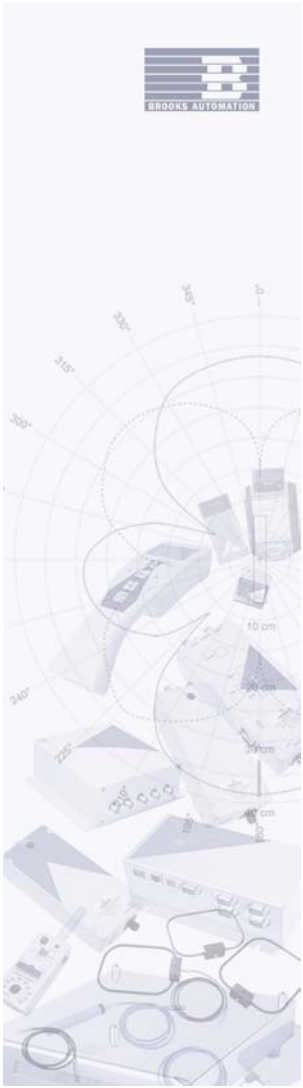


User Manual

HF80 Transponder Reader

(Ethernet – HSMS)

ID090014
Rev 03-2009
Printed in Germany
Subject to modifications

RFID Division
Gartenstrasse 19
D-95490 Mistelgau
Germany

Tel: +49 9279 991 910
Fax: +49 9279 991 900
E-mail: rfid.support@brooks.com

TABLE OF CONTENTS

1 INTRODUCTION

1.1 About this Device

The BROOKS Transponder Reader System is a 13.56 MHz high-frequency identification system that uses FM transmission.

The basic item is a transponder that works as a forgery-proof electronic identity disk.

The reading unit of the system sends an energy impulse via the antenna. The capacitor of the passive, battery-free transponder is charged by this impulse. After that, the transponder returns a signal with the stored data.

The reading process needs less than 3 ms (communication between tag and reader/antenna).

As a sight connection between the transponder and the reader is not absolutely necessary, the transponder can also be identified through non-metallic material.

The device communicates with the host via the TCP/IP interface with HSMS protocol.

[Picture with serial and Ethernet interface]

1.2 About this Manual

This manual contains information about installing, operating and error handling the BROOKS HF80 Transponder Reader RS232/Ethernet. It consists of nine chapters:

- Introduction
- Safety Instructions
- Product Description
- Installation
- Operation
- Service and Error Handling
- Deinstallation and Storage
- Transportation and Disposal
- Accessories

2 SAFETY INSTRUCTIONS

This product is manufactured in accordance with state of the art technology and corresponds to recognized safety regulations. Nevertheless, there are dangers associated with the use of the equipment even for its intended purpose. You should therefore read the following safety information carefully and keep it in mind.

Only install and operate this equipment if it is in perfect condition and with reference to this manual. Do not use the equipment if it is damaged.

2.1 Symbols and Types Used in this Manual

	This symbol alerts you to dangerous voltage
	This symbol alerts you to important instructions
	This symbol indicates electromagnetic radiation
	This symbol alerts you to risk of explosion
	This symbol alerts you to risk of fire
	This symbol indicates important additional information
	Electrostatically sensitive components

`13:44:33`
`Incoming:`
`ENQ (05)`
	This type represents transmitted data display

2.2 General Safety Instructions

1 Read and understand all safety and operating instructions before installing and operating the device.

2 This instruction is designed for specially trained personnel. This device is NOT intended for use by the “general population” in an uncontrolled environment. Installation, operation and error handling the device shall be carried out by specially trained personnel only (see additional information on pages 12, 22, 31, and 141).

3 Keep these instructions. Store this manual in a place that can be accessed at any time by all persons involved in installing, operating and error handling the device.

4 Heed all warnings. Follow all warnings on and