

13. When the GPS frame was encoded and calculated in local time. Because it is correct for 9, 10 is to be added.

14. The time calculated via GPS + offset.

15. The date calculated via GPS + offset.

16. Yes : GPS is connected to MOSCAD(always defaults to no).

17. Whether the time from GPS is valid.

18. Yes : Execute Warm Restart , meaning reconfigure GPS.

1601   LEVEL = 1

```
Current MOSCAD Time
Time in TICKS register                       : %% : %% : %% 1
Date in TICKS register                       : %% : %% : %% 2
Time in Real time Clock                      : %% : %% : %% 3
Date in Real time Clock                      : %% : %% : %% 4
Time in GPS receiver                         : %% : %% : %% 5
Date in GPS receiver                         : %% : %% : %% 6
Is GPS connected to MOSCAD CPU ?             : %% 7
Is GPS time valid ?                          : %% 8
```

• The current GPS and MOSCAD times:

1. The MOSCAD time (updated only if clocks have been updated or the update is from GPS).

2. The MOSCAD date.

3. The time in RTC (updated from ToolBox , GPS).

4. The date in RTC.

5. Time that was received from GPS.

6. Date that was received from GPS.

7. Yes : GPS is connected to MOSCAD (See 9)

8. Whether GPS time is valid.

9. This is the flag that is set to YES whenever there is a 1pps interrupt from GPS. Subsequently MOSCAD changes it to NO in order to diagnose whether GPS disconnected. If receiving reception timeout of 2 sec and this flag is NO, the system knows that the GPS has been disconnected and will wait for reconnection, and then it will reconfigure it. If a timeout occurred and the flag is set to YES, GPS is connected and therefore will try to receive again. Therefore this flag varies according to system needs and does not really indicate whether GPS is connected or not.

1610

```
GPS statistical information
How many 2 seconds timeout occurred during reception ?     : %% 1
How many valid frames were received                        : %% 2
Number of invalid frames received (total)                  : %% 3
Number of received frames that got timeout in the middle   : %% 4
Number of received frames with size less than 4 chars      : %% 5
Number of received frames that got invalid 2 prefix bytes  : %% 6
Number of received frames that got invalid 2 opcode bytes  : %% 7
Number of received frames with length more than required   : %% 8
Number of received frames that got invalid 2 suffix bytes  : %% 9
Number of received frames that got invalid checksum        : %% 10
Number of frames that were handled long time after pps     : %% 11
How many valid frames were received with error status byte ?: %% 12
```

- The GPS module statistics:
     LEVEL : 10 - zeroes counters after statistics
     LEVEL : 11 -does not zero counters

1. The number of two second timeouts during which no frame was received from GPS.

2. The number of times a valid frame was received from GPS.

3. The number of times an invalid frame was received from GPS.

4. The number of times a timeout was received during reception of a frame.

5. The number of times the frame was too short.

6. The number of times the frame had an invalid prefix.

7. The number of frames that had an invalid opcode.

8. The number of frames that were too long.

9. The number of frames that had an invalid suffix.

10. The number of frames that had an invalid checksum.

11. The number of frames that were received after their 1pps time (more than a second).

12. The number of frames that were supposedly valid, but their status determined that they were not satellite times.

TCP/IP

1700   LEVEL = 0

```
Ethernet address                                          : %%1
IP address                                                : %%2
Default router address                                    : %%3
IP network mask                                           : %%4
IP broadcast address                                      : %%5
Time in ms between clock service calls                    : %%6
Boot time in seconds                                      : %%7
Max num of packets on UDP sending queue                   : %%8
Max num of packets on UDP receive queue                   : %%9
Max num of packets on sending queue of TCP socket         : %%10
Max num of packets on receiving queue of TCP socket       : %%11
Maximum retries to create TCP connection                  : %%12
Maximum sockets                                           : %%13
Maximum # of waiting connection for listening socket      : %%14
Initial size in MSS for TCP dynamic receive window        : %%15
Max number of Ethernet packets which can be queued        : %%16
when using a row socket
The number of ARP cache entries to allocate               : %%17
The time to live value, in minutes, for ARP cache entries : %%18
ARP ask timeout interval in seconds                       : %%19
Router ASK timeout interval in seconds                    : %%20
Router daemon is used <0 NO, else YES>                    : %%21
The default time , in seconds, to wait for a new entry    : %%22
in the router cache
Time to wait in delayed close before blowing away the socket : %%23
The minimum heap size, in bytes, below which the IP will  : %%24
begin to send ICMP Source Quench messages to the generators
of any incoming TCP packets
allow IP router to learn <0 NO, else YES>                 : %%25
Max num of threads using TCP/IP                           : %%26
Heap Size in bytes                                        : %%27
Length of buffer for debug printouts                      : %%28
Printout task create priority                             : %%29
Printout task stack size                                  : %%30
Heap key for printouts                                    : %%31
UART key for printouts                                    : %%32
Length of buffer for sprintf                              : %%33
```

1. Ethernet address of the unit.

2. IP address of the unit.

3. Default router address of the unit.

4. IP network mask of the unit.

5. IP broadcast address of the unit.

6. The time in milliseconds between clock service calls.

7. Boot time in seconds.

8. The maximum number of packets on the UDP sending queue.

9. The maximum number of packets on the UDP receive queue.

10. The maximum number of packets on the sending queue of the TCP socket.

11. The maximum number of packets on the receiving queue of the TCP socket.

12. The maximum number of retries to create a TCP connection.

13. The maximum number of sockets.

14. The maximum number of waiting connections for the listening socket.

15. The initial size in MSS for the TCP dynamic receive window.

16. The maximum number of Ethernet packets which can be queued when using a row socket.

17. The number of ARP cache entries to allocate.

18. The time to live value, in minutes, for ARP cache entries.

19. The ARP ask timeout interval in seconds.

20. Router ASK timeout interval in seconds.

21. Whether the IP Gateway should work as a router. <0 NO, else YES>   Only "No" is currently available.

22. The default time, in seconds, to wait for a new entry in the router cache.

23. The time to wait in delayed close before blowing away the socket.

24. The minimum heap size, in bytes, below which the IP will begin to send ICMP Source Quench messages to the generators of any incoming TCP packets.

25. Allow IP router to learn Gateway. <0 NO, else YES>.

26. The maximum number of threads using TCP/IP.

27. The heap size in bytes.

28. The length of the buffer for debug printouts.

29. Printout task create priority.

30. Printout task stack size.

31. The Heap key for printouts.

32. The UART key for printouts.

33. The length of the buffer used for sprintf.

GAUART   DEVICE = COMxA, RTUxA, LINxA

2020   LEVEL = 0

```
GAUart 's  Hardware Internal Registers :-
--------------------------------------------
Internal software  data (key) (DATA)      : %% 1
General Status Register       (GSR)       : %% 2
General reset Register        (GRR)       : %% 3
Events  Register              (ER)        : %% 4
Events Mask Register          (EMR)       : %% 5
Max idles Register            (MX_IDL)    : %% 6
Close Character                           : %% 7
baud rate read register low   (BRR_L)     : %% 8
baud rate read regiaster high (BRR_H)     : %% 9
Mode  register                (MR)        : %%  10
control 1 register            (CC1)       : %% 11
control 2 register            (CC2)       : %% 12
external pins register                    : %% 13
Receive Ready control Register(RR_x)      : %% 14
Receive Status control Registe(RS_x)      : %% 15
transmit control register     (TC_x)      : %% 16
Receive Ready control Register(RR_x)      : %% 17
Receive Status control Registe(RS_x)      : %% 18
transmit control register     (TC_x)      : %% 19
```

1. Device key.

2. General Status Register.

3. General reset Register.

4. Events Register.

5. Events Mask Register.

6. Max idles Register.

7. Close Character

8. Read register containing baud rate (low byte)

9. Read register containing baud rate (high byte)

10. Mode register.

11. Control 1 register.

12. Control 2 register.

13. External pins register.

14. Receive Ready control Register (1st buffer).

15. Receive Status control Register (1st buffer).

16. Transmit control bits (1st buffer).

17. Receive Ready control Register (2nd buffer).

18. Receive Status control Register (2nd buffer).

19. Transmit control bits (2nd buffer).

2021   LEVEL = 1
```
GAUART's  Software descriptors   :-
--------------------------------------
Head (offset) software receive  descriptor: %% 1
tail (offset) software receive  descriptor: %% 2
Head (offset) software transmit descriptor: %% 3
tail (offset) software transmit descriptor: %% 4
empty         software receive  descriptor: %% 5
ready         software receive  descriptor: %% 6
empty         software transmit descriptor: %% 7
ready         software transmit descriptor: %% 8
```

1.   Where the processor will leave the next received data.

2.   Where the software will take the next received data.

3.   Where the software will leave the next data to be transmitted.

4.   Where the processor will take the next data to be transmitted.

5.   Number of empty software receive descriptors

6.   Number of full software receive descriptors ready to be emptied.

7.   Number of empty software transmit descriptors

8.   Number of full software transmit descriptors ready to be emptied.

2022   LEVEL = 2

```
GAUART's  Internal RAM data-Device Key :-
--------------------------------------------
Current mode parameters  (MODE_BACKUP): %% 1
Current rate parameters  (RATE_BACKUP): %% 2
Current sync parameters  (SYNC_BACKUP): %% 3
Address mask parameters  (MASK_BACKUP): %% 4
Address data parameters  (ADRS_BACKUP): %% %% %% %% 5
Current channel's  name  (CHAN_BACKUP): %% 6
Current channel's  data  (CHAN_DATA) : %% 7
Current channel's  code  (CHAN_CODE) : %% 8
Current heap's     name  (HEAP_BACKUP): %% 9
Current heap's     name  (HEAP_DATA) : %% 10
Current heap's     data  (HEAP_CODE) : %% 11
Current channel's  port  (GAUART_PORT): %% 12
Reception     data lock  (RXBD_LOCK) : %% 13
Transmission  data lock  (TXBD_LOCK) : %% 14
Reception     data head  (RXBD_HEAD) : %% 15
Transmission  data tail  (TXBD_TAIL) : %% 16
Communication signals    (GAUART_SIGNAL): %% 17
Communication buffers    (GAUART_TYPE) : %% %% 18
Communication uart lock  (GAUART_LOCK) : %% 19
Communication time lock  (TIME_LOCK) : %% 20
Communication time data  (TIME_DATA) : %% 21
Communication status        (NOISY): %% 22
                            (QUIET): %% 23
Communication preset/timers  (GRANT): %% %% 24
                            (QUIET): %% %% 25
```

1. Current working mode of the channel (synchronous, asynchronous, DTE, DCE).

2. Communication baud rate.

3. Current synchronization character.

4. Not relevant.

5. The addresses to which this site will respond through this port.

6. Channel access name.

7. Current channel's device.

8. Current channel's pin table.

9. Heap name.

10. Heap device key.

11. Heap pin table.

12. The port number.

13. Semaphore of the reception function.

14. Semaphore of the transmission function.

15. Offset for Rx descriptors for receiving frame.

16. Offset for Tx descriptors for transmitting frame .

17. MTE signal of conditions that were met.

18. Whether the frame is formatted or unformatted.

19. Device semaphore.

20. Not in use.

21. Coded time stamp of last received frame (in ticks)

22. Current counter of noise.

23. Current counter of quiet.

24. GRANT-TIME for channel access: The time the site will wait to obtain a transmission channel until it decides that a channel is not available.

25. QUIET-TIME after transmission: The time to wait before a retry.

2040   LEVEL = 0

```
Index  Name   Pointer
-----  -----  -------
```

All saved names and pointers to blocks used until now. The names are created with the function MOSCAD_bind_name()and pointers are created with MOSCAD_get_named_ptr() for the purpose of keeping historical data on the block.

SITTBL

2060   LEVEL = 0

```
Dynamic Site-Table :
Index  ID    Link  ComFal
-----  ----  ----  ------
```

The Dynamic Site Table as determined by C functions such as init_site_table(), new_site_table(), and Set_site_table(). Includes Site ID, Link ID, and status of the ComFal bit.

2061   LEVEL = 1

```
Static Site-Table :
Index  ID    Link  ComFal
-----  ----  ----  ------
```

The Site Table as defined in the Ladder of the Application Programmer. Includes Site ID, Link ID, and status of the ComFal bit.

IPLINK   LINxL

2200   LEVEL = 0

```
Iplink device key
-------------------
Heap key          : %% 1
Network key       : %% 2
Network pin table : %% 3
Site ID           : %% 4
Link ID           : %% 5
IP port number    : %% 6
IP address        : %% 7
Enable RCP        : %% 8
Port is in Fail   : %% 9
Group IP address  : %% 10
All RTU Simulation: %% 11
Enable IPModem    : %% 12
Learn IP Address  : %% 13
Check failed sites   : %%14
Max echoes to send   : %%15
Max sec between echoes: %%16
Max sec to check alive: %%17
```

When Port is defined as MDLC Over IP (Astro, iDEN,Tetra, Terminal server or Standard Modem).

1. General Heap key for transmission and reception.

2. Network layer in the unit.

3. A pointer which allows "cabling" between two devices during run time.

4. Site ID.

5. Link ID.

6. Number of the IP Port as defined in Site Configuration.

7. IP Address as defined in Site Configuration.

8. Enable RCP- Yes or No

9. Status of Link.

10. IP address used for Group Call as defined in Site Configuration.

11. YES if the Addr. range response for 'All RTU simulation' (Network Layer Advanced Parameter) was set to non zero.

12. YES if connected to iDEN.

13. YES if the port's IP address will be retrieved during run time, e.g. from the iDEN modem.

14. YES if the sites that are *failed* will be checked before transmitting to them. If the site does not reply, transmissions will be routed to an alternative path (if such exists.) A site is considered *failed* when

transmission to it results in an ICMP:Dest Unreach error message, or when the 'check alive' test fails. Use of this parameter makes MLDC over IP more reliable when transmitting to *failed* sites.

15. If 'Check failed sites' is YES, this specifies the number of retries of the 'check alive' test to the *failed* site, before the message is routed to an alternative path (if such exists) and asserting that it is still *failed*.

16. If 'Check failed sites' is YES, this specifies the timeout in seconds between retries of the 'check alive' test.

17. If 'Check failed sites' is YES, this specifies the timeout in seconds in which no message was received from a site before declaring it as *unknown*. Any new transmission to the site will first cause a 'check alive' test as explained above. This parameter is extends the 'check alive' test to sites which are not *failed*, but have been idle for some time. If this parameter is set to 0, no 'check alive' test will be performed for idle sites.

2201   LEVEL = 1

```
Iplink socket status
--------------------
Socket number            : %%
Socket state             : %%
Socket timeout           : %%
Socket open latest result : %%
Socket send latest result : %%
Socket recv latest result : %%
```

Status of the socket on the link. For system software developers only.

2202   LEVEL = 2

```
Iplink status
--------------------------
Queue size                                             : %%1
Is transmission thread waits for new buffer            : %%2
If transmission thread waits for socket to be opened   : %%3
Is transmission thread waits for socket to transmit data  : %%4
Is reception thread waits for socket to received new data : %%5
Last transmitted site ID                               : %%6
Last transmitted IP address                            : %%7
Last received site ID                                  : %%8
Last received IP address                               : %%9
```

1. Number of frames awaiting transmission.

2. Not relevant.

3. Not relevant.

4. Not relevant.

5. Not relevant.

6. Last Site ID to which the RTU transmitted.

7. Last IP address to which the RTU transmitted.

8. Last Site ID from which the RTU received transmission.

9. Last IP address from which the RTU received transmission.

2203   LEVEL = 3

```
Iplink conversion table
-----------------------
Maximum entries allowed             : %%1
Number of actual entries            : %%2
Next entry for setcall              : %%3

                        Number Echo Reply     Average Failed            Echo
Site      IP-address    Status Failed Sent Received Delay   Time[sec] Hint Left
----      ----------    ------ ------ ---- -------- ------  --------- ---- ----
```

1. Maximum number of entries allowed in IP Conversion Table.

2. Actual number of entries in IP Conversion Table.

3. Not relevant.

The contents of the IP Conversion Table is provided:

- Site ID

- IP Address

- Site Status   OK/Fail/-- (Unknow)

- Number failed   Number of times site has become failed.

- Echo Send   Number of polls sent to site during check alive test.

- Reply received   Number of polls replied by the site.

- Average Delay   Each poll bears the site timestamp. When the site replies, an average delay is recalculated.

- Failed time[sec]   Time in seconds from which the site was first declared as failed.

- Hint   Not relevant.

- Echo left   An xx/yy where xx notes number of polls left and yy represents the number of seconds remaining until the next poll. If xx is 0, then yy denotes the number of seconds remaining until the 'check alive' test (see parameter 17 in #2200 above.)

2210   LEVEL = 10, 11

```
Iplink statistics
-----------------
Number of times re-opened socket                      : %%1
Number of times transmitted successfully              : %%2
Number of times failed transmission                   : %%3
Number of times failed get IP address before transmitting : %%4
Number of times failed set IP address after receiving : %%5
Number of times failed get buffer from heap           : %%6
Number of times received a frame successfully         : %%7
Number of times failed reception                      : %%8
Number of times received irrelevant frame             : %%9
Number of times failed handle received control frame  : %%10
Number of times failed handled received data frame    : %%11
Number of times port has become failed                : %%12
Number of times port has recovered                    : %%13
Error when failed pushing received datagram to network : %%14
Number of times tried a loop transmission             : %%15
Number of ICMP:Host Unreach messages received         : %%16
Last destination Site ID that caused ICMP:Host Unreachable: %%17
Number of unknown frames received from peer MOSCAD sites : %%18
Last MOSCAD site ID that sent an unknown frame        : %%19
Number of times failed transmission because of full queue : %%20
Number of times transmitted sync frame                : %%21
Number of times received sync frame                   : %%22
Number of times transmitted to non OK sites           : %%23
Number of bytes transmitted                           : %%24
Number of bytes received                              : %%25
Number of echo rqst frames sent to other peer MOSCAD sites : %%26
Last MOSCAD site ID that sent an echo request to      : %%27
Number of echo rply frames received from peer MOSCAD sites : %%28
Last MOSCAD site ID that sent an echo reply frame     : %%29
```

1. Not relevant.

2. Number of successful transmissions.

3. Number of failed transmissions.

4. Not relevant.

5. Not relevant.

6. Not relevant.

7. Not relevant.

8. Number of time reception failed – invalid MDLC file.

9. Not relevant.

10. Number of times that a radio control frame could not be processed (Astro Spectra only).

11. Number of times that a radio data frame could not be sent to the network, usually because the network is busy (Astro Spectra only).

12. Number of times the port went into failed mode.

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13. Number of times the port recovered from failed mode.

14. Reason for failure to push received radio data frame to network (as in 11 above.)

15. Number of times transmission was attempted to a destination site with the same IP address as the RTU. As a result, transmission failed.

16. Number of times an ICMP:Host Unreachable message was received after transmission. As a result, destination site has become failed.

17. Last Site ID to become failed because of an ICMP:Host Unreachable message.

18. Number of valid MDLC frames received from peer MOSCAD sites that could not be processed by the RTU. This is because of an MDLC version mismatch. The message has been reported back to the peer site.

19. Last peer Site ID to have sent a message that could not be processed. The message has been reported back to the peer site.

20. The number of times that transmission failed because the queue was full. This prevents over-consuming MDLC heap resources when transmitting large blocks of data.

21. The number of times that synchronization was transmitted to all sites.

22. The number of times that synchronization was received.

23. The number of times that data was transmitted to a site which is either *failed* or its status is currently unknown. Usually a site like this is polled before transmitting, but in order to free heap resources, data was transmitted to it and may have been lost. (relevant only when Check failed sites is set to YES in #2200 parameter 17)

24. Number of bytes transmitted. (includes both 2 and 26)

25. Number of bytes received. (includes both 7 and 28)

26. Number of polls sent to other sites. (includes both 2 and 24)

27. Site ID of the last MOSCAD that was polled.

28. Number of replies received. (includes both 7 and 25)

29. Site ID of the last MOSCAD that replied to a poll request.

SLIP   LINxSlp

2300   LEVEL = 0

```
Slip port parameters
--------------------
formater key                    : %%1
port mode                       : %%2
port rate                       : %%3
port from                       : %%4
port flow control               : %%5
Is device down                  : %%6
Is char being received          : %%7
Is driver wait during transmission: %%8
Char that is being received     : %%9
Has device went up ?               : %% 10
Is driver being stopped ?          : %% 11
Is reception from port being held? : %% 12
Is driver PPP ?                                    : %%13
Maximal no reception time to declare disconnect [sec]: %%14
Time elapsed since last Slip/PPP reception [sec]   : %%15
Is driver being stopped                    : %%16
Is driver being started/connected          : %%17
Last error when started driver (HEX)        : %%18
Is disconnected driver on ?                : %%19
Was AT response been received when driver was up ?   : %%20
Send optional String                        : %%21
Is driver being freezed ?                   : %%22
```

1. Not relevant.

2. Not relevant.

3. Baud rate of port, as defined in Site Configuration.

4. Not relevant.

5. Type of flow control (DTR/CTS) as defined in Site Configuration.

6. Not relevant.

7. Not relevant.

8. Not relevant.

9. Not relevant.

10. Has the SLIP device been activated?

11. Is transmission of IP datagrams through SLIP device currently paused?

12. Is reception of IP datagrams through SLIP device currently paused?

Note: 11 and 12 are YES when initializing modem (e.g. iDEN) using AT commands.

13. YES if driver is PPP; NO if it is SLIP.

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14. Timeout in seconds in which no data was received and disconnecting/reactivating SLIP/PPP.

15. Time elapsed in seconds since the last received SLIP/PPP data from port.

16. Is PPP/SLIP driver in the process of being disconnected?

17. Is PPP/SLIP driver in the process of being connected?

18. Not relevant.

19. Not relevant.

20. Was an AT response noted when receiving data in SLIP/PPP mode? An AT response can be ERROR, +CME ERROR, AT, ATH, etc. It indicates that the modem has moved to command mode and therefore the driver needs to be disconnected.

21. Not relevant.

22. Not relevant.

2301   LEVEL = 1

```
PPP Status
---------------
LCP  Layer Status: %%1
IPCP Layer Status: %%2
PAP  Layer Status: %%3
CHAP Layer Status: %%4

PPP State
---------------
LCP  Layer State: %%5
IPCP Layer State: %%6
PAP  Layer State: %%7
CHAP Layer State: %%8

                  Terminate   Configure   Failure
                  ---------   ---------   -------
LCP  Layer Retry: %%9          %%9         %%9
IPCP Layer Retry: %%10         %%10        %%10
PAP  Layer Retry: %%11         %%11        %%11
CHAP Layer Retry: %%12         %%12        %%12

PPP Configuration   My                Their           Negotiated
-----------------   ------------      --------------  ----------
Asyncctl        :   %%13
Magic           :   %%14
Maxmtu          :   %%15
Auth     protocol:  %%16
Quality  protocol:  %%17
Protocol comp.  :   %%18
Address  comp.  :   %%19
IP Address      :   %%20
Tcp Compressio  :   %%21
Tcp Comp Max slot:  %%22
Tcp Comp slot   :   %%23
```

1. Status of LCP layer (up or down).

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2. Status of IPCP layer (up or down).

3. Status of PAP layer (up or down).

4. Status of CHAP layer (up or down).

5. Not relevant.

6. Not relevant.

7. Not relevant.

8. Not relevant.

9. Number of retries to terminate or configure the LCP layer.

10. Number of retries to terminate or configure the IPCP layer.

11. Number of retries to terminate or configure the PAP layer.

12. Number of retries to terminate or configure the CHAP layer.

13. PPP Async option of myself/peer and negotiated one.

14. PPP Magic option of myself/peer and negotiated one.

15. PPP Authentication protocol option of myself/peer and negotiated one.

16. PPP Protocol compression option of myself/peer and negotiated one. 1 if this is required.

17. PPP Address compression option of myself/peer and negotiated one. 1 if this is required.

18. IP Address option of myself, peer, and negotiated one.

19. TCP header compression protocol of myself, peer and negotiated one.

20. TCP header compression maximal slot of myself, peer and negotiated one.

21. TCP header compression slot of myself, peer and negotiated one.

2302   LEVEL = 2

```
PPP log information
-------------------
Last protocol received : %%1
LCP protocol received  : %%2
LCP code received      : %%3
LCP id received        : %%4
LCP message length     : %%5
LCP message received   : %%6
Time received last LCP : %%7
Number of Nak received : %%8
Number of Rej received : %%9

IPCP protocol received : %%10
IPCP protocol received : %%11
IPCP code received      : %%12
IPCP id received        : %%13
IPCP message length     : %%14
IPCP message received  : %%15
Time received last IPCP: %%16
Number of Nak received : %%17

PAP protocol received : %%18
PAP code received      : %%19
PAP id received        : %%20
PAP message length     : %%21
PAP message received  : %%22
Time received last PAP: %%23

CHAP protocol received : %%24
CHAP code received      : %%25
CHAP id received        : %%26
CHAP message length     : %%27
CHAP message received  : %%28
Time received last CHAP: %%29
Number of 'Success' code : %%30
Number of 'Fail' code : %%31

Last protocol transmitted: %%32
LCP protocol transmitted : %%33
LCP code transmitted      : %%34
LCP id transmitted        : %%35
LCP message length        : %%36
LCP message transmitted   : %%37
Time transmitted last LCP: %%38
Number of Nak transmitted: %%39
Number of Rej transmitted: %%40

IPCP protocol transmitted : %%41
IPCP code transmitted      : %%42
IPCP id transmitted        : %%43
IPCP message length        : %%44
IPCP message transmitted   : %%45
Time transmitted last IPCP: %%46
Number of Nak transmitted : %%47
Number of Rej transmitted : %%48

PAP protocol transmitted : %%49
PAP code transmitted      : %%50
PAP id transmitted        : %%51
```

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```
PAP message length      : %%52
PAP message transmitted  : %%53
Time transmitted last PAP: %%54

CHAP protocol transmitted : %%55
CHAP code transmitted     : %%56
CHAP id transmitted       : %%57
CHAP message length       : %%58
CHAP message transmitted  : %%59
Time transmitted last CHAP: %%60
Number of 'Success' codes : %%61
Number of 'Fail' codes    : %%62
```

1. Last protocol received.

2. Not relevant.

3. Last LCP code received.

4. Last LCP id received.

5. Last LCP/IP message received.

6. Last LCP/IP message length in bytes.

7. Time the message was received.

8. Number of Nacks received for LCP.

9. Number of Rejects received for LCP.

10. Not relevant.

11. Last IPCP code received.

12. Last IPCP id received.

13. Last IPCP message received.

14. Last IPCP message length in bytes.

15. Time the message was received.

16. Number of Nacks received for IPCP.

17. Number of Rejects received for IPCP.

18. Not relevant.

19. PAP code received.

20. PAP id received.

21. PAP message length in bytes received.

22. Last PAP message length in bytes.

23. Time the message was received.

24. Not relevant.

25. CHAP code received.

26. CHAP id received.

27. Length of CHAP message received in bytes.

28. CHAP message received.

29. Time the CHAP message was received.

30. Number of 'Success' CHAP messages received.

31. Number of 'Fail' CHAP messages received.

32. Not relevant.

33. Not relevant.

34. Last LCP code transmitted.

35. Last LCP id transmitted.

36. Last LCP/IP message length in bytes.

37. Last LCP/IP message transmitted.

38. Time the last LCP/IP message was transmitted.

39. Number of Nacks transmitted to LCP.

40. Number of Rejects transmitted to LCP.

41. IPCP protocol transmitted.

42. IPCP code transmitted.

43. IPCP id transmitted.

44. Length in bytes of the last IPCP message transmitted.

45. Last IPCP message transmitted.

46. The last time an IPCP message was transmitted.

47. Number of Nacks transmitted for IPCP.

48. Number of Rejects transmitted for IPCP.

49. Not relevant.

50. PAP code transmitted.

51. PAP id transmitted.

52. Length in bytes of the last PAP message transmitted.

53. Last PAP message transmitted.

54. The last time an PAP message was transmitted.

55. Not relevant.

56. CHAP code transmitted.

57. CHAP id transmitted.

58. Length in bytes of the last CHAP message transmitted.

59. Last CHAP message transmitted.

60. The last time an CHAP message was transmitted.

61. Number of 'Success' CHAP messages transmitted.

62. Number of 'Fail' CHAP messages transmitted.

2310   LEVEL = 10, 11

```
Slip port statistics
--------------------
Number of succefull transmissions   : %%1
Number of failed transmissions      : %%2
Number of successfull bytes received : %%3
Number of times failed receiving byte: %%4
Number of pulled bytes by Fusion     : %%5
Size of last transmitted frame       : %%6
Number of transmitted rejected frames: %%7
Number of times driver was stopped   : %%8
Number of times failed stop driver   : %%9
Number of times got AT response during Slip/PPP session: %%10
Number of times disconnected by force             : %%11
Number of timeouts when bringing device up        : %%12
Number of timeouts when bringing device down      : %%13
Number of times failed alloc LCP msg              : %%14
Number of times failed alloc IPCP msg             : %%15
Number of times got bad PPP frame with invalid size   : %%16
Number of times got bad PPP frame with invalid frame  : %%17
Number of times PPP failed authentication phase   : %%18
Number of times PPP failed obtain IP address      : %%19
Number of times got invalid ICMP message          : %%20
Number of times bytes available in FUSION heap    : %%21

Last Time received msg  : %%22
Last msg received len   : %%23
Last msg received       : %%24
Last Time transmit msg  : %%25
Last msg transmitted len: %%26
Last msg transmitted    : %%27
```

1. Number of frames successfully sent from the RTU to the Radio/Link over SLIP line.

2. Number of frames unsuccessfully sent from the RTU to the Radio/Link over SLIP line.

3. Number of bytes received.

4. Number of bytes received by the RTU which could not be processed.

5. Not relevant.

6. Size in bytes of the last transmitted datagram.

7. Number of rejected transmissions of datagrams when the driver was paused. The driver is paused when initializing modem (e.g. iDEN) using AT commands.

8. Number of times the driver was paused.

9. Number of times failed to pause the driver.

10. Number of times got AT response (such as ERROR, +CME ERROR, AT, ATH) when Slip/PPP was connected. This denotes a modem error, which forces RTU to disconnect Slip/PPP.

11. Number of times disconnected by force (for example when CD drops.)

12. Number of times timeout expired when trying to connect Slip/PPP.

13. Number of times timeout expired when trying to disconnect Slip/PPP.

14. Number of times failed alloc LCP message. Denotes lack of internal resources.

15. Number of times failed alloc IPCP message. Denotes lack of internal resources.

16. Number of bad PPP with invalid size received.

17. Number of times bad PPP frames with invalid CRC received.

18. Number of times failed authenticate PPP when connecting.

19. Number of times failed to obtain an IP Address from the modem when connecting.

20. Number of times got bad ICMP message from the modem (with source IP Address 0). (Tetra bug)

21. Number of bytes currently available in internal heap for TCP/IP stack (sockets/PPP, etc.)

22. Last time received Slip/PPP message from port. Relevant when driver is connected or trying to connect.

23. Length of last Slip/PPP message received.

24. Last Slip/PPP message received.

25. Last time transmitted Slip/PPP message from port. Relevant when driver is connected or trying to connect.

26. Length of last Slip/PPP message transmitted.

27. Last Slip/PPP message transmitted.

2398

```
PPP is not created on this port
```

User has tried issue level 1 or 2 for SLIP port (## 2301 or ## 2302). Port is not PPP.

2399

```
PPP was not initialized yet try again later
```

User has tried issue level 1 or 2 for PPP port (## 2301 or ## 2302). Port is still initializing and cannot provide data. Try again later.

IPLINK   LINxL

2500   LEVEL = 100

```
RCP user parameters
-------------------
Radio IP address                                  : %%1
RCP IP port                                       : %%2
RTU sets radio in encrypted mode                  : %%3
Time to wait while diagnosing radio [millisec] : %%4
```

1.   IP address of radio.

2.   Should always be 469.

3.   If radio is encrypted, this parameter will be Yes. If radio is in clear, this parameter will be No.

4.   Radio diagnose reply timeout, as defined in Site Configuration.

2501   LEVEL = 101

```
Status of RCP
-------------
Is radio being configured                         : %%1
Has configuration of radio failed                 : %%2
RCP request of which configuration failed         : %%3
Last request SDU tag number                       : %%4
Last request sent to radio                        : %%5
Is radio registered in infrastructure             : %%6
Is data service not available                     : %%7
Is ICMP:Network unreachble received               : %%8
Has radio failed transmission due to encryption problem : %%9
Last report received from radio                   : %%10
Is port in 'Fail' mode                            : %%11
```

1.   If RTU is configuring radio (radio startup, RTU startup or when making connection), this will be yes.
     In this case, the data will remain pending until it can be transmitted.

2.   Whether the configuration of the radio has failed. If so, data cannot be transmitted by way of the
     link/radio.

3.   Describes which configuration message failed.

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4. Sequential number of configuration message last sent to radio.

5. Indicates last type of operation.

6. Indicates whether radio succeeded in registering in the infrastructure.

7. Whether data service is unavailable (This might be the reason for failure to register in infrastructure.)

8. Whether network is unreachable (This might be the reason for failure to register in infrastructure.)

9. Not relevant.

10. The string which the radio returns (RF ACK).

11. Indicates whether port is in failed mode. (as in ## 2200)

2502   LEVEL = 102

```
RCP socket status
-------------------
Socket number            : %%
Socket state             : %%
Socket timeout           : %%
Socket open latest result : %%
Socket send latest result : %%
Socket recv latest result : %%
```

Not relevant.

2503   LEVEL = 103

```
Radio configuration
-------------------
Encryption mode: %%
```

Indicates whether radio is in Encryption mode or not.

2504   LEVEL = 104

```
Radio information
------------------
Radio's software version           : %%
Radio's manufacturer               : %%
Radio's current CAI logic link ID  : %%
Radio's maximum transfer unit      : %%
Radio's serial number              : %%
Radio's registeration status       : %%
Radio's channel quality            : %%
Radio's signal strength            : %%
Radio's battery level              : %%
```

Basic information from radio.

2505   LEVEL = 105

```
Encryption failue info:
-----------------------
%%
RTU sets radio in encrypted mode: %%
Encryption mode of radio        : %%
```

Indicates if there is a contradiction between the radio's actual encryption mode and the encryption mode according to the RTU.

2510   LEVEL = 110, 111

```
RCP statistics in RTU
---------------------
Number of requests issued to radio                     : %%1
Number of requests aborted by RTU                      : %%2
Number of relevant replies received from radio         : %%3
Number of irrelevant replies received from radio       : %%4
Number of reports received from radio                  : %%5
Number of irrelevant reports received from radio       : %%6
Number of 'power up' reports received from radio        : %%7
Number of 'not registered' reports received from radio  : %%8
Number of 'data service' reports received from radio    : %%9
Number of 'encryption state' reports received from radio : %%10
Number of 'encryption failed' reports received from radio: %%11
Number of invalid reports/replies received from radio    : %%12
Number of ICMP Netowrk unreachable received from radio   : %%13
Number of ACK reports received from the radio           : %%14
Last Destination IP Address that received ACK for        : %%15
```

1. Number of requests sent from the RTU to the radio.

2. Number of times the RTU aborted transmission of a request due to timeout.

3. Number of replies from the radio (should match the number of requests.)

4. Number of replies from the radio which were discarded.

5. Number of reports from the radio.

6. Number of reports from the radio which cannot be deciphered by the RTU.

7. Number of reports from the radio of type "data service".

8. Number of reports from the radio of type "not registered".

9. Number of reports from the radio of type "encryption state".

10. Number of reports from the radio of type "encryption failed".

11. Number of reports from the radio of type "encryption failed".

12. Number of reports/replies received from radio which were illegal.

13. Number of messages received from radio that ICMP Network is unreachable.

14. Number of Acknowledgements from the infrastructure on message that were sent.

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15. Last Destination IP Address for which an acknowledgement was received.

2520   LEVEL = 100

```
IPMODM user parameters
----------------------
Learn IP address from modem                      : %% 1
RTU IP address                                   : %% 2
RTU's gateway IP address                         : %% 3
RTU Subnet mask                                  : %% 4
DTE IP Address in modem                          : %% 5
DTE Subnet mask in modem                         : %% 6
Home Agent in modem                              : %% 7
Modem IP Address                                 : %% 8
Modem version                                    : %% 9
Getting "OK" timeout from modem       [millisec]: %% 10
Time to wait for ATD to succeed       [millisec]: %% 11
Time to wait for modem to be configured [millisec]: %% 12
Optional string to send before dialing           : %% 13
Radio Sampling time for RALP prototol [millisec]  : %% 14
Connect to                                        : %%15
Disconnect on ICMP:Network Unreachable reception? : %%16
Is Abort Sequence supported in the modem ?        : %%17
Ignore CD Signal ?                                : %%18
Maximal Rx Idle time to disconnect [seconds ]     : %%19
```

Parameters for packet data modem (e.g. iDEN).

1. YES if the port's IP address is to be retrieved during run time, e.g. from iDEN modem.

2. Current RTU's IP address.

3. Current RTU's default gateway.

4. Current RTU's subnet mask.

5. The IP address of the modem's configured RTU as stored in the modem.

6. The subnet mask address of the modem's configured RTU as stored in the modem.

7. The home agent configured for the modem (to be used as the RTU's default IP address.)

8. The IP address of the modem.

9. The OEM version of the modem (should be R35.01.00 or later).

10. Timeout in milliseconds for getting an OK response when sending an AT command.

11. Timeout in milliseconds to wait for the modem to succeed in registration (if needed) and go online.

12. Timeout in milliseconds to wait for the modem to be configured. To be used when transmitting while the modem is being configured. If this time elapses, transmission will fail. Refer to Modem configuration timeout parameter in the Site Configuration Advanced Link Layer.

13. Optional AT command string to send to modem before dialing. Used by the RTU to override default settings in the modem. Refer to technical support if needed.

14. Radio sampling time in milliseconds that RALP will poll the radio registration status. Relevant only if RALP is enabled.

15. Device to which the RTU is connected (iDEN,Tetra, Standard Modem, or Null Modem).

16. YES, if the RTU should disconnect Slip/PPP when getting an ICMP:Destination Unreach message.

17. YES, if the modem supports abort sequence. An abort sequence is +++ issued after a pause of 1 second and followed by another pause of 1second. If YES, the modem should switch to command mode when this sequence is issued by the RTU. The modem may or may not disconnect from PD channel. Tetra or Novatell (CDPD) for example do not support it, but most modems do (for example iDEN or G18).

18. *Never,* if CD is being polled constantly. This includes the time while Slip/PPP is being connected and when the connection is established. When CD drops, the modem will be disconnected by the RTU. *Always,* if CD is never checked. It is assumed that it is active all the time, so its state does not denote Slip/PPP state.
When connecting, if CD is ignored during Slip/PPP connection but polled when connection is established.

19. Maximal Rx idle time to disconnect in seconds. If no data is received from the port for this period of time, Slip/PPP will be disconnected. If this parameter is 0, it will never be checked.

2521   LEVEL = 101

```
IPMODM state
------------
Is modem being configured ?                        : %% 1
State of configuration task                        : %% 2
Is CD active ?                                      : %% 3
Has modem configuration been aborted ?             : %% 4
Is Modem registered in the system ?                : %% 5
Cause for configuration failure                    : %% 6
Last command that was sent to Modem                : %% 7
Response received from modem that caused failure : %% 8
Time it took to configure modem [millisec]         : %% 9
Is port being locked ?                             : %%10
Last time started configure modem                  : %%11
Command sent to modem that caused failure          : %%12
```

1. YES if modem is in the process of being configured. In this case, it operates in command mode, and it cannot transmit data.

2. Connected and Registered should be displayed if the modem is online. In online mode, the modem can transmit data.

3. YES if the CD pin is active. If YES, the modem is connected and is in online mode.

4. Internal use only.

5. YES if the packet data modem is registered in the system.

6. If last modem configuration failed, display the reason for the failure.

7. The last AT command which was sent to the modem when configuring it.

8. If modem configuration has failed, display the last response from the modem that caused this failure (No Response if there was none).

9. Time in milliseconds that it took to configure the modem last time. Relevant only if modem configuration has succeeded. Note that it does not denote the actual time the modem has been in command mode, just the last cycle.

10. Should be YES when configuring the modem.

11. Marks the time that last started to configure the modem. Along with 9, this denotes the time Slip/PPP has been reconnected.

12. The last command sent to the modem causing it to fail and issue parameter 6.

2522   LEVEL = 102

```
RALP State
----------
Diagnostic timeout                  : %% 1
IP Port Number                      : %% 2
IP Address                          : %% 3
Was RALP initiated                  : %% 4
Is Communication Enabled in Radio : %% 5
Is request being executed           : %% 6
Current exectued group              : %% 7
Current executed opcode             : %% 8
Current expected opcode             : %% 9
Pointer of response buffer          : %% 10
```

Relevant for iDEN only.

1. Time in milliseconds to wait for a response from the iDEN modem to a RALP command. Refer to Modem diagnose reply timeout parameter in the Site Configuration Advanced Link Layer.

2. IP port number of the RALP protocol.

3. IP Address of the modem for the RALP protocol.

4. YES if a RALP session has been initiated with the modem.

5. YES if the modem has enabled RALP communication with the RTU.

6. YES if the RTU expects a RALP response from the modem.

7. Currently executed RALP command group

8. Currently executed RALP opcode.

9. Currently executed RALP opcode.

10. Internal use only.

2523   LEVEL = 103

```
iDEN Radio Status:
------------------
Radio status    : %% 1
Radio substatus : %% 2
Radio services  : %% 3
Radio mobile IP : %% 4
```

1. Modem status.

2. Modem substatus (Packet data registered).

3. Modem supported services (e.g. packet data).

4. Accept if modem is mobile IP capable.

2524   LEVEL = 104

```
iDEN Phone Information:
----------------------
Ralp version     : %% 1
Model type       : %% 2
Model number     : %% 3
Serial number    : %% 4
IMEI number      : %% 5
Codeplug version : %% 6
DSP ROM version  : %% 7
RCE ROM version  : %% 8
Software Type    : %% 9
```

This information is obtained via RALP from the modem.

1. RALP version in the modem.

2. Modem type.

3. Modem model number.

4. Modem serial number.

5. Modem electronic number (IMEI).

6. Modem codeplug version.

7. Modem software version.

8. Modem software version.

9. Modem software type.

2525   LEVEL = 105

```
LAPi related statistics in iDEN modem:
--------------------------------------
Number of PRAP message expirations                      : %% 1
Number of Inbound I PDUs sent (not including retries)    : %% 2
Number of Inbound All Block Retry I PDUs sent            : %% 3
Number of Inbound Retry I PDUs sent                      : %% 4
Number of Outbound I PDUs received (not including retries) : %% 5
Number of Outbound Retry I PDUs received                 : %% 6
Number of PDUs lost when the LLC receives a Local Release : %% 7
Number of PDUs lost due to an error or connection loss   : %% 8
Number of Inbound user bytes requested to be transmitted : %% 9
Number of Outbound user bytes received                   : %%10
Number of half duplex collisions detected by the LAPi LLC : %%11
Number of SABME received because of N(R) or timeout in peer : %%12
Number of unexpected UAs received                        : %%13
Number of unexpected DMs received                        : %%14
Number of retransmissions exhausted while connect/disconnect: %%15
Number of retransmissions exhausted while transmitting I PDU: %%16
Number of N(R)s received out of valid range              : %%17
Number of N(S)s received out of valid range              : %%18
Number of Retry I PDUs received without Original I PDU    : %%19
Number of reliable datagrams from client too big to send  : %%20
Number of unreliable datagrams from client too big to send : %%21
Number of PDUs received in a state when they were invalid : %%22
The number of invalid PDUs received from FNE             : %%23
The number of multiple block I PDUs with an LLC FCS error : %%24
```

The parameters are obtained via RALP from modem. Only the important parameters are described below:

2.   Number of messages sent over the air towards the MDG/iDEN system. Not including the number of retries in #3 and 4.

3,4. Number of retries for messages sent over the air towards the MDG.

5.   Number of messages received from the MDG. Not including the number of retries in #6.

6.   Number of retries received from the MDG.

9.   Number of bytes transmitted over the air towards the MDG.

10. Number of bytes received over the air from the MDG.

All other parameters denote communication problems over the air. Contact system administrator/technical support if not 0.

Note: After executing diagnostics, these parameters are reset in the modem.

Refer to iDEN documentation such as iDEN Protocol Manual 68P81129E10-B for an explanation of the LAPi protocol and meaning of parameters.

2526   LEVEL = 106

```
IP Related Statistics in iDEN modem:
------------------------------------
Total number of IP Datagrams received from DTE          : %% 1
Total number of Total IP Datagrams received from FNE    : %% 2
Number of Valid IP Datagrams received from DTE          : %% 3
Number of Valid IP Datagrams received from FNE          : %% 4
Number of IP Datagrams sent to DTE                      : %% 5
Largest IP Datagram sent to DTE (bytes)                 : %% 6
Largest IP Datagram sent to FNE (bytes)                 : %% 7
Number of ICMP Error Messages Sent                      : %% 8
Number of Valid UDP Datagrams received                  : %% 9
Number of received UDP datagrams discarded by the MS    : %%10
Number of UDP Datagrams Sent                            : %%11
Number of successful MIP registrations by the MS        : %%12
Number of rejected MIP registrations by the MS          : %%13
Number of retries MIP Registrations Requests sent by the MS: %%14
```

1. Number of datagrams transmitted by the RTU to the modem including RALP/diagnostics of the modem as well as over the air data.

2. Number of datagrams transmitted by the modem to the RTU as a response, including RALP/diagnostics of the modem as well as over the air data.

3. Number of valid datagrams received over the air from the MDG.

4. Number of valid datagrams transmitted by the RTU to the modem including RALP/diagnostics of modem as well as over the air data.

5. Number of datagrams sent over the air to the MDG.

6. Size of largest datagram sent to the RTU. Datagram may be either MDLC data or RALP diagnostics.

7. Size of largest datagram sent over the air to the MDG/iDEN system. (data only)

8. Number of ICMP errors sent to the RTU.

9. Number of valid UDP datagrams received in the modem from the RTU or from the MDG. This does not include the RTU's over the air data.

10. Number of valid UDP datagrams discarded by the modem. This does not include the RTU's over the air data.

11. Number of UDP datagrans sent by the modem (usually RALP) towards the RTU. This does not include the RTU's over the air data.

12,13,14. Number of times succeeded, denied, and retried mobile IP registration with the MDG.

Note: After executing diagnostics, these parameters are reset in the modem.

2527   LEVEL = 107

```
iDEN modem server description
-----------------------------
Normalized battery level  : %% 1
Color code                : %% 2
Carrier                   : %% 3
Carrier RSSI (dbm)        : %% 4
Carrier SQE  (db)         : %% 5
Battery level             : %% of %% 6
Signal strength           : %% of %% 7
```

Obtained via RALP from modem.

1. Battery level 0 to 60.

2. Color code.

3. Carrier code.

4. RSSI, received signal strength, should be more than –100 dbm.

5. SQE, received signal strength in db.

6. Battery level from 1 to 6 (highest).

7. Signal strength from 1 to 6 (highest).

2530   LEVEL = 110,111

```
IPModem statistics:
-------------------
Number of times CD has dropped                           : %% 1
Number of times RTU powered up                           : %% 2
Number of times Registration failed                      : %% 3
Number of times configuration timeout occured            : %% 4
Number of times modem configuration has succeeded        : %% 5
Number of times modem configuration has failed           : %% 6
Number of times detetected that modem is not packet data : %% 7
Number of times link failed because of registration      : %% 8
Number of times re-registered modem                      : %% 9
Number of times restarted modem                          : %%10
Last reason for link failure                             : %%11
Number of times received icmpnetunreachable              : %%12
Number of times lost connection with modem (PPP)         : %%13
Number of times disconnect because there was no resonse  : %%14
Number of times failed dialup                            : %%15
Number of times failed hangup                            : %%16
Number of times failed start slip/ppp                    : %%17
```

1. Number of times CD became inactive, e.g. the modem was disconnected or went offline (command mode).

2. Number of times the RTU powered up (cold or warm restart).

3. Number of times the modem was online and got deregistered from the infrastructure.

4. Number of times the configuration timeout elapsed. This may happen when configuration takes longer than the time specified by the user in the Modem configuration timeout parameter in the Site

Configuration Advanced Link Layer. If data was transmitted while the modem was being configured, that data may have been lost.

5. Number of times that configuration succeeded.

6. Number of times that configuration failed. When failed, the RTU keeps reconfiguring the modem in cycles until it succeeds. This number denote how many configuration cycles have failed.

7. Number of times the RTU failed to register the modem because it is not data packet capable. (The modem is probably not registered in the infrastructure database.)

8. Not relevant (future use).

9. Number of times the RTU deregistered and reregistered the modem by force.

10. Number of times the RTU restarted the modem (usually because of registration problems).

11. Last event that caused the port to be failed: Modem configuration failed, or modem became deregistered from the infrastructure.

12. Number of ICMP:Destination unreach messages received of type Network unreachable.

13. Number of times the PPP connection was dropped.

14. Number of times the Slip/PPP connection was disconnected because it failed to respond for RALP requests. Relevant for iDEN.

15. Number of times failed to issue ATD (dialup) command to modem.

16. Number of times failed to issue ATH (disconnect) command to modem (there was no response).

17. Number of times failed to connect Slip/PPP.

Note: Activating this message with level 110 will reset these parameters.

2540   LEVEL = 210,211

```
RALP statistics:
----------------
Number of times failed lock RALP                    : %%  1
Number of times posted a request                    : %%  2
Number of times aborted request                     : %%  3
Number of times got response for requests           : %%  4
Number of times got unsolicited alarms              : %%  5
Group of last response received from radio          : %%  6
Opcode of last response received from radio         : %%  7
Last alarm received from radio                      : %%  8
Number of software alarms received from radio       : %%  9
Last software alarm error                           : %%10
Last software alarm task name                       : %%11
Number of registration alarms received from radio   : %%12
Last registration alarm code                        : %%13
Last registration alarm roaming                     : %%14
Last registration alarm domain                      : %%15
Number of times have got invalid alarm              : %%16
Number of times have got invalid reponse (not alarms) : %%17
Number of times ignored responses                   : %%18
Number of times ignored alarms                      : %%19
Number of times got 'Failed execute' alarm          : %%20
```

Relevant only if RALP is enabled.

1. Internal use only.

2. Number of times a RALP request was sent to the modem.

3. Number of times aborted RALP when waiting for a reply from the modem.

4. Number of times a response was received for RALP requests from the modem.

5. Number of times unsolicited alarms weres received from the modem (registration/software etc).

6. Group of last RALP response received from the modem.

7. Opcode of last RALP response received from the modem.

8. Code of last alarm received from the modem.

9,10,11- Number of software alarms received from the modem, and specific parameters of the last one received.

12,13,14,15. Number of registration alarms received from the modem, and specific parameters of the last one received.

16. Number of times an alarm was received denoting that a RALP request was invalid.

17. Number of times invalid messages were received via RALP socket from the modem.

18. Number of times that responses which were received from the modem were ignored.

19. Number of times that alarms which were received from the modem were ignored.

20. Number of times the modem failed to execute a RALP request sent from the RTU.

2542   LEVEL = 102

```
IPMODM File variables
---------------------
Variable        Value
--------        -----
```

When a Standard Modem is used, this level shows obtained variables as set in the downloadable IP Modem file.

The Variable column shows the variable name, and the Value column shows its contents.

2598

```
Failed communicate with radio
```

Indication that communication with radio has failed. (Occurs when response from the radio times out.)

2599

```
Communication with radio already in progress - please try again
```

Occurs when configuring modem, and it cannot be diagnosed using RALP over SLIP (SLIP has not been initiated).

DMAP27   DEVICE = RADxD

2700   LEVEL = 0

```
Dmap27 information :
Partner site     :%%1
Net key          :%%2
Link key         :%%3
Imap27 key       :%%4
```

1.   Other Site ID talked/talking to.

2.   Network (upper) layer key address.

3.   LINK (lower) layer key address.

4.   IMAP27 layer key address.

2710   LEVEL = 10,11

```
Dmap27 counter information  :
Number ok txframes        :%%1
Number bad txframes       :%%2
Number reject txframes    :%%3
Number returned txframes :%%4
Number ok rxframes        :%%5
Number bad rxframes       :%%6
Last netpush err          :%%7
```

1. Number of MDLC frames transmitted successfully by the LINK.

2. Number of MDLC frames not transmitted successfully by the LINK.

3. Number of MDLC frames rejected by the LINK.

4. Number of MDLC frames returned back from the LINK.

5. Number of MDLC frames received successfully.

6. Number of MDLC frames not received successfully by the LINK.

7. Last error number generated while calling net_push_frame.

MPT1327 (PHYSICAL MODULE)   DEVICE = RADxP

2750   LEVEL = 0

```
*********************
* MPT1327 DEVICE KEY *
*********************

pointer to device key : %%0


----------------------------
sync part of the data table
----------------------------
 sync_mode                (hdlc mode)  : %%1
 sync_rate                (data rate)  : %%2
 sync_chan_backup_ptr     (pointer to channel device name): %%3
 sync_chan_data_ptr       (pointer to channel device data): %%4
 sync_signal              (sync communication  signal)    : %%5
 sync_time_lock           (sync SYNCRONIZATION latch lock): %%6
 sync_time_data           (sync SYNCRONIZATION latch data): %%7
 sync_holdup_time         (replaces the holdup parameter in the radio model):%%8
 sync_max_tx_empty_wait (max time to wait until TXD_EMPTY will occur):%%9
 sync_rts                 (sync RTS mode automatic "0" or on "1" ):%%10
 sync_sync_delay          (syncs Channels Delay in Msec Units): %%11


----------------------------
async part of the data table
----------------------------
 async_rate               (CONTROL RATE)                  : %%12
 async_signal             (async communication signal)   : %%13
 async_mode               (ASYNC MODE)    : %%14
 async_tx_grant           (ASYNC tx grant): %%15


------------------------------
general part of the data table
------------------------------
 sync            (Number of idles to close reception): %%16
 working_mode           (SYNC_MODE "1" or ASYNC_MODE "0" )  : %%17
 channel_valid_flag  (channel open "1" channel close "0"): %%18
 heap_data_ptr       (pointer of heap device data):    %%19
 mask_backup         (mpt1327 communication device mask) : %%20
 syst_backup         (mpt1327 communication device syst) : %%21
 unit_backup         (mpt1327 communication device unit) : %%22
 null_backup         (mpt1327 communication device null) : %%23
 user_backup         (mpt1327 communication device user) : %%24
 sync_max_rx_quiet   (max rx quiet): %%25
```

0.   Pointer to the memory address of the device key.

1.   HDLC mode register values (later on downloaded to SCM1 (Mode register)).

2.   HDLC rate register values (later on downloaded to SCON1 (rate register)).

3.   Backup of channel device name.

4.   Memory pointer to channel device data.

5. Signal parameter, contains the status of the system (HDLC mode).

6. Sync SYNCRONIZATION latch lock.

7. Sync SYNCRONIZATION latch data.

8. Sync holdup time. Replaces the holdup parameter in the radio model. Its purpose is to set holdup time in the transmit mechanism.

9. Maximum time to wait until TXD_EMPTY occurs.

10. Sync RTS mode automatic "0" or on "1".

11. Sync Channel's Delay in Msec units.

12. CONTROL RATE, MAP27 baud rate (9600 default).

13. Signal parameter, contains the status of the system (UART mode).

14. UART mode register values (later on downloaded to SCM1 (Mode register)).

15. ASYNC TX grant parameter (UART mode).

16. Number of idles to close reception.

17. Working mode of the model (SYNC_MODE="1" or ASYNC_MODE="0").

18. This parameter indicates if the voice channel is open or not (channel open="1" channel close="0").

19. Pointer of heap device data.

The following parameters are received from the link layer and stored here for backup; They are used in the change mode routine.

20. MPT1327 communication device mask.

21. MPT1327 communication device system.

22. MPT 1327 communication device unit.

23. MPT 1327 communication device null.

24. MPT 1327 communication device user.

25. Maximum RX quiet time parameter.

2751   LEVEL = 1

```
******************************
* MPT1327 hardware registers *
******************************
CURRENT MODE (from device key) : %%1
ASYNC_MODE=0 , SYNC_MODE=1

SCON1 (Config register)        : %%2
       ASYNC_MODE =  00D6 h
       SYNC_MODE  =  30D6 h

SCM1  (Mode register)          : %%3
       ASYNC_MODE =  013D h
       SYNC_MODE  =  093C h

DSR1  (Data sync register)     : %%4
       ASYNC_MODE =  7E7E h
       SYNC_MODE  =  7E7E h

SCCE1 (Event register)         : %%5
ASYN  (CTS,CD,IDL,BRK,CCR,BSY,TX,RX)
SYNC  (CTS,CD,IDL,TXE,RXF,BSY,TXB,RXB)

SCCM1 (Mask register)          : %%6
       ASYNC_MODE =  1F h
       SYNC_MODE  =  1F h

SCCS1 (Status register)        : %%7
       ASYNC_MODE =  07 h
       SYNC_MODE  =  06 h


******************************
* PORT A REGISTERS (PORT 3) *
******************************
PACNT (PORT A Control register)      : %%8
       ASYNC_MODE =  0373 h
       SYNC_MODE  =  0373 h

PADDR (PORT A DATA direction register): %%9
       ASYNC_MODE =  1884 h
       SYNC_MODE  =  1884 h

PADAT (PORT A DATA register)         : %%10
       ASYNC_MODE =  AB23 h
       SYNC_MODE  =  AB23 h
```

The contents of each hardware register are shown. For each register, the preset value is displayed for both ASYN (MAP27) and SYNC (HDLC) modes. The user should verify the current state of the system (Async or Sync) before comparing the contents of the register to one of the preset values.

1.   CURRENT MODE of operation.(ASYNC_MODE=0 , SYNC_MODE=1)

2.   SCON1 register parameters (See MC68302 Manual Pages 4-28,4-49)

3.   SCM1 register parameters (See MC68302 Manual Pages 4-31,4-49)

4. DSR1 register parameters (See MC68302 Manual Page 4-119)

5. SCCM1 register parameters (See MC68302 Manual Page 4-44)

6. SCCE1 register parameters (See MC68302 Manual Page 4-44)

7. SCCS1 register parameters (See MC68302 Manual Page 4-44)

8. PACNT (PORT A Control register parameters) (See MC68302 Manual Page 3-33)

9. PADDR (PORT A Direction register parameters) (See MC68302 Manual Page 3-35)

10. PADAT (PORT A DATA register parameters)

2752   LEVEL = 2

```
*********************************************
* MPT1327 SPECIFIC PARAMETERS (ASYNC MODE) *
*********************************************
MAX_IDL    (Maximum IDLE Characters (Receive)) : %%1
IDLC       (Temporary Receive IDLE Counter)    : %%2
BRKCR      (Break Count Register (Transmit))   : %%3
----------------------------------------------------
PAREC      (Receive Parity Error Counter)      : %%4
FRMEC      (Receive Framing Error Counter)     : %%5
NOSEC      (Receive Noise Counter)             : %%6
BRKEC      (Receive Break Condition Counter)   : %%7
----------------------------------------------------
UADDR1     (UART ADDRESS Character 1)          : %%8
UADDR2     (UART ADDRESS Character 2)          : %%9
----------------------------------------------------
RCCR       (Receive Control Character Register): %%10
CHARACTER1 (CONTROL Character 1)               : %%11
CHARACTER2 (CONTROL Character 2)               : %%12
CHARACTER3 (CONTROL Character 3)               : %%13
CHARACTER4 (CONTROL Character 4)               : %%14
CHARACTER5 (CONTROL Character 5)               : %%15
CHARACTER6 (CONTROL Character 6)               : %%16
CHARACTER7 (CONTROL Character 7)               : %%17
CHARACTER8 (CONTROL Character 8)               : %%18
```

See MC68302 Manual Pages 4-53 to 4-55.

1. Maximum IDLE Characters (Receive)   (UART mode)

2. Temporary Receive IDLE Counter   (UART mode)

3. Break Count Register (Transmit)   (UART mode)

4. Receive Parity Error Counter   (UART mode)

5. Receive Framing Error Counter   (UART mode)

6. Receive Noise Counter   (UART mode)

7. Receive Break Condition Counter)   (UART mode)

8. UART ADDRESS Character 1   (UART mode)

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9. UART ADDRESS Character 2   (UART mode)

10. Receive Control Character Register   (UART mode)

11. CONTROL Character 1   (UART mode)

12. CONTROL Character 2   (UART mode)

13. CONTROL Character 3   (UART mode)

14. CONTROL Character 4   (UART mode)

15. CONTROL Character 5   (UART mode)

16. CONTROL Character 6   (UART mode)

17. CONTROL Character 7   (UART mode)

18. CONTROL Character 8   (UART mode)

2753   LEVEL = 2

```
*******************************************
* MPT1327 SPECIFIC PARAMETERS (SYNC MODE) *
*******************************************
C_MASK_L (Constant see book)                  : %%1
C_MASK_H (Constant see book)                  : %%2
TCRC_L   (Temp Trasmit CRC low)               : %%3
TCRC_H   (Temp Trasmit CRC High)              : %%4
-----------------------------------------------
DISFC    (Discard Frame Counter)              : %%5
CRCEC    (CRC Error counter)                   : %%6
ABTSC    (Abort Sequence Counter)             : %%7
NMARC    (Nonmatching Address Received Counter : %%8
RETRC    (Frame Retransmission Counter)       : %%9
-----------------------------------------------
MFLR     (Max Frame Length Register)          : %%10
MAX_cnt  (Max Length Counter)                 : %%11
-----------------------------------------------
HMASK    (User-Defined Frame Address MASK)    : %%12
HADDR1   (User-Defined Frame Address)         : %%13
HADDR2   (User-Defined Frame Address)         : %%14
HADDR3   (User-Defined Frame Address)         : %%15
HADDR4   (User-Defined Frame Address)         : %%16
Mode of operation                             : %% 1
TimeAuth device key (HEX)                     : %% 2
TimeAuth handle                               : %% 3
Authentication stamp offset                   : %% 4
```

See MC68302 Manual Pages 4-81 to 4-83.

1. Constant see book   (HDLC mode)

2. Constant see book   (HDLC mode)

3. Temp Trasmit CRC low   (HDLC mode)

4. Temp Trasmit CRC High   (HDLC mode)

5. Discard Frame Counter   (HDLC mode)

6. CRC Error counter   (HDLC mode)

7. Abort Sequence Counter   (HDLC mode)

8. Nonmatching Address Received Counter (HDLC mode)

9. Frame Retransmission Counter   (HDLC mode)

10. Max Frame Length Register   (HDLC mode)

11. Max Length Counter   (HDLC mode)

12. User-Defined Frame Address MASK   (HDLC mode)

13. User-Defined Frame Address   (HDLC mode)

14. User-Defined Frame Address   (HDLC mode)

15. User-Defined Frame Address   (HDLC mode)

16. User-Defined Frame Address   (HDLC mode)

17. Whether or not to allow reception of SYNC frames.

18. TimeAuth device key in Hexadecimal form.

19. TimeAuth identifier.

20. Offset of Authentication stamp within the buffer for authenticated SYNC frames only.

2754   LEVEL = 3

```
*****************************
* MPT1327 DESCRIPTORS  STATUS *
*****************************
RECEIVE  INDEX (RECEPTION INDEX)  : %%1
TRANSMIT INDEX (TRASMITION INDEX) : %%2


-------------------------------------------------
 RECEIVE  ! STATUS    ! LENGTH   !    BUFFER
-------------------------------------------------
 (RXBD0)  :    %%  !  %%   !  %%3
 (RXBD1)  :    %%  !  %%   !  %%4
 (RXBD2)  :    %%  !  %%   !  %%5
 (RXBD3)  :    %%  !  %%   !  %%6
 (RXBD4)  :    %%  !  %%   !  %%7
 (RXBD5)  :    %%  !  %%   !  %%8
 (RXBD6)  :    %%  !  %%   !  %%9
 (RXBD7)  :    %%  !  %%   !  %%10
-------------------------------------------------


-------------------------------------------------
 TRANSMIT ! STATUS    ! LENGTH   !    BUFFER
-------------------------------------------------
 (TXBD0)  :    %%  !  %%   !  %%11
 (TXBD1)  :    %%  !  %%   !  %%12
 (TXBD2)  :    %%  !  %%   !  %%13
 (TXBD3)  :    %%  !  %%   !  %%14
 (TXBD4)  :    %%  !  %%   !  %%15
 (TXBD5)  :    %%  !  %%   !  %%16
 (TXBD6)  :    %%  !  %%   !  %%17
 (TXBD7)  :    %%  !  %%   !  %%18
-------------------------------------------------
```

1. Current RECEIVE INDEX (RECEPTION INDEX)

2. Current TRANSMIT INDEX (TRANSMISSION INDEX)

3. #3-#10 Receive descriptors (See MC68302 Manual Pages 4-66 to 4-70, 4-88 to 4-91.)

4. #11-#18 Transmit descriptors (See MC68302 Manual Pages 4-71 to 4-80, 4-92 to 4-96.)

2760   LEVEL = 10,11

```
-------------------------------------------
MPT1327 hardware/software last status :
-------------------------------------------
Discard frame          counter   (DISFC) : %%1
Crc      error         counter   (CRCEC) : %%2
Abort    sequence      counter   (ABTSC) : %%3
Non matching address   counter   (NMARC) : %%4
Frame retransmit       counter   (RETRC) : %%5
Async receive descriptors full  (counter): %%6
Async transmit descriptors full (counter): %%7
```

1. Number of times a frame was discarded.

2. Number of frames with a CRC error.

3. Number of Abort sequences.

4. Number of frames with non-matching addresses.

5. Number of frames which had to be retransmitted.

6. Counter which measures if the Async receive descriptors are full. This number should be zero. If not, there might be a problem with the values of the radio's timers. This should be checked using the RSS of the radio)

7. Counter which measures if the Async transmit descriptors are full. This number should be zero. If not, there might be a problem with the values of the radio's timers. This should be checked using the RSS of the radio)

IMAP27

2800   LEVEL = 0

```
Imap27 information  :
Map27  state         :%%1
IMap27 mode          :%%2
Link ready           :%%3
```

1. Map27 state: One of: "Idle", "OutCallWait", "Active", "WaitForDisconnect".

2. Map27 mode One of: "CONTROL", "DATA".

3. MAP27 link to the local radio indication.

2801   LEVEL = 1

```
Imap27 States information  :
Map27  state         :%%1
IMap27 mode          :%%2
Init done            :%%3
Initiator bit        :%%4
Warmup done          :%%5
New convtable        :%%6
Link ready           :%%7
Failed transmit frame:%%8
Last site id         :%%9
Last imap27 addr     :%%10
Max txpacket size    :%%11
Last txpacket size   :%%12
Initiator hang count :%%13
Responder hang count :%%14
Hang count           :%%15
Retry hang count     :%%16
Initiate dial count  :%%17
Connect2Start tx wait:%%18
Last transmitted Map27 frame:19
```

1. Map27 state: One of : "Idle", "OutCallWait", "Active", "WaitForDisconnect".

2. Map27 mode: One of : "CONTROL", "DATA".

3. Indication that Initialization was done. (1 = yes, 0 = no)

4. Indication that this site is the initiator of the call. (1 = yes, 0 = no)

5. Indication that the IMAP27 warmup process was done (dialing). (1 = yes, 0 = no)

6. Indication that a new MAP27 (to Site ID) conversion table exists.

7. Indication that a MAP27 link to the local radio is exists.

8. Indication that the attempt to transmit a frame in MAP27 protocol has failed. (1 if failed, 0 if succeeded)

9. Last Site ID that the RTU was talking to.

10. Last MAP27 address that the RTU was talking to.

11. Maximum size of frame transmitted in MAP27 protocol.

12. Size of last transmitted frame in MAP27 protocol.

13. Number of calls hung up by the call initiator.

14. Number of calls hung up by the call responder.

15. Total number of calls hung up.

16. Number of times needed to try to hang up.

17. Number of times tried to dial in order to initiate a call.

18. Time interval between "connected" message to the transmit begin, in order to overcome MPT1327 signaling delays.

19. Content of the last transmitted MAP27 frame.

2802   LEVEL = 2

```
Map27 address convert table:
 Number of entries in table :%%1
 Location of current entry  :%%2
     Site ID    Ident     Prefix
     =======    =====     ======
      %%3        %%3        :%%3
```

1. Number of entries in the conversion table.

2. Location in the memory of the conversion table.

3. The table's actual data.

2810   LEVEL = 10,11

```
Imap27 counter information :
Number ok txmapframes    :%%1
Number bad txmapframes   :%%2
Number rxmapbytes        :%%3
Number ok txmdlcframes   :%%4
Number bad txmdlcframes  :%%5
Number ok rxmdlcframes   :%%6
Number bad rxmdlcframes  :%%7
Number failedcalls       :%%8
Number outcalls          :%%9
Number accepted incalls  :%%10
Number ignored incalls   :%%11
Number line was cleared  :%%12
Number protocol info     :%%13
Number radiobusy         :%%14
Last protocol info reason :%%15
Failed get buf           :%%16
```

1. Number of Map27 frames transmitted OK.

2. Number of Map27 frames transmitted not OK.

3. Number of received MAP27 bytes.

4. Number of MDLC frames transmitted OK.

5. Number of MDLC frames transmitted not OK.

6. Number of MDLC frames received OK.

7. Number of MDLC frames received not OK.

8. Number of calls that failed connecting.

9. Number of successful outgoing calls.

10. Number of accepted incoming calls.

11. Number of calls ignored by this unit.

12. Number of times the call (line) was cleared during the call or at the end.

13. Number of MAP27 protocol info messages received.

14. Number of times a MAP27 radio-busy message was received.

15. Reason for the last MAP27 protocol info message.

16. Number of times failed to get a new buffer for MAP27 protocol usage.

DESx

2900   LEVEL = 0
```
%%#1        %%#2
```

Encryption device information. Two strings will appear:

1.   Denotes whether or not a certain DES instance is active.

2.   DES serial number

2901   LEVEL = 1
```
Size of an encryption key alias:      %%1
Number of encryption keys possessed:  %%2
Currently active encryption key set:  %%3
Number of encryption keys in each set:%%4
```

1.   Encryption key alias size.

2.   Number of encryption keys.

3.   Encryption key set which is currently active.

4.   Number of encryption keys in each set.

2902   LEVEL = 2
```
%%
```

Encryption device status messages. One of two messages will appear. Either:

- The specific encryption device whose serial number appears in ## 2900/Level 0 is not currently active.

  OR

- No encryption key aliases were defined. I.e. the encryption device is active, but the user has only defined keys not aliases for that device.

2903   LEVEL = 2
```
Encryption key aliases:
Index    Key Alias
=====    =========
```

This information represents the list of key aliases that were defined by the user in the network configuration for a given device. In order to identify the specific DES device, see Software Diagnostics for AUSYNC Level 2 and get the Link Device Key for the relevant Link ID. Go to TMAUTH Level 1 and get the serial number associated with the Link Device Key. Next check all DESx Level 0 diagnostic until you see the relevant serial number.

AUSYNC

3000   LEVEL = 0

```
Operation mode:
Is synchronized (1=YES, 0=NO):        %%1
SYNC interval (seconds):              %%2
Number of links (includes zones):     %%3
Number of authenticated links:        %%4
Server SiteID:                        %%5
Server LinkID:                        %%6
Server link index:                    %%7
Maximum drift (seconds):              %%8
RX SYNC interval (seconds):           %%9
TX SYNC REQUEST interval (seconds):   %%10
TX AFTER RESTART retry (seconds):     %%11
Maximum network delay (MSEC):         %%12
RX SYNC timer (seconds):              %%13
TX AFTER RESTART timer (seconds):     %%14
TX SYNC REQUEST timer (seconds):      %%15
Requested signals (HEX):              %%16
Link device interface function (HEX): %%17
```

1.   Is the RTU synchronized or not.

2.   How frequently a SYNC message is to be sent.

3.   The number of links (includes zones) attached to the RTU.

4.   Number of authenticated links on the RTU.

5.   Site ID of the Server RTU which provides synchronization.

6.   Link ID through which the RTU is connected to the Server.

7.   Server link index

8.   Maximum number of seconds by which the timestamp of an incoming message can differ from the RTU clock.

9.   RX SYNC interval (seconds):   %%9

10. TX SYNC REQUEST interval (seconds):   %%10

11. TX AFTER RESTART retry (seconds):   %%11

12. Number of milliseconds added to network delay (MSEC):   %%12

13. RX SYNC timer (seconds):   %%13

14. Number of seconds TX AFTER RESTART timer (seconds):   %%14

15. Number of seconds TX SYNC REQUEST timer (seconds):   %%15

16. Hexadecimal Requested signals (HEX):   %%16

17. Hexadecimal Link device interface function (HEX): %%17

C-126

3001   LEVEL = 1

```
Device keys:
MiniSession device key (HEX):  %%1
Stock device key (HEX):        %%2
Heap device key (HEX):         %%3
TimeAuth device key (HEX)   :  %%4
```

1. The MiniSession device key in Hexadecimal form.

2. The Stock device key in Hexadecimal form.

3. The heap device key in Hexadecimal form.

4. The TimeAuth device key in Hexadecimal form.

3002   LEVEL = 2

```
Link basis information
Index   LinkID   Flags   Timer TX SYNC   Link device key
=====   ======   =====   ===== =======   ===============
```

Forms a table representing the link basis information.

3010   LEVEL = 10

```
Counters:
Number of requests arrived:  %%1
Number of requests handled:  %%2
Number of requests sent:     %%3
Number of responses arrived: %%4
Number of invalid response:  %%5
Number of SYNC arrived:      %%6
Number of invalid messages:  %%7
```

1. Count of the number of requests which have arrived.

2. Count of the number of requests which have been handled.

3. Count of the number of requests which have been sent.

4. Count of the number of responses which have arrived.

5. Count of the number of invalid responses which have been received.

6. Count of the number of SYNC which have arrived.

7. Count of the number of invalid messages which have which have been received.

Retrieving this diagnostic information sets all counters back to zero.

3011   LEVEL = 11

```
Counters:
Number of requests arrived:  %%1
Number of requests handled:  %%2
Number of requests sent:     %%3
Number of responses arrived: %%4
Number of invalid response:  %%5
Number of SYNC arrived:      %%6
Number of invalid messages:  %%7
```

1. Count of the number of requests which have arrived.

2. Count of the number of requests which have been handled.

3. Count of the number of requests which have been sent.

4. Count of the number of responses which have arrived.

5. Count of the number of invalid responses which have been received.

6. Count of the number of SYNC which have arrived.

7. Count of the number of invalid messages which have which have been received.

TMAUTH

3100   LEVEL = 0

```
Number of registered devices:          %%1
Maximum number of registered device: %%2
AuthSync device key (HEX):             %%3
```

1. Number of encryption devices registered for TMAUTH for this RTU.

2. Maximum number of allowed registered TMAUTH devices.

3. Identifier for the AUTHSYNC device which enables communication between the TMAUTH and AUTHSYNC devices (in Hexadecimal format).

3101   LEVEL = 1

```
Encryption device basis information
Flags Device-key  Link-key  SerNum  Stamp-interval  Stamp-timer  MaxDrift
StampInx   NumOfENCFail  NumOfRXAuthFail
```

This is a table representing an encryption device basis information.

REQMNG

5000   LEVEL = 0

```
Reqmng data:
------------
max clients         : %%1
max channels        : %%2
max buffers         : %%3
comm buffer length  : %%4
clients offset      : %%5
channels offset     : %%6
buffers offset      : %%7
read list offset    : %%8
next client         : %%9
next channel        : %%10
n read channels     : %%11
cur buffer          : %%12
gateway id          : %%13
gateway status      : %%14
client error        : %%15
mng thread channel  : %%16
tx global           : %%17
rx global           : %%18
mng global          : %%19
site id             : %%20
startup mode        : %%21
left                : %%22
```

1. The maximum number of clients.

2. The maximum number of channels.

3. The maximum number of buffers.

4. The length of the communication buffer.

5.-13. Internal use

14. The status of the IP Gateway. 1H = Primary mode, 5H = Secondary mode.

15. – 20. Internal use.

21. The IP Gateway startup mode: 0 = Stand-alone, 1 = Redundant1, 2 = Redundant2

22. Internal use.

NOTE: The sub revision of the Gateway version appears always at the bottom of this level.

5001   LEVEL = 1

```
name    free    id    tx    burst    error
 %%1     %%2    %%3   %%4    %%5      %%6
```

1. The name of the connected clients. (If a row starts with 1, the name field is empty.)

2. Is the client free?

3. The channel ID of the channel used for receiving. (255 means no such channel)

4. The channel ID of the channel used for transmitting. (255 means no such channel)

5. The channel ID of the channel used for burst. (255 means no such channel)

6. Has an error occurred? (255 means no such channel)

5005   LEVEL = 10, 11

```
Reqmng data:
------------
In Buffers          : %%1
Out Buffers         : %%2
In Blocks           : %%3
Out Blocks          : %%4
Out Burst Blocks    : %%5
In Buffers with Err : %%6
```

1. Number of buffers received from the SCADA driver to the IP Gateway for execution.

2. Number of buffers sent from the IP Gateway to the SCADA driver.

3. Number of blocks received from the SCADA driver to the IP Gateway for execution.

4. Number of blocks sent from the IPGW to the SCADA driver.

5. Number of Burst blocks (unsolicited messages) sent from the IP Gateway to the SCADA driver.

6. Number of buffers sent with Error.

Note: Level 10 retrieves the information and resets the Data. Level 11 retrieves this information without reset.

HELTHCH (HEALTH CHECK)

5121   LEVEL = 1

```
Health Check Diagnostics - Rtus   (times are in seconds)
-------------------------------
SiteId LinkId Status   PingTime      ResponseTime  PingsSent
------ ------ ------   --------      ------------  --------
%%1    %%2    %%3       %%4            %%5           %%6
```

1. The Site ID.

2. The Link ID of the link through which the site is connected to the network.

3. The status of the site (alive /dead / disabled)

4. The time that the last ping was sent.

5. The time of the last response to a ping.

6. The number of pings sent to the site.

LNKHNDL

5161   LEVEL = 1

```
Site #:  %%1
Site Up   Time : %%2              Site Discover Time : %%3
Site Down Time : %%4              Site Mirror   Time : %%5
  Primary  Link  %%6    is %%7    %%8    %%9
  Secondary Link  %%10  is %%7    %%8    %%9
```

1. The Site ID.

2. The time that "Site up" message was received . (measured in number of peaks since startup)

3. The time that the site was discovered by the Gateway. (measured in number of peaks since startup)

4.   The time that "Site down" message was received. (measured in number of peaks since startup)

5.   The time of the last periodic refresh of data from the site. (measured in number of peaks since startup)

6. The Link ID of Primary Link to the site.

7. The status of the link (UP/DOWN).

8. Internal use

9. Internal use

10. The Link ID of Secondary Link to the site.

DOCTOR

5211   LEVEL = 1

```
  %%1        Doctor Version: %%2     System Version: %%3
  MTE ERROR            SR:%%4   PC:%%5   ErrCode:%%6   CurrTask:%%7
CandidTask:%%8        DevKey:%%9         DevName:%%10

                 %%11
```

In the first line, general information about the crash history is presented.

1. The time and date of the restart event.

2. The version and revision of the Doctor feature.

3. The version and revision of the firmware.

4. The contents of the SR register at the time of restart.

5. The contents of the PC register at the time of restart.

6. The indication of the event (e.g. initiated restart event.)

7. The task that actually initiated the event (e.g. the GENHNDL task.)

8. The task that was ready to run when the restart event occurred. This does not necessarily have to be the same as CurrTask. Setting of the CurrTask and CandidTask indications relies on the system's scheduling mechanism.

9. The address of the device responsible for this task.

10. The name of the device responsible for this task.

11. At the end of the message, the system gives a text description of all these indications.

Error Messages

Error Logger Messages

This section lists the errors and warnings which may be generated by the Error Logger. The messages are listed as they appear on the screen, with %% signs in the text to represent alphanumeric values provided by the Error Logger.

The description which follows the error messages, provides one or more possible causes for the error and possible solutions.

Error #20:   Invalid Box in TX Queue – Device: %%

This message appears due to a fault memory overwrite in the Tx Queue in the link layer. The 'Device' is the name of the link layer (referring to the port). Consult product group.

Error #21:   Invalid Box in Positive ACK Queue – Device: %%

This message appears due to a fault memory overwrite in the ACK Queue in the link layer. The 'Device' is the name of the link layer (referring to the port). Consult product group.

Error #22:   Invalid Box in Busy/Setcall Queue – Device: %%

This message appears due to a fault memory overwrite in the Busy/Setcall Queue in the link layer. The 'Device' is the name of the link layer (referring to the port). Consult product group.

Error #23:   Can Not Get a New ACK Buffer, increase # of ACK Buffers – Device %%

For each link layer, 8 acknowledge buffers are defined. If all those buffers are full and the link intends to prepare another acknowledgment for transmission, this message is displayed and there will be a retry on behalf of the transmitting side. Usually, this may occur in Nodes. Consult product group.

Error #24:   ACk Buffer (Formatted) is too Small – Device: %%

For system software developers only. Consult product group.

Error #25:   Can Not Get a New ACK Buffer, ACKs Buffer was corrupted – Device: %%

This message appears due to a memory overwrite in the heap of the acknowledgments in the link layer.

Error #40:   Illegal Operation Code For Configuration

Illegal operation code during configuration download.

Error #41:   Low Byte Error When Using Flash Memory

This message appears during configuration download, while downloading the flash. There is a problem in the flash.

Error #42:   High Byte Error When Using Flash Memory

This message appears during configuration download, while downloading the flash. There is a problem in the flash.

Error #43:   Given address is not start address of flash memory

This message appears during configuration download, while downloading the flash. This message indicates a software error in the Download program.

Error #44:   Wrong number of bytes in flash memory

This message appears during configuration download, while downloading the flash.

Error #45:   Error After Send Struct

Communication problem during configuration download.

Error #46:   Error After Get Struct

Communication problem during configuration download.

Error #47:   Control error !!

May indicate system software error. Consult product group.

Error #60:   Can Not Remove Slice – Device: %% , Size: %%

This message appears when receiving a MDLC communication buffer, that passed a CRC check, but one of the communication layers ('Device') can not understand its contents (due to a bug or a unique case of an illegal buffer receive). This buffer will be dumped into the heap.

Error #61:   Can Not Get Slice – Device: %% , Size: %%

For system software developers only. Consult product group.

Error #62:   Can Not Push Block – Device: %% , Length: %%

For system software developers only. Consult product group.

Error #80:   Fixed transaction Index (%%) is Out Of Range

This message indicates that a fixed transaction that can not be found in the transaction table was received. It is an illegal transaction.

Error #81:   No Fixed transactions Table Was Assigned To Slave

A fixed transaction was received but the fixed transaction table was not downloaded into the slave.

Error #82:   Bad transaction Format

Illegal transaction. For example: 'Z' (table number) does not exist.

Error #85:   Trying To Comm. After Session Was Ended

Illegal communication. The transaction ended but data still arriving. This may occur due to differences in the data structure of master and slave.

Error #86:   Transaction Length Exceeds 256 Bytes

Transaction is too big.

Error #87:   Bad transaction Flags: %%

Undefined bits are set in the flags area of the transaction.

Error #88:   Data too long

Due to differences in the data structure between master and slave, spare data is arriving.

Error #89:   Data too short

Due to differences in the data structure between master and slave, only part of the data has arrived.

Error #95:   Queue in fram_seq is full

The Rev Seq queue is full and the application did not get the frames.

Error #96:   Trouble in queue: %%

Illegal management of linked buffers.

Error #100:   Trying to access illegal logical channel in transport layer

Illegal logic channel for the device.

Error #101:   Illegal data in transport layer structure

Illegal data for the device.

Error #110:   Illegal number of logical channels in transport multiplexer

The actual number of logical channels is bigger than the number defined during the creation of the device.

Error #111:   From Site : %%Link : %% can not communicate with current unit

Communication was initiated by a site which is not defined in the Site table.

Error #112:   Trouble in queue: %%

Illegal management of linked buffers.

Error #113:   Illegal control byte : %%

Memory overwrite in a buffer that passed a CRC check. The buffer is dumped into the heap.

Error #114:   Illegal buffer : %%

The Transport Multiplex layer can not understand a buffer that passed a CRC check. This buffer is dumped into the heap.

Error #115:   Application Id not exists : %%

Applying to an application that does not exist in the RTU. This may occur when using a new version of Tool Box with new features to communicate with an older RTU that is not familiar with those new features.

Error #116:   Machine code illegal : %%

Due to a bug in the Transport Multiplex layer, the 'states machine' has reached an illegal state.

Error #117:   Can't talk with master because unit was not defined as Slave !! OR flag Master is Set but Unit was not defined as Master !!

For system software developers only. Consult product group.

Error #120:   Can not get characters from existing buffer

May indicate system software error. Consult product group.

Error #121:   Illegal compilation of SEND output

Indicates a software error in the Application Programmer. Consult product group.

Error #140:   Invalid Link ID, network layer: %%, Dest Site: %%,
Dest Link: %%, Dest Port: %%

The network layer in a RTU is asked to transfer a communication buffer to the Dest Site, Dest Link & Dest port but the specific link is not known to this RTU (since other links are defined).

Error #141:   Can not find Link ID in network configuration, network layer: %% Dest Site: %%, Dest Link: %%,   Dest Port: %%

The network layer in a RTU is asked to transfer a communication buffer to the Dest Site, Dest Link & Dest port but there is no route defined in the network configuration, which the communication can be transferred through.

Error #142:   Destination=Default Central, Network layer: %%, Dest Site: %%, Dest Link: %%,   Dest Port: %%

Network is trying to transfer a buffer to Default central before the last one communicate with the transmitting site at least once.

Error #144:   Transparent Network layer !! Can not route via other Link ID network layer: %%

For system software developers only. Consult product group.

Error #145:   Formatted buffer is smaller than the received frame, network layer: %%

May indicate system software error. Consult product group.

Error #160:   Timer service is not activated since timer is defined with 0 time units, device: %%

The data of the timers device is corrupted. Trying to operate a timers routine with no time units.

Error #161:   # of time units passed without activating timer service is %%, device: %%

The timers task can not start its operation in a time interval which is bigger than the time interval that was allocated for it in the device creation. This message may indicate either a long scan time (above 500 msec) or an infinite loop in the user application.

Error #170:   Illegal data in constant cyclic buffer structure

May indicate system software error. Consult product group.

Error #171:   Illegal data in variable cyclic buffer structure

May indicate system software error. Consult product group.

Error #180:   Illegal setting of date & time:
Seconds: %%   Minutes: %%   Hours: %%
Day   : %%   Date : %%   Month: %%   Year: %%

The date and time settings are not correct. This message appears when the user application updates the time and date and one or more of the settings is incorrect.

Error #181:   Getting illegal date & time:
                Seconds: %%   Minutes: %%   Hours: %%
                Day   : %%   Date : %%   Month: %%   Year: %%

May indicate either system software error or incorrect real-time clock component in the RTU. Consult product group.

Error #190:   Corrupted heap data base:
                device   : %%
                pointer to start chain   : %%
                pointer to current chain   : %%
                pointer to end chain   : %%
                # of buffers left in heap   : %%

May indicate system software problem. Consult product group.

Error #191:   Heap: buffer is allocated for too much time.
                device   : %%
                buffer address   : %%
                allocated for more than %% minutes, it happened %% time(s).

May indicate system software problem. Consult product group.

Error #192:   Buffer: %% is already free. Calling address is: %%

May indicate system software problem. Consult product group.

Error #200:   Odd address of working area

For system software developers. Consult product group.

Error #201:   Insufficient space in work area

May indicate system software problem. Consult product group.

Error #202:   Corrupted device KEY

May indicate system software problem. Consult product group.

Error #203:   Heap: %% is empty, device: %%

Empty heap. Consult product group.

Error #210:   Corrupted Duty Cycle: %% or Gap Cycle: %%

Illegal percents (above 100% or negative) were assigned to the Duty Cycle in the user application.

Error #212:   Main process is running more than 1.2 seconds !!

The user application includes either an infinite loop or a loop that occupies the CPU for a long time, and other tasks do not get CPU time.

Error #230:   Bad table coordinate :%%

The 'Z' coordinate (table number) belongs to a table that does not exist in the application, probably because of differences in the data structure between master and slave.

Error #231:   Bad row coordinate :%% in table #%%

The 'Y' coordinate (row number) does not exist in the table, probably because of differences in the data structure between master and slave.

Error #232:   Bad column coordinate :%% in table #%%

The 'X' coordinate (column number) does not exist in the table, probably because of differences in the data structure between master and slave.

Error #233:   No COS memory space was allocated to table #%%

There is no 'COS' column defined in the table.

Error #234:   NOT enough Space for Differentiators (%% Bytes). Application DISABLED.

Each application needs at least 256 bytes, which are not available, for differentiators.

Error #235:   Warning: Short USER RAM: %% Bytes

In case the free space available for application is less than 2 Kbyte, the user is notified that the running application is limited.

Error #236:   Index is out of range : %% %%

The index in the user application has reached 256 or exceeded it.

Error #237:   No application in FLASH memory or Application was stopped !!

Trying to get data from some table, while the application was not downloaded or was stopped.

Error #238:   Task '%%' does NOT exist !!

For system software developers only. Consult product group.

Error #239:   No Delta COS Area Was Allocated To Column #%% in Table #%%

Trying to read COS of a column that does not have COS area. Improper use of DB_Map application.

Error #240:   Invalid Time Tag List: %% OR Events list: %%
                error returned from sio_set_di_cos_en(): %%

May indicate system software problem. Consult product group.

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Error #241:   Txintrc or Rxintrc was called with invalid type %%

Invalid parameter type. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Error #242:   Intrac/Meic port not created

The appropriate port must be defined in Site Configuration.

Error #243:   One of the following calls: Txintrc, Txwidth, Rxintrc, Rxwidth, Rxiupd failed getting pointer to value at intrac system table

May indicate system software problem. Consult product group.

Error #244:   Txintrc was called with ITxStt=0 or Txwidth was called with Tx_len=0

Illegal value set in application.

Error #245:   #the 'Load' option was used to download the application, however the number of diffrentiators were changed.

You should use the 'Reset Load' option instead and then do Download.

Error #250:   Cannot read module type at: %%

I/O module defined but physically missing.

Error #251:   Module type does not match site configuration, module: %%

Incompatible module type. Configuration definition and physical module are different.

Error #252:   Module: %%, initial values are invalid.

There are no preset values in the control registers of the DO module gate array.

Error #253:   Digital output module: %%, desired values in gate array are not equal to image in memory.

The gate array data and the image in the RTU do not match.

Error #254:   Digital output module: %%, actual values of relays are not equal to desired values in gate array.

The gate array data and the image in the RTU do not match.

Error #255:   I/O module: %% analog input not calibrated.

At least one of the analog input in the module is not calibrated.

Error #256:   Cannot 'communicate' with module: %%

It is not possible to read data from the module; it is faulty.

Error #257:   Some Failure In Module %%.

Faulty FIFO communication in the specified module.

Error #258:   CLOCK fail flag in module %% is on.

The clock in the specified module is faulty.

Error #259:   I/O module: %% EE memory problem.

All the channels are calibrated, but the inner EE is problematic.

Error #260:   Analog input module: %% FIFO time-out.

The Analog Input module does not respond to the RTU CPU.

Error #261:   Mixed I/O module: %% analog input problem

There is a problem in the specified analog input of the Mixed I/O module.

Error #262:   I/O Module: %% analog output not calibrated.

The specified analog input of the Mixed I/O module is not calibrated.

Error #263:   I/O module: %% analog input calib. succeeded with borderline input.

Calibration succeeded but one of the measurements is out of range.

Error #264:   DI FAIL In Module %%.

The specified module (DI or Mixed I/O) is in FAIL.

Error #265:   AI FAIL In Module %%.

The AI module is in FAIL.

Error #266:   Relay Check Back (CB) FAIL In Module %%.

Incompatibility between desired and actual status in DSP outputs.

Error #267:   Module %%, Scale Factor or Threshold Changed From User Requested Value.

Incompatibility between desired and actual status in AO.

Error #268:   Module %%, DSP Not Ready.

The AC Analyzer module does not respond due to hardware or software problems. Consult product group.

Error #269:   Module %%, DSP Reset.

The AC Analyzer module has reset itself. Hardware or software problems. Consult product group.

Error #270:   Incompatible Communication PROTOCOL on: PORT #%% CONTROL=%% STATUS=%%

May indicate system software/hardware problem. Consult product group.

Error #271:   Uncontrollable Communication PHYSICAL on: PORT #%% CONTROL=%% STATUS=%%

May indicate system software/hardware problem. Consult product group.

Error #272:   Unoperational Communication PHYSICAL on: PORT #%% CONTROL=%% STATUS=%%

May indicate system software/hardware problem. Consult product group.

Error #273:   Unoperational PHYSICAL Internal LOOP on: PORT #%% CONTROL=%% STATUS=%%

When checking the port (HDLC or UART), the RTU turns into a self loop mode, sends a frame and receives it. This message is displayed if the received frame is not equal to the one that was sent, and the port is port3.

Error #274:   Unoperational PHYSICAL External LOOP on: PORT #%% CONTROL=%% STATUS=%%

When checking the port (HDLC or UART), the RTU turns into an internal loop mode, sends a frame and receives it. This message is displayed if the received frame is not equal to the one that was sent, and the ports are 1 or 2.

Error #275:   Unsuccessful PHYSICAL Configuration on: PORT #%% COMMAND=%% ANSWER=%%

Internal modem does not exist or illegal parameters were downloaded to this modem.

Error #276:   Uncontrollable PHYSICAL Configuration on: PORT #%% COMMAND=%% DATA=%%

Problem in the internal modem.

Error #280:   Incompatible Communication BOARD on: PORT #%% CONTROL=%% STATUS=%%

Piggyback on port3 is illegal.

Error #281:   Uncontrollable Communication CHANNEL on: PORT #%% CONTROL=%% STATUS=%%

Programmable RS-232 was not defined and the CTS & RTS detectors are defected.

Error #282:   Unoperational Communication CHANNEL on: PORT #%% CONTROL=%%
                STATUS=%%

                The port is transferred to software mode. This message is displayed if CD is not
                active.

Error #283:   Unoperational CHANNEL Internal LOOP on: PORT #%% CONTROL=%%
                STATUS=%%

                Incompatibility between the frame that was sent and received by the internal
                loop.

Error #284:   Unoperational CHANNEL External LOOP on: PORT #%% CONTROL=%%
                STATUS=%%

                Incompatibility between the frame that was sent and received by the external
                loop.

Error #285:   Unsuccessful CHANNEL Configuration on: PORT #%% COMMAND=%%
                ANSWER=%%

                Internal modem does not exist or illegal parameters were downloaded.

Error #286:   Uncontrollable CHANNEL Configuration on: PORT #%% COMMAND=%%
                DATA=%%

                Problem in the internal modem.

Error #287:   No response from internal DPSK modem on: port #%% command=%%
                data=%%

                Problem in the internal modem-piggyback plug in Port Type unit for Port 3.

Error #288:   An Incompatible piggyback was found.
                The configuration was defined for Radio model: R%%
                The installed piggyback ID is: %%
                 (see the table below for conversion)
                The following table lists the available IDs:

Piggyback ID	Description
1	Spread Spectrum (Aironet) R202
2	Spread Spectrum (Aironet) R100
3	Spread Spectrum (Aironet) R202 AND DPSK interface
4	Spread Spectrum (Aironet) R100 AND DPSK interface
Other	Unknown, invalid or no piggiback

                For Spread Spectrum radio only (MOSCAD-L only).

Error #289:   Could not program the spread spectrum (aironet) radio successfully. The
                readback registers value was different from the written ones.

                Piggyback cannot be programmed. Switch or fix piggyback.

Error #290:   A fault has occurred in the spread spectrum (aironet) radio. The system has checked the radio registers and found that their values are different from the expected ones. The system tried to correct the problem by reinitializing the radio unsuccessfully. A power restart of the CPU and the radio may resolve the problem.

Try to do a restart.

Error #300:   MTE CRASH:

Error Code	: %%
Problematic Thread	: %%
Problematic Device	: %%
Status Register (SR)	: %%
Program Counter (PC)	: %%
Current Task	: %%
Candidate Task	: %%

May indicate system software problem. Consult product group.

Error #301:   MTE WARNING: The MTE_VLD Lowest Priority Task in The System Was Not Reached For %% Ticks. System is Either Overloaded Or Some Process is in Infinite Loop !!!! . Maximum Allowed Time At Which The Lowest Task May Not Activate is %% Ticks.

A task is in infinite loop. Consult product group.

Error #302:   %% CRASH:

R/~W	: %%
~I/N	: %%
Function Code	: %%
Access Address	: %%
Instruction Register	: %%
Status Register (SR)	: %%
Program Counter (PC)	: %%
Current Task	: %%
Candidate Task	: %%

Bus error or address error crash. May indicate system software problem. Consult product group.

Error #303:   %% CRASH:

Status Register (SR)	: %%
Program Counter (PC)	: %%
Current Task	: %%
Candidate Task	: %%

Illegal instruction crash. May indicate system software problem. Consult product group.

Error #304:   MTE: The CONTROL procedure of devices was not started, because the type of control parameter is out of range !!
Type of requested control was :   %%
The last valid control entry is   :   %%

Internal error. May indicate system software problem. Consult product group.

Error #305:   MTE: The MTE CONTROL procedure of devices failed !!!
Device Name   :   %%
Control Type   :   %%
Number of successive fails   :   %%

The control procedure of one of the devices has failed. May indicate system software problem. Consult product group.

Error #350:   Session layer: in function %% remove slice failed. Remove slice failed.

May indicate system software problem. Consult product group.

Error #351:   Session layer: in function %% get slice failed. Get slice failed.

For system software developers. Consult product group.

Error #352:   Session layer: in function %% allocation of formatted buffer failed. Allocation of a buffer failed.

May indicate system software problem. Consult product group.

Error #353:   Session layer: in function %% buffer in RX is kept by lower layer.

May indicate system software problem. Consult product group.

Error #354:   Session layer: in function %% no more room for error buffers.

May indicate system software problem. Consult product group.

Error #355:   Session layer: in function %% received not error buffer, while in tx.

May indicate system software problem. Consult product group.

Error #356:   Session layer: in function %% format error. Protocol found error.

May indicate system software problem. Consult product group.

Error #357:   Session layer: in function %% unable to perform abort session.

May indicate system software problem. Consult product group.

Error #358:   SESSION: In Function %% Illegal Password. Session Not Opened.

Illegal password. Session was not opened.

Error #400:   Presentation layer: in function %% remove slice failed. Remove slice failed.

                May indicate system software problem. Consult product group.

Error #401:   Presentation layer: in function %% get slice failed. Get slice failed.

                May indicate system software problem. Consult product group.

Error #402:   Presentation layer: in function %% push byte in fbuf failed. Push byte failed.

                May indicate system software problem. Consult product group.

Error #403:   Presentation layer: in function %% pull byte from fbuf failed. Pull byte failed.

                May indicate system software problem. Consult product group.

Error #404:   Presentation layer: in function %% push block in fbuf failed. Push block failed.

                May indicate system software problem. Consult product group.

Error #405:   Presentation layer: in function %% pull block from fbuf failed. Pull block failed.

                May indicate system software problem. Consult product group.

Error #406:   Presentation layer: in function %% allocation of fbuf failed. Allocation problem.

                Empty heap. Consult product group.

Error #407:   Presentation layer: in function %% the presentation is in aborted state

                May indicate system software problem. Consult product group.

Error #408:   Presentation layer: in function %% the presentation is not in tx state.

                May indicate system software problem. Consult product group.

Error #409:   Presentation layer: in function %% the presentation is not in rx state.

                May indicate system software problem. Consult product group.

Error #410:   Presentation layer: in function %% the len of tx structure is out of range.

                May indicate system software problem. Consult product group.

Error #411:   Presentation layer: in function %% general format error. Protocol format error.

                May indicate system software problem. Consult product group.

Error #412:   Presentation layer: in function %% format error, compression not supported.
                Format error. Compression is not supported.

                May indicate system software problem. Consult product group.

Error #413:   Presentation layer: in function %% format error, encryption not supported. Encryption and compression are not supported.

May indicate system software problem. Consult product group.

Error #414:   Presentation layer: in function %% format error, control number out of range. Protocol format error.

May indicate system software problem. Consult product group.

Error #415:   Presentation layer: in function %% general synchronization error.

May indicate system software problem. Consult product group.

Error #416:   Presentation layer: in function %% the rx applic, buffer size is too small.

May indicate system software problem. Consult product group.

Error #417:   Presentation layer: in function %% no more rooms for error buffers.

May indicate system software problem. Consult product group.

Error #450:   Stock set: the stock buffer is locked for too much time

For system software developers. Consult product group.

Error #451:   Stock get: the stock buffer is locked for too much time

For system software developers. Consult product group.

Error #500:   IOTEST: Invalid Option: %%

Applying to a non-existing option for I/O module testing in the RTU. This may occur when using a new version of Tool Box with new features to communicate with an older RTU that is not familiar with those new features.

Error #501:   IOTEST: Bad Device Name %% for Service %%

Problem in getting device key & pin_table out of device name.

Error #520:   Minisess: illegal box nr. %% , data problem !!!

May indicate system software problem. Consult product group.

Error #540:   Time_tag rack module not exist: %%

Data was received for an I/O bit that exists in an I/O module, but not defined in the user ROM.

Error #541:   Time_tag->read %%> time_tag->write %%

May indicate system software problem. Consult product group.

Error #560:   The MC68882 Coprocessor is connected, but is not OK.

All floating point and double precision calculations are emulated by software.

Error #561:   The MC68882 device data is corrupted. Software problem.

May indicate system software problem. Consult product group.

Error #562:   The check validity or test of MC68882 device failed due to MTE_TSTNSET locking. Software problem.

May indicate system software problem. Consult product group.

Error #563:   The MC68882 RAM jump table is too short !!! Software problem.

May indicate system software problem. Consult product group.

Error #564:   The MC68882 Coprocessor is no more functioning.

All floating point and double precision calculations are emulated by software.

Error #565:   Fatal !!!! The %% operation is not executed correctly !!!

May indicate system software problem. Consult product group.

Error #600:   Unable to run %% from 2 different processes !!

Unable to run PPH from two different processes.

Error #601:   The scan_discrete_in call in PPH module failed !!

May indicate system software problem. Consult product group.

Error #602:   The call to prv_userrom_pph_timer from timer 10 ms is to late !!! PPH may have lost pulses !!!!!!!!!!

May indicate system software problem. Consult product group.

Error #603:   The PPH structure is CORRUPTED !!! The PPH calculations may be wrong !!!

May indicate system software problem. Consult product group.

Error #604:   Fatal !!! CPY Not Performed due to border problems !!!

Trying to use the CPY function with illegal parameters.

Error #605:   Fatal !!! Division by 0 in rungs while performing the MODULO operation. The result is undefined !!

Dividing by 0 in user application.

Error #606: Fatal !!! Division by 0 in rungs while performing the divide operation. The result is undefined !!

Dividing by 0 in user application.

Error #620: Ticks disabled exceed allowed limit : SR=%% IPR/IMR=%% WRR/WCN=%%

May indicate system software problem. Consult product group.

Error #640: Fatal !!! Not enough work space for Monitor application !!
Available space transferred for the Monitor – %% bytes.
Minimum space required for Monitor – %% bytes.

May indicate system software problem. Consult product group.

Error #700: Invalid next version pointer   : %%
Current version pointer : %%
Entry pointer of list   : %%

Illegal linked list in the FLASH memory.

Error #701: Invalid data pointer   : %%
Current version pointer :   %%
Entry pointer of list   : %%

Illegal linked list in the FLASH memory.

Error #702: Start data pointer   : %%
Length of data   : %%

Illegal linked list in the FLASH memory.

Error #730: Device TOPLC,Function %%, Port Name %% : Illegal Request from application.

May indicate system software problem. Consult product group.

Error #731: Device TOPLC,Function %%, Port Name %% : Unable To Unpack F-Buffer.

May indicate system software problem. Consult product group.

Error #732: Device TOPLC,Function %%, Port Name %% : ERR_LOCK In TX Physical.

May indicate system software problem. Consult product group.

Error #733: Device TOPLC,Function %%, Port Name %% : ERR_FULL In TX Physical.

May indicate system software problem. Consult product group.

Error #734: Device TOPLC,Function %%, Port Name %% : Unable to Push A Block In F-UF Buffer. Push block failed.

May indicate system software problem. Consult product group.

Error #735: Device TOPLC,Function %%, Port Name %% : Unable To Alloc Uf Buffer. Allocation problem.

May indicate system software problem. Consult product group.

Error #736: Device TOPLC,Function %%, Port Name %% : Unable To Unpack Uf Buffer. Unpack Uf Buffer failed.

May indicate system software problem. Consult product group.

Error #737: Device TOPLC,Function %%, Port Name %% : Unable To Alloc Buffer. Allocation problem.

Empty heap. Consult product group.

Error #738: Device TOPLC,Function %%, Port Name %% : The Port to PLC is busy.

The port is busy.

Error #739: Device TOPLC,Function %%, Port Name %% : Not enough memory for the application !!

May indicate system software problem. Consult product group.

Error #740: Device TOPLC,Function %%, Port Name %% FATAL, State EQ Waiting Control but f_buf NE NULL !! Software problem.

May indicate system software problem. Consult product group.

Error #741: Device TOPLC, Function %%, Port Name %% : Fbuf Must Be NULL !!

May indicate system software problem. Consult product group.

Error #742: Device TOPLC,Function %%, Port Name %% : flashapp_get_block() has failed !!

May indicate system software problem. Consult product group.

Error #743: Device TOPLC,Function %%, Port Name %% : flashapp_cur_burn() has failed !!

May indicate system software problem. Consult product group.

Error #744: Device TOPLC, Function %%, Port Name %% : Not found the loaded software for the port. This port is not operational.

The third-party protocol port is not operational.

Error #745: Device TOPLC, Function %%, Port Name %%

The download of software for this port has failed.

Error #746:   Device TOPLC, Function %%, Port Name %% Received a control from the SWITCHER while there is no software loaded for the PLC port. The received f_buf (control) has been freed.

The RTU has to switch frames while the protocol is not loaded in the FLASH memory.

Error #760:   Device TOSCADA, Function %% Port Name %% : Illegal Request from application.

May indicate system software problem. Consult product group.

Error #761:   Device TOSCADA, Function %% Port Name %% : Unable To Unpack F-Buffer. Unpack F-Buffer failed.

May indicate system software problem. Consult product group.

Error #762:   Device TOSCADA, Function %% Port Name %% : ERR_LOCK In TX Physical.

May indicate system software problem. Consult product group.

Error #763:   Device TOSCADA,Function %% Port Name %% : ERR_FULL In TX Physical.

May indicate system software problem. Consult product group.

Error #764:   Device TOSCADA, Function %% Port Name %% : Unable to Push a Block In F-UF Buffer. Push block failed.

May indicate system software problem. Consult product group.

Error #765:   Device TOSCADA, Function %% Port Name %% : Unable To Alloc Uf Buffer. Allocation of buffer failed.

Empty heap. Consult product group.

Error #766:   Device TOSCADA, Function %% Port Name %% : Unable To Unpack Uf Buffer. Unpack Uf Buffer failed.

May indicate system software problem. Consult product group.

Error #767:   Device TOSCADA, Function %% Port Name %% : Unable To Alloc Buffer. Allocation of buffer failed.

Empty heap. Consult product group.

Error #768:   Device TOSCADA, Function %% Port Name %% : The Port to SCADA is busy.

The port is busy.

Error #769:   Device TOSCADA, Function %% Port Name %% : The f_buf is missing !!

May indicate system software problem. Consult product group.

Error #770:   Device TOSCADA, Function %% Port Name %% : Cannot find site index and
                port.

                There is a problem in PLC table or site table definition.

Error #771:   Device TOSCADA, Function %% Port Name %% : Not enough memory for the
                application.

                Memory problem. Consult product group.

Error #772:   Device TOSCADA, Function %% Port Name %% : flashapp_get_block() has
                failed !!

                May indicate system software problem. Consult product group.

Error #773:   Device TOSCADA, Function %% Port Name %% : flashapp_cur_burn() has
                failed !!

                May indicate system software problem. Consult product group.

Error #774:   Device TOSCADA, Function %% Port Name %% :
                Not found the loaded software for the port. This port is not operational.

                PLC port connected to master is not operational. Consult product group.

Error #775:   Device TOSCADA, Function %% Port Name %%
                The download of software for the port failed.

                Download of software for third party protocol has failed.

Error #776:   Device TOSCADA, Function %%   Port Name %%
                Received a reply frame from the SWITCHER while there is no software loaded
                for the port.

                The received frame (reply) has been freed. No software loaded for third party
                protocol port.

Error #820:   Userrom Plc module, Function %%
                Control Format Error !

                Communication protocol format error. May indicate system software problem.
                Consult product group.

Error #821:   Userrom Plc module, Function %%
                Pushbyte To fbuf Failed !

                May indicate system software problem. Consult product group.

Error #822:   Userrom Plc module, Function %%
                Pusblock To fbuf Failed !

                May indicate system software problem. Consult product group.

Error #823:   Userrom Plc module, Function %%
                Get_coldef_tab Failed !

                May indicate system software problem. Consult product group.

Error #824:   Userrom Plc module, Function %%
                Data Type Format Error In Protocol !

                Communication format error. Consult product group.

Error #825:   Userrom Plc module, Function %%
                Data Type Mismatch !

                Data type error when accessing a column via PLC communication. Data type
                mismatch.

Error #826:   Userrom Plc module, Function %%
                Number of elements must be greater from 0

                May indicate system software problem. Consult product group.

Error #827:   Userrom Plc module, Function %%
                First Y – coord. out of range !

                This message indicates that the SCADA accesses via PLC communication a
                row which is out the range of defined rows.

Error #828:   Userrom Plc module, Function %%
                Last Y – coord. out of range !

                This message indicates that the SCADA accesses via PLC communication a
                row which is out the range of defined rows.

Error #829:   Userrom Plc module, Function %%
                Unpack of f_buf failed !

                May indicate system software problem. Consult product group.

Error #830:   Userrom Plc module, Function %%
                Scan failed. No rows in column !

                May indicate system software problem. Consult product group.

Error #831:   Userrom Plc module, Function %%
                Cannot allocate f-buf !

                Empty heap. Consult product group.

Error #832:   Userrom Plc module, Function %%
                Reply Format Error !

                Communication format error in the reply frame. May indicate system software
                problem. Consult product group.

Error #833:   Userrom Plc module, Function %%
               Cannot Find PLCStt !

               May indicate system software problem. Consult product group.

Error #834:   Userrom Plc module, Function %%
               Iolink definition problem of PLC column !

               May indicate system software problem. Consult product group.

Error #835:   Userrom Plc module, Function %%
               Some PLC address in not defined in PLC Table !

               Define all PLC addresses in the PLC Table.

Error #836:   Userrom Plc module, Function %%
               Illegal Data Type !

               May indicate system software problem. Consult product group.

Error #837:   Userrom Plc module, Function %%
               Reply ignored, when no application

               This message may appear during an additional application download.

Error #838:   Userrom Plc module, Function %%
               Reply Ignored, Not Waiting For Reply !

               May indicate system software problem. Consult product group.

Error #839:   Userrom Plc module, Function %%
               Reply Ignored due to unpack failure!

               May indicate system software problem. Consult product group.

Error #840:   Userrom Plc module, Function %%
               Reply Ignored, site index and port not as expected!

               May indicate system software problem. Consult product group.

Error #841:   Userrom Plc module, Function %%
               Reply Ignored, sequence number not as expected!

               Timeout problems. Consult product group.

Error #842:   Userrom Plc module, Function %%
               Reply Ignored, length is not as expected!

               May indicate system software problem. Consult product group.

Error #843:   Userrom Plc module, Function %%
               Reply Application Error %% !

               May indicate system software problem. Consult product group.

Error #844:   Userrom Plc module, Function %%
Cannot Find PLC address %% in download process or userrom not OK.

Can not perform PLC communication while application not loaded or during application download.

Error #845:   Userrom Plc module, Function %%
Failed to find PLC address %% in PLC Table.

Define all PLC addresses in PLC Table.

Error #846:   Userrom Plc module, Function %%
When referring RTU PLC from rungs, you must define in IOLINK only the (z,x,y) coordinates !
The length of each coordinate must be 1 byte !

I/O link definition error in PLC type column.

Error #847:   Userrom Plc module, Function %%
Destination PLC IOLINK data type error !

When referring RTU PLC from rungs, the data type of the column in I/O Link must be defined as one of the following:

   a) PLCBIT
   b) PLCVAL
   c) PLCFLT

Communication protocol format error. Consult product group.

Error #848:   Userrom Plc module, Function %%
The length of PLC column being scanned should not exceed 140 bytes !!!

Scan on PLC type column should not exceed 140 bytes.

Error #861:   The phone connection was established, but the RTU doesn't respond

Different Site ID of the addressed phone number.

Error #862:   ML_Dial: TX fail, probably the phone line was disconnected.

Can not transmit due to disconnected phone line.

Error #863:   No phone Book in flash memory.

Can not dial without phone book.

Error #875:   Status is 'wait for call' but the line is active.

The RTU software status and phone line status do not match; the line will be disconnected.

Error #876:   The TX thread did not hang up the phone line as the RX thread asked.

For system software developers. Consult product group.

Error #877:   Can not find Site Id – %% in phone book.

Can not dial a Site ID without it being defined in the phone book.

Error #878:   Modem refuses to dial this phone number (too long, invalid command, or answer mode only):

Invalid command (internal problem).

Error #900:   PLC Switcher module, Function %%
Fatal ! The SWITCHER Device is destroyed – CRC error !

May indicate system software problem. Consult product group.

Error #901:   PLC Switcher module, Function %%
Cannot allocate a formatted buffer !

Empty heap. Consult product group.

Error #902:   PLC Switcher module, Function %%
Found in port table a logical port i.d with not expected direction

Third party protocol port definition problem.

Error #903:   PLC Switcher module, Function %%
Remove slice of formatted buffer failed !

May indicate system software problem. Consult product group.

Error #904:   PLC Switcher module, Function %%
Get slice of formatted buffer failed !

For system software developers. Consult product group.

Error #905:   PLC Switcher module, Function %%
buf_f_init of formatted buffer failed !

For system software developers. Consult product group.

Error #906:   PLC Switcher module, Function %%
Switcher format error of received frame !

May indicate system software problem. Consult product group.

Error #907:   PLC Switcher module, Function %%
Illegal direction parameter!! Getting of PLC port failed !

Third party protocol port definition error.

Error #908:   PLC Switcher module, Function %%
Cannot get the PIN Table !

May indicate system software problem. Consult product group.

Error #909:   PLC Switcher module, Function %%
Cannot find the key of a PLC port software from logical port i.d.!

May indicate system software problem. Consult product group.

Error #910:   PLC Switcher module, Function %%
Cannot find in switcher port table the key of PLC%% connected to %%

PLC table,site table or third party protocol port definition problem.

Error #911:   PLC Switcher module, Function %%
Pull Buffer from Head LIST Failed, although the list is not empty !!

May indicate system software problem. Consult product group.

Error #912:   PLC Switcher module, Function %%
Push Buffer to Head LIST Failed.
Fatal !! The Head List is corrupted !

May indicate system software problem. Consult product group.

Error #913:   PLC Switcher module, Function %%
Push Buffer to Head LIST Failed. Too many buffers in the head list!
The buffer was freed !!

May indicate system software problem. Consult product group.

Error #930:   MODBUSTM module, Function %%
Illegal state !!

May indicate system software problem. Consult product group.

Error #931:   MODBUSTM module, Function %%
Not enough RAM memory for MODBUS load module connected to MASTER !!

May indicate system software problem. Consult product group.

Error #932:   MODBUSTM module, Function %%
Received the reply not in expected format

Timeout problems or system software problem. Consult product group.

Error #933:   MODBUSTM module, Function %%
The size of MODBUS format reply is too large or too small

The master should not send frames or poll for frames longer than 140 bytes.

Error #934:   MODBUSTM module, Function %%
                The MODBUS reply frame CRC is not correct

                CRC error in MODBUS reply frame.

Error #935:   MODBUSTM module, Function %%
                The size of RTU PLC format reply is too large or too small

                The master should not send frames or poll for frames longer than 140 bytes.

Error #936:   MODBUSTM module, Function %%
                No support for broadcast. Frame ignored

                The MODBUS module does not support broadcasts.

Error #937:   MODBUSTM module, Function %%
                MODBUS to RTU PLC format translation of control failed !!

                Unable to interpret MODBUS format frame. May indicate system software
                problem. Consult product group.

Error #938:   MODBUSTM module, Function %%
                RTU to MODBUS format translation of reply failed !!

                Unable to combine MODBUS reply. May indicate system software problem.
                Consult product group.

Error #939:   MODBUSTM module, Function %%
                The received frame is too long for the RX buffer of the module !!

                The MODBUS master should not send frames or poll for frames longer than
                140 bytes.

Error #940:   MODBUSTM module, Function %%
                The size of translated to RTU PLC format control is too large for the buffer

                The received MODBUS frame is too long.

Error #941:   MODBUSTM module, Function %%
                The RTU PLC reply format buffer is less than 2 bytes!

                May indicate system software problem. Consult product group.

Error #942:   MODBUSTM module, Function %%
                The RTU PLC format NACK buffer is greater than 2 bytes!

                May indicate system software problem. Consult product group.

Error #943:   MODBUSTM module, Function %%
                The RTU PLC format spare field is not 0 !!

                May indicate system software problem. Consult product group.

Error #944:   MODBUSTM module, Function %%
               The box number of the reply is not as expected!!

               Timeout problems. Consult product group.

Error #945:   MODBUSTM module, Function %%
               The length of pure data in frame is not as expected!!

               Timeout problems or system software problem. Consult product group.

Error #946:   MODBUSTM module, Function %%
               Can not pack in 1 byte the N_BYTES field in 1 byte.
               The value of N_BYTES > 0xff.

               May indicate system software problem. Consult product group.

Error #947:   MODBUSTM module, Function %%
                The ACK reply received with data. Expecting ACK with no data !

               Timeout problems or system software problem. Consult product group.

Error #948:   MODBUSTM module, Function %%
               Received a non supported function request

               Received a request from MODBUS master that is not supported by the RTU.
               Request is ignored.

Error #949:   MODBUSTM module, Function %%
               Number of elements must be less from 0xff.
               Received a request for more than 0xff elements.

               The master should not send frames or poll for frames longer than 140 bytes.

Error #950:   MODBUSTM module, Function %%
               The FLUSH function failed, but continuing

               May indicate system software problem. Consult product group.

Error #951:   MODBUSTM module, Function %%
               The Set Parameters function failed, but continuing

               May indicate system software problem. Consult product group.

Error #970:   MODBUSTS module, Function %%
               Illegal state !!

               May indicate system software problem. Consult product group.

Error #971:   MODBUSTS module, Function %%
               Not enough RAM memory for MODBUS load module connected to PLC !!

               May indicate system software problem. Consult product group.

Error #972:   MODBUSTS module, Function %%
                The FLUSH function failed, but continuing

                May indicate system software problem. Consult product group.

Error #973:   MODBUSTS module, Function %%
                The Set Parameters function failed, but continuing

                May indicate system software problem. Consult product group.

Error #974:   MODBUSTS module, Function %%
                The size of MODBUS format reply is too large or too small

                The master should not send frames or poll for frames longer than 140 bytes.

Error #975:   MODBUSTS module, Function %%
                MODBUS to RTU PLC format translation of reply failed !!

                May indicate system software problem. Consult product group.

Error #976:   MODBUSTS module, Function %%
                No support for broadcast. Frame ignored

                No support for broadcast frames in MODBUS protocol.

Error #977:   MODBUSTS module, Function %%
                The CRC of MODBUS control frame is not correct !

                Consult product group.

Error #978:   MODBUSTS module, Function %%
                The control frame in MODBUS format is too long for the module or is too short !

                The master should not send frames or poll for frames longer than 140 bytes.

Error #979:   MODBUSTS module, Function %%
                The control frame in RTU PLC format is too long for the module or is too short !

                The master should not send frames or poll for frames longer than 140 bytes.

Error #980:   MODBUSTS module, Function %%
                Illegal opcode (command) in RTU PLC format control !

                May indicate system software problem. Consult product group.

Error #981:   MODBUSTS module, Function %%
                Pure data in Poll control. No data must appear in this control !!

                May indicate system software problem. Consult product group.

Error #982: MODBUSTS module, Function %%
The N_ELM field in poll control is zero !
It must be GE from 1.

May indicate system software problem. Consult product group.

Error #983: MODBUSTS module, Function %%
Could not translate the RTU PLC to MODBUS because the MODBUS buffer is too short

The master should not send frames or poll for frames longer than 140 bytes.

Error #984: MODBUSTS module, Function %%
Could not translate the RTU PLC to MODBUS !
No support for the data type appearing in a poll control !

May indicate system software problem. Consult product group.

Error #985: MODBUSTS module, Function %%
The length of pure data in send control is 0 !!
It must be GE from 1

May indicate system software problem. Consult product group.

Error #986: MODBUSTS module, Function %%
The N_ELM field in send control is EQ 0 !
It must be GE from 1

May indicate system software problem. Consult product group.

Error #987: MODBUSTS module, Function %%
The length of pure data in send control is greater from 0xff !
It must be LE from 0xff !

May indicate system software problem. Consult product group.

Error #988: MODBUSTS module, Function %%
The length of pure data does not fit to the data type and to the N_ELM field in RTU PLC format frame !

May indicate system software problem. Consult product group.

Error #989: MODBUSTS module, Function %%
No support for the data type in the send control frame !

May indicate system software problem. Consult product group.

Error #990: MODBUSTS module, Function %%
The expected length of pure data reply is GT 0xff bytes. Modbus protocol does not allow read of DATA the length of which is GT 0xff bytes

The master should not send frames or poll for frames longer than 140 bytes.

Error #991:   MODBUSTS module, Function %%
               The length of exception reply is not as expected

               Timeout problems or system software problem. Consult product group.

Error #992:   MODBUSTS module, Function %%
               The reply header contents is not as expected

               Timeout problems or system software problem. Consult product group.

Error #993:   MODBUSTS module, Function %%
               The reply frame length is not as expected

               Timeout problems or system software problem. Consult product group.

Error #994:   MODBUSTS module, Function %%
               RTU to MODBUS format translation of control has failed !!

               May indicate system software problem. Consult product group.

Error #1000:   ABTS module, Function %%
               Illegal state !!

               May indicate system software problem. Consult product group.

Error #1001:   ABTS module, Function %%
               No support for non MOSCAD master in Allen Bradley protocol

               No support for MOSCAD/MOSCAD-L as slave in Allen Bradley protocol.

Error #1002:   ABTS module, Function %%
               The control frame in RTU PLC format is too long for the module or is too short !

               The master should not send frames or poll for frames longer than 140 bytes.

Error #1003:   ABTS module, Function %%
               The Set Parameters function failed, but continuing

               May indicate system software problem. Consult product group.

Error #1004:   ABTS module, Function %%
               Could not translate the RTU PLC to Allen-Bradley !
               No support for the data type appearing in a poll control !

               May indicate system software problem. Consult product group.

Error #1005:   ABTS module, Function %%
               Number of bits must be a multiple of 16 !

               The length of PLC_DI or PLC_DO column must be a multiple of 16.

Error #1006: ABTS module, Function %%
Failed to build the reply or command in Allen Bradley format !

May indicate system software problem. Consult product group.

Error #1007: ABTS module, Function %%
Pure data in Poll control. No data must appear in this control !!

May indicate system software problem. Consult product group.

Error #1008: ABTS module, Function %%
The N_ELM field in send control is EQ 0 !
It must be GE from 1

May indicate system software problem. Consult product group.

Error #1009: ABTS module, Function %%
The length of pure data in send control is 0 !!
It must be GE from 1

May indicate system software problem. Consult product group.

Error #1010: ABTS module, Function %%
The N_ELM field in send control is EQ 0 !
It must be GE from 1

May indicate system software problem. Consult product group.

Error #1011: ABTS module, Function %%
No support for the data type in the send control frame !

May indicate system software problem. Consult product group.

Error #1012: ABTS module, Function %%
The opcode in RTU PLC format is neither SEND nor POLL !

May indicate system software problem. Consult product group.

Error #1013: ABTS module, Function %%
The expected reply length in RTU PLC format is too long !

There is no support for replies longer than 140 bytes. Do not scan columns
longer than 140 bytes.

Error #1014: ABTS module, Function %%
Failed to decode the Allen-Bradley reply !

May indicate system software problem. Consult product group.

Error #1015: ABTS module, Function %%
The size of Allen-Bradley format reply is too large or too small

The reply should not exceed 140 bytes.

Error #1016:   ABTS module, Function %%
               The FLUSH function failed, but continuing

               May indicate system software problem. Consult product group.

Error #1017:   ABTS module, Function %%
               Not enough RAM memory for Allen-Bradley load module connected to PLC !!

               May indicate system software problem. Consult product group.

Error #1018:   ABTS module, Function %%
               Allen-Bradley to RTU PLC format translation of reply failed !!

               Internal communication protocol format error. Consult product group.

Error #1100:   Invalid Destination Address : %%
               X25 address is too short. Can not operate call request.

               X.25 address is too short.

Error #1101:   Local port #%% was not found. destination Address is : %%
               X25 address contains unidentified port.

               Can not switch since local port is not available.

Error #1102:   Invalid router 'PROVIDER' Mode: %%

               Invalid mode.

Error #1103:   Router table #%%, Channel #%% – status is %%
               Expected status is %%, Operation code is: %%

               Incorrect operation according to the states table for a single logic channel. For
               example, data transfer in an unopened channel.

Error #1104:   Invalid Self Address : %%
               Illegal RTU X25 address.

               The X.25 address defined in the configuration is not correct.

Error #1105:   Router table #%% does not contain logical channel #%%
               Illegal logic channel.

               The logic channel does not exist. May indicate system software problem.
               Consult product group.

Error #1107:   Invalid Calling Address : %%
               Illegal initiator's X25 address.

               May indicate system software problem. Consult product group.

Error #1108:   Number Of Slaves – %% is Greater Than Number of Sites – %%

               The additional slaves that do not have corresponding sites are not useful.

Error #1109:   Attempt To Use Slave With No Entry in Site table – %%

RTU defined as Master can not operate without Site table.

Error #1110:   Self Site ID is not defined in X.25 Addresses Table. Please add it to your Addresses Table.

Modify X.25 Addresses Table.

Error #1111:   Call Request Aborted - UnKnown Site ID: %%

Check X.25 Addresses Table.

Error #1112:   Call Request Aborted - UnKnown X.25 address: %%

Check X.25 Addresses Table.

Error #1113:   Invalid Convert table X.25 address <--> site

Check X.25 Addresses Table.

Error #1150:   Bad Primitive – Msg Id: %% Child Id: %% Msg Type: %% Child State: %%

The operation does not match the status table.

```
X25 MSG TYPE :

0xc000   Transmit request          0xc00a Call response
0x8001   Received packet           0xc00b Clear request
0xc002   Timeout                   0xc00c Clear response
0x8004   Establish indication (L2) 0xc00d Interrupt request
0x8005   Establich confirmation (L2) 0xc00e  Interrupt response
0x8006   Disconnect indication (L2) 0xc00f Reset request
0x8007   Disconnect confirmation   0xc010 Reset response
0xc009   Call request

LAPB MSG TYPE :

0xc000   Transmit request          0x8004 Establish request
0x8001   Receive frame             0xc005 Disconnect request
0xc002   Timeout

X25 STATE :

0 Ready                    5       Clear request by upper
1 Waiting for peer         6       Flow control (connected)
2 Waiting for upper        7       Reset request by peer
3 Call collision           8       Reset request by upper
4 Clear request by peer

LAPB STATE :

0 Disconnected       3       Established (connected)
1 Awaiting for establish   4       Timer recovery
2 Awaiting for disconnect  5       FRMR condition

Operation does not exist in states table of X25/LAPB.
```

Error #1151:   Invalid ID – Msg Id: %% Msg Type: %%
Illegal X25/LAPB channel ID.

May indicate system software problem. Consult product group.

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Error #1152: Channel Not Init – Msg Id: %% Msg Type: %%
Uninitialized X25/LAPB channel.

May indicate system software problem. Consult product group.

Error #1153: Intr_ID: %% Code: %% Len: %% Params: %%
X25 internal errors.

```
CODE :

   1      Rx frame discarded no header
   2      Rx frame discarded inactive Intr.
   3      Rx frame discarded Intr. not establish
   4      Rx frame discarded packet too short
   5      Rx frame discarded bad GFI
   6      Rx frame discarded unassigned lcn
   7      Bad interface state
   8      Bad interface state
   9      Bad lchan state
  10      Rx a DL_DICS_IND from lower layer
  11      Rx a DL_DICS_CNF from lower layer
  12      Timeout when executing restart
  13      Transmit t_frame failed
  14      Received r_frame failed
  15      Timeout when executing reset
  16      Undefined packet type.
  17      Inconsistent Qbit.
  18      Dbit=0, Mbit=1, and not full
  19      Can't split t_frame: No mem
  20      Received a DIAGNOSTIC packet
  21      Packet too long
  22      No msg for packet copying
  23      Rx DL_CONN_CNF without asking
  24      No msg for Ind. to upper
  25      Net congestion/operational
  26      Received reg.cnf without Req.
  27      Received a restart packet
  28      Registration request timeout
```

Error #1154: LAPB ID: %% Code: %%
LAPB internal errors.

```
CODE :

   1      Unsolicited S, F=1 (code A)
   2      Unsolicited DM, F=1 (code B)
   3      Unsolicited UA, F=1 (code C)
   4      Unsolicited UA, F=0 (code D)
   5      Unsolicited DM, F=0 (code E)
   6      Peer initiated re-connect (code F)
   7      SABME retry limit (code G)
   8      DISC retry limit (code H)
   9      Status enquiry retry limit (code I)
  10      N(R) error (code J)
  11      FRMR received (code K)
  12      Unimplemented frame (code L)
  13      I field not permitted (code M)
  14      Frame with wrong size (code N)
  15      N1 error (code O)
  16      N(S) error
  17      Cannot tx control: no memory
  18      Cannot pass control to lower
  19      Cannot pass I to lower
  20      No confirmation from lower
  21      Frame(s) in garbage queue
  22      Cannot pass I to upper
  23      Unexpected P/F bit in UI
  24      Rx frame discarded (no header)
```

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```
25      FRMR retry limit
```

Error #1230: Chnltest -RX task got err Frame When Called From Trnsintr.
buf_f_get() Returned: %%

May indicate system software problem. Consult product group.

Error #1231: Chnltest -Received tested frame too small. Length of frame is %%
Frame lacks its header.

May indicate system software problem. Consult product group.

Error #1232: Chnltest -Tx Task Could not get a new buffer from heap.
Ret: %%

No buffer for transmission.

Error #1233: Chnltest -Tx Task has Frame area too small for tested frame.
Frame Area Size is %%

Frame size is less than the user's definition in the test's setup. May indicate
system software problem. Consult product group.

Error #1234: Chnltest -Tx Task Failed Transmit Frame. trnsintr_tx_frame()
Returns : %%

Can not transmit a frame via Transport MUX. May indicate system software
problem. Consult product group.

Error #1235: Chnltest -Tx Task Failed Getting indx of tested_link in sites_table. Err code %%

Could not get tested link id's index in site table prior to transmitting a frame.
May indicate system software problem. Consult product group.

Error #1236: Chnltest -Cannot Handle Control Frame. Another Opcode Already Exist

May indicate system software problem. Consult product group.

Error #1237: Chnltest -Received Control Frame (pres_get_struct) too small to decode. Length
of Frame is %%

May indicate system software problem. Consult product group.

Error #1238: Chnltest -Control Frame too Small for answer. Length is %%

May indicate system software problem. Consult product group.

Error #1239: Chnltest -Received aplic structure with invalid size. Size is %% Length bigger
than buffer or Length small to contain opcode.

May indicate system software problem. Consult product group.

Error #1260: Tmrevent: Events/Timers Buffer is Full.

No more buffers for DI events and their related timers. Number of buffers can be increased in expert screen in configuration.

Error #1261: Tmrevent: Events/Timers were Ignored – NO 'Get Event' for %% msec

DI events and/or related timers were not checked (by GtEvnt function in rungs) during a time interval longer than the maximum time that was defined in the expert screens, and therefore were ignored.

Error #1450: Ladder or C application needs I/O modules with DI, but Configuration I/O modules do not have the expected amount of DI

Define more DI modules in Site Configuration.

Error #1500: 'TxIntrc' was called with invalid address 'ITxStn' %%

This error occurs when you call the TxIntrc function with the wrong StnAck variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Possible range: 0-2047.

Error #1501: 'TxIntrc' was called with invalid group 'ITxGrp' %%

This error occurs when you call the TxIntrc function with the wrong ITxGrp variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Possible range: 0-7.

Error #1502: 'TxIntrc' was called with invalid direction 'ITxDir' %%

This error occurs when you call the TxIntrc function with the wrong ITxDir variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual).

Possible range: 0-1.

Error #1503: 'TxIntrc' was called with invalid value 'ITxDat' %%

This error occurs when you call the TxIntrc function with the wrong ITxDat variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Possible ranges: Analog   from -512 to 511.
                   Counter   0-999
                   Bits   0-255

Error #1504:   'TxIntrc' was called with invalid subgroup 'ITxSub' %%

This error occurs when you call the TxIntrc function with the wrong ITxSub variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Possible range: 0-3

Error #1505:   'TxIntrc' or ' TxWdth' was called with invalid link 'Tx_Lnk' %%

This error occurs when you call the TxIntrc or TxWdth functions with the wrong Tx_Lnk variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Possible ranges: Radio (1)
                     Line (2)
                     LOTrnk (1)
                     HiTrnk (11)

Error #1506:   'TxWdth' was called with invalid address 'TxTo' %%

This error occurs when you call the TxWdth function with the wrong TxTo variable. See *Intrac Protocols* chapter in *Advanced Features* in the *Application Programmer* manual.

Possible range: 0-8191

Error #1509:   Received frame with invalid length %% from INTRAC/MEIC port

In the INTRAC case, the frame length is 4 bytes. In the MEIC case the frame length is 5-16 bytes. Any other length is invalid.

Error #1545:   INTRAC modem piggyback has error %%

The error message ID (%%) may be one of the following:

ID	Description
160	Piggyback got control frame from 68302 with invalid opcode
161	Piggyback got characters from 68302 not between 0A and 0D
162	Piggyback got from 68302 control frame too large
163	Piggyback got from 68302 overrun byte in rxsci
164	Piggyback got from 68302 character when cyclic buffer full
165	Piggyback tried to close frame with invalid framelength
166	Piggyback has buffer with invalid ID
167	Piggyback has buffer with invalid temporary length
168	Piggyback has pulled empty buffer which is not last in frame
169	Piggyback has watchdog reset
170	Piggyback has clock fail reset
171	Piggyback has a spike
172	Piggyback has idle line

173   Piggyback got from 68302 frame error

174   Piggyback got from 68302 noise error

175   Piggyback Config register not programmed properly

Error #1553: Failed configuring or diagnosing INTRAC modem (ID = %%)

The error message ID (%%) may be one of the following:

ID   Description

100   RTU received irrelevant config/diagnostics ACK from piggyback

101   RTU received irrelevant config/diagnostics ACK from piggyback

102   Piggyback failed to write parameters to its internal eeprom

103   RTU did not receive answer about config/diagnostics from piggyback

Error #1555: Cannot operate repetition, Heap is empty

Heavy transmission traffic not necessarily on the INTRAC/MEIC only, but because the heap serves the other MDLC channels.

Error #1557: INTRAC system table: invalid station address (StnAdr) %%

Invalid StnAdr value in the INTRAC system tables (database builder).

Possible range: 0-8191

Error #1563: INTRAC system table: invalid repeater mode (RptMod) %%

Invalid RptMod value in the INTRAC system tables (database builder).

Possible range: 0-1

Error #1564: Transmission failed: %% channel at INTRAC/MEIC port (ID = %%)

The first variable in this message is the channel name. The second (ID) may be one of the following:

The error message ID (%%) may be one of the following:

ID   Description

0   0comm module failed physical_transmit()

1   0comm module failed physical_wait(EOTX)

10   Fskadp could not transmit because CTS signal is stuck. It means that the piggyback internal buffer is full.

11   Fskadp could not transmit because the channel was busy

12   UART transmission timeout occurred at Fskadp module

13   'Wait for Holdup' transmission timeout occurred af Fskadp

14   fskadp_warmup() was called with illegal piggyback

Error #1601: Could not identify INTRAC Modem piggyback

Problem with identifying the modem board. Possible hardware problem.

Error #1602:   Failed testing INTRAC modem piggyback (CTS signal)

Hardware problem in modem.

Error #1638:   INTRAC system table: invalid radio warmup time (R_Ptt) %%

Invalid R_Ptt value in the INTRAC system tables (database builder).

Possible range: 10-60000 msec.

Error #1639:   INTRAC system table: invalid radio override time (ROvrid) %%

Invalid ROvrid value in the INTRAC system tables (database builder).

Possible range: 10-60000 msec.

Error #1640:   INTRAC system table: invalid radio quiet time (RQuiet) %%

Invalid RQuiet value in the INTRAC system tables (database builder).

Possible range: 0-60000 msec.

Error #1641:   INTRAC system table: invalid line warmup time (L_Ptt) %%

Invalid L_Ptt value in the INTRAC system tables (database builder).

Possible range: 10-60000 msec.

Error #1642:   INTRAC system table: invalid line override time (LOvrid) %%

Invalid LOvrid value in the INTRAC system tables (database builder).

Possible range: 10-60000 msec.

Error #1643:   INTRAC system table: invalid line quiet time (LQuiet) %%

Invalid LQuiet value in the INTRAC system tables (database builder).

Possible range: 0-60000 msec.

Error #1700:   Failed initiating GPS port

Port 2, connected to GPS, cannot be initialized, because of hardware problem.

Error #1701:   Transmission failure to GPS

Transmission to GPS failed because of hardware problem.

Error #1750:   Insufficient dynamic memory. Needed: %%

Cannot allocate memory for "C" block because the size indicated in Site Configuration is insufficient.

Error #1751:   Invalid block

Invalid "C" block loaded to the RTU. Its calculated CRC does not match that of the loaded block. Reload the "C" block.

Error #1752:   User Application Error:

Occurs as a result of MOSCAD_error function usage in one of the "C" blocks loaded to the RTU.

Error #1763:   'C' Block version is higher than system 'C' application version.

Consult product group.

Error #1764:   'C' block no. %% contain invalid name %% in the user_jumptable.

Check the function names entered in the user_jumptable. An invalid name is one whose length is more than six characters or one which contains a blank or other invisible character.

Error #1770:   The Downloadable "C" function is running too long. Could not delete it from table.

Occurs as a result of error in one of the "C" blocks loaded to the RTU.

Error #1790:   Socket Opening failed.

Communication problem with MDLC over IP.

Error #1791:   Socket Connection failed.

Communication problem with MDLC over IP.

Error #1810:   Could not abort the master sessions. The master channels are not stopped.

Problem with C master session during Download.

Error #1900:   Cannot push into queue - it has reached maximal size

Error in MDLC over IP. Buffers for transmission are coming into queue faster than port can take them. Up to 255 messages may be stored in transmission queue prior to transmission from SLIP line. This error occurs if trying to transmit more than this.

Error #1904:   Destination site ID %% not supported

Error in MDLC over IP. Site ID does not appear in the IP Conversion Table. Check if Site has IP address or if Site ID is correct.

Error #1905:   Sync transmission is not supported

Error in MDLC over IP. RTU cannot send Sync frames through this link. Error is obsolete.

Error #1906:   Invalid conversion table in Flash

Error in MDLC over IP. IP Conversion Table which was downloaded could not be read or is invalid. There may be a problem with the Flash or with the IP Conversion Tool. Consult product group.

Error #1907:   IP address in conversion table for this CPU is %% instead of the configured %%

Error in MDLC over IP. Mismatch in IP Conversion Table between the IP address of this RTU and the one configured in the table. Correct either the table or the Site ID.

Error #1908:   Configured IP address (%%) of this CPU is in use by site %%

Error in MDLC over IP. Error in IP addresses. This error is obsolete.

Error #1909:   Failed configuring radio in encryption mode.

Error in MDLC over IP for Astro radio. Problem with radio configuration. Relevant for encryption mode only.

Error #1910:   Failed transmission to Site %% because its IP address is myself.

RTU tried to transmit to a destination site with the same IP address as the RTU. As a result, transmission failed. Check IP address conversion table for the specified site; it will have the same IP address as that of the RTU. Correct IP address.

Error #1911:   User configured RTU IP address as %% instead of modem's configuration %%

Future use. This error will occur when connecting to a non-iDEN packet data modem with Learn IP Address as NO. When the IP addresses configured in the modem and RTU differ, the RTU has not learned the address from the modem. Reconfigure RTU IP address or consult product group.

Error #1912:   Modem not configured for Packet data properly (error code %%)

Modem packet data parameters are not appropriate, e.g. no Home Agent IP address, or no RTU IP address as expected by the infrastructure.

Error #1913:   Failed connect IPMODM to Timer key.

Internal use; should not occur. Denotes SLIP port configuration failure.

Error #1914:   Got alarm %% from iDEN modem

Got unexpected software alarm from modem (which is not software or registration.) Denotes a problem with the modem software. Consult product group.

Error #1915: Unsupported 'connect to' %% device in MDLC over IP port

'Connect to' parameter is not supported by this system. This is provided for future configuration having new drivers that will be downloaded to older systems that does not support them.

Error #1916: MDLC Compression not supported in Slip/PPP port

This error is set when future configurations that support MDLC compression on Slip/PPP will be downloaded to older systems that do not support it.

Error #1917: MDLC confirmed link not supported in Slip/PPP port

This error is set when future configurations that support MDLC link capability between adjacent sites on Slip/PPP will be downloaded to older systems that does not support it.

Error #1918: Dial operation not supported in Slip/PPP port

This error is set when future configurations that support dial operation on Slip/PPP will be downloaded to older systems that do not support this feature. Dial operation is a qualifier specifying when RTU needs to connect and initiate Slip/PPP. When not used or not supported RTU is always connected.

Error #1919: Dial number not supported in Slip/PPP port

This error is set when future configurations that support dial numbers on Slip/PPP will be downloaded to older systems that do not support it. Dial number is an alternate string (such as phone number) used when connecting to modem instead of common ATD. Even though not supported, user can still specify this string and others by using a Standard Modem configuration through a downloaded IP Modem file.

Error #1920: %%

This error is set when there was a problem reading/executing a command from the IP Modem file. The IP Modem file is read when configuring a *Standard Modem* for Slip/PPP port.

Error #1940: Port connection type changed to slip

This error is set when a PPP configuration was downloaded into a system that does not support PPP (such as systems with small FLASH). Slip is used instead of PPP.

Error #1950: Failed to push buffer to the reception queue of the dowloaded protocol driver

May indicate system software error. Consult product group.

Error #1951: Failed to get character(s) from the reception queue of the dowloaded protocol driver

May indicate system software error. Consult product group.

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Error #1952: The reception queue of the dowloaded protocol driver is full

Driver of second protocol is not emptying frames from queue fast enough.

Error #2000: No SYNC server list was found in flash. Authentication was not activated.

An Authentication information table should be defined in the Network Configuration tool.

Error #2001: An invalid SYNC server list was found in flash. Authentication was not activated.

A new Authentication information table should be defined in the Network Configuration tool.

Error #2002: Warning: Link ID %% was denoted as an authenticated one but an error occurred while trying to use authentication on this Link.

Authentication was not possible on the specified Link ID. Recheck the network configuration and the port.

Error #2003: Number of Links reported to AuthSync does not match the number of Links known to the Network layer.

Recheck the network configuration and the ports.

Error #2004: Warning: User has denoted to activate authentication but this could not be done due to invalid parameters.

Be aware that Authentication is not currently active. Check Authentication parameters in the Network Configuration tool.

Errors #3000-3999 are used for MOSCAD NFM.

Error #4030: Invalid access code to logging flash %%.

May indicate system software error. Consult product group

Error #4031: Logflash operation (%%) failure: %%.

Operation to the logging flash has failed. See error codes in the 'C" Toolkit for MOSCAD Family RTUs manual.

Errors #5000-6999 are used for MCP-T.

Errors #7000-9999 are used for C Applications.

Errors #10000-12999 are used for MCP-M/T.

Error: 15001   Reqmng - Buffer size problem : %% %% %%

Error: 15002   Reqmng - Buffer2 Size problem : %% %% %%

Error: 15003   Reqmng - Suspend failed : %% , ret code %%

Error: 15006   Reqmng - Problem mapping devices : %% %% %%

Error: 15007   Reqmng - No Comm buffers to fill. Last buffer is %%

Error: 15008   Reqmng - TX Q full - unable to push buffer %%

Error: 15009   Reqmng - Create device failed %%

Error: 15010   Reqmng - Create Task failed %% %%

Error: 15011   Reqmng - Cannot Connect to manager.

Error: 15012   Reqmng - Unauthorized host logged in.

Error: 15013   Reqmng - No tx channel : rx channel type %% , Rx Channel %%

Error: 15014   Reqmng - Unmatching client IDs %%, %% reset anyway.

Error: 15015   Reqmng - Unmatching channel IDs %%, %% init anyway.

Error: 15016   Reqmng - No room For new client (%%) in database.

Error: 15017   Reqmng - Illegal tx channel %%.

Error: 15018   Reqmng - Get conf unmatch client/channel (%%,%%)

Error: 15019   Reqmng - No tx channel : Rx Channel %%

Error: 15020   Reqmng - Fail to send config block. Block Number %%, Channel ID %% Buffer
                Number %%

Error: 15021   Reqmng - Fail to send block to threadpool. Block Number %%, client ID %%

Error: 15022   Reqmng - Double Duplication Loop. Dupping channel %% , Duped channel %%

Error: 15023   Reqmng - No channels left to alloc.

Error: 15030   Gtcpip - Unknown Protocol Type %%.

Error: 15050   Gtcpip - create socket error %% (%%)

Error: 15051   Gtcpip - Bind socket error %% (%%)

Error: 15054   Gtcpip - Problem reading from socket %%.

Error: 15055   Gtcpip - Select error %%.

Error: 15056   Gtcpip - Problem reading from socket %% (%%)

Error: 15060   Gtcpip - Create Device error %%

Error: 15061   Gtcpip - Problem writing to socket %% (%%)

Error: 15062   Gtcpip - Channel already occupied %% (%%).

Error: 15121   Gtos   - Create Task Failed %%

Error: 15150   Gsim   - Create Device Error %%

Error: 15202   Trdpool- Create device %% failed %%

Error: 15204   Trdpool- Init Boxes container %% faied %%

Error: 15206   Trdpool- Init threads container %% faied %%

Error: 15208   Trdpool- Container upb failed %% %%

Error: 15209   Trdpool- Container addr error %% %%

Error: 15212   Trdpool- Container box range error %% %%

Error: 15213   Trdpool- Container thread range error %% %%

Error: 15215   Trdpool- Not enough boxes in queue %% %%.

Error: 15216   Trdpool- Get add box address failed.

Error: 15217   Trdpool- Add box to Queue failed %% %%

Error: 15221   Trdpool- Create task %% failed %%

Error: 15231   Trdpool- Q get error %% %%

Error: 15232   Trdpool- Free Q put error %% %%

Error: 15233   Trdpool- Free Q get error free %% %%

Error: 15234   Trdpool- Other Q get att %% %%

Error: 15235   Trdpool- Get lower thread %% %%

Error: 15236   Trdpool- Get thread failed %% %%

Error: 15237   Trdpool- Issue thread, get thread error %% %%

Error: 15238   Trdpool- Issue thread, get box error %% %%

Error: 15239   Trdpool- Block2Box, get box error %% %%

Error: 15241   Trdpool- Block2Box, request length too big %% %%

Error: 15242   Trdpool- Block2Box, copy failed %% %%

Error: 15243   Trdpool- Get from Free Q error %% %%

Error: 15244   Trdpool- Get from Other Q error %% %%

Error: 15245   Trdpool- Get from Other Lower Q error %% %%

Error: 15246   Trdpool- Box2Block, get box error %% %%

Error: 15249   Trdpool- Push to Unhandled Q failed %% %%

Error: 15250   Trdpool- Get thread attached box failed %% %%

Error: 15251   Trdpool- Get thread box to release failed %% %%

Error: 15252   Trdpool- Get attached Box to release failed %% %%

Error: 15253   Trdpool- Put box in the proper Q failed %% %%

Error: 15260   Trdpool- Issue thread failed %% %%

Error: 15261   Trdpool- Thread pool suspend failed %% %%

Error: 15262   Trdpool- Get attached box failed %% %%

Error: 15263   Trdpool- Tp_get, box2block failed %% %%

Error: 15264   Trdpool- More requests than the ThreadPool can handle.

Error: 15265   Trdpool- Thread_pool Block Copy failed %% %%

Error: 15266   Trdpool- Tp_push, issue thread failed.

Error: 15300   Reqmng - (%%) create failed %%

Error: 15301   Reqmng - (%%) put failed : index %%, ret %%

Error: 15351   Gtappl - Nstart, map failed %% %%

Error: 15352   Gtappl - Nstart, thread map failed %% %%

Error: 15353   Gtappl - Nstart, setfunctab failed %% %%

Error: 15354   Gtappl - Nstart, trdpool get block failed %% %%

Error: 15355   Gtappl - Nstart, unknown application type %% %%

Error: 15357   Gtappl - Nstart, reqmng push block failed %% %%

Error: 15358   Gtappl - Nstart, threadpool release box failed %% %%

Error: 15359   Gtappl - Burst, map failed %% %%

Error: 15360   Gtappl - Burst, reqmng push block failed %% %%

Error: 15365   Gtappl - Mismatch in block data length %% %%

Error: 15366   Gtappl - Ctls2blk, spec data error %% %%

Error: 15367   Gtappl - Ctls2blk, site data error %% %%

Error: 15368   Gtappl - Block size error - expecting data %% %%

Error: 15369   Gtappl - Invalid pin called.

Error: 15370   Gtappl - Z_OK length problem.

Error: 15371   Gtappl - Fetch length problem %% %% %%

Error: 15373   Gtappl - Store length problem %% %%

Error: 15376   Gtappl - Map failed %% %%

Error: 15377   Gtappl - Map thread failed %% %%

Error: 15378   Gtappl - Burst error %% %%

Error: 15380   Gtappl - Unknown block type %%

Error: 15381   Gtappl - Broadcast hb called

Error: 15382   Gtappl - Unknown Datetime block type.

Error: 15382   Gtappl - Diag hb called.

Error: 15384   Gtappl - Sync hb called.

Error: 15385   Gtappl - Ttag hb called.

Error: 15500   newdel – forbidden malloc

Error: 15501   newdel – forbidden free %%

Error: 15502   newdel – pure virtual called

Error: 15503   mcpsbld – create device error

Error: 15510   contalib – forbidden delete: class %% ptr %%

Error: 15511   contalib – forbidden resize: class %% ptr %%

Error: 15530   HelthChk – Create failed

Error: 15531   HelthChk – NULL parameter

Error: 15532   HelthChk failed

Error: 15533   Send ping failed for site id %% link id %% .

              Trnsintr_tx_frame_seg_2id() failed. Error = %% Tried %% times.

Error: 15534   Get of formatted buffer (buf_f_get()) failed. Error + %%.

Error: 15535   HelthChk failed to create ping task. Error = %%

Error: 15536   HelthChk failed to create pong task. Error = %%

Error: 15537   HelthChk failed to create dead task. Error = %%

Error: 15538   Ping RTUs failed. Error = %%

Error: 15539   Pong RTUs failed. Error = %%

Error: 15540   Update dead RTUs failed. Error = %%

Error: 15550   MCPS-Build Failed to create MCPS CONTROL task. error = %%.

Error: 15551   MCPS-CTRL Failed to create Polling task. error = %%.

Error: 15552   MCPS-CTRL Failed to create Link Up task. error = %%.

Error: 15553   MCPS-CTRL Failed to create Link Down task. error = %%.

Error: 15554   MCPS_CTRL Communication Error.

Error: 15555   MCPS_CTRL Burst Unknown.

Error: 15556   MCPS-CTRL Link Up failed. Site = %%.

Error: 15557   MCPS-CTRL Link Down failed. Site = %%.

Error: 15590   NE-TYPE-DEFINE Failed to create Device. error = %%.

Error: 15610   HASH-DB Failed to create Device. error = %%.

Error: 15611   HASH-DB Failed to Update Heltch-Check\Link-Handler.

Error: 15612   HASH-DB Failed to read Site Table.   error = %%.   site = %%

Error: 15630   POOL-MANAGER Failed to create Device. error = %%.

Error: 15632   POOL-MANAGER Pool Manager size was Trancate from: %% To: %%

Error #16002: Doctor - Burn a new flash section failed. Error code - %% block size - %%
               block id   - %%.

               Attempt to burn a new section of the flash has failed. Erase the configuration
               and then download all files again.

Error #16003: Doctor - Burn a new flash section failed. Error code - %% block size - %%
               block id   - %%.

               Attempt to burn another new section of the flash has failed. Erase the
               configuration and then download all files again.

Error #16004: Doctor - System has performed a restart due to %%.

               System has crashed and is restarting. Consult product group.

Entering the Password

When you activate a Toolbox application at the beginning of a work session, Toolbox displays the Password window, shown below, where you must enter the password.

Type your password and click **OK**.

This operation activates the communication driver, and the password remains in force throughout the session. If you want to access an RTU that requires a different password, you must stop the communication driver first. See Changing the Session Password below.

Changing the Session Password

To access an RTU that requires a different password, close all Toolbox tools and then double-click the Stop Communication Driver application icon in the Toolbox group. Then, activate the Toolbox application you want and enter the password.

Note: If you try to stop the communication driver while a communication session is in progress, a message warns you that a logical channel is currently open. If you chose to continue (stop the driver), the results of the current communication cannot be predicted. It is advisable to finish the current task and then to stop the driver.

Uninstalling the IP Gateway Toolbox Application

To uninstall the IP Gateway Toolbox on Windows, do the following:

- Click the Start button.
- Click Settings.
- Click Control Panel.
- Double-click Add/Remove Programs icon.
- Select IP Gateway Toolbox.
- Click Add/Remove button.

Files created after the installation process will not be removed.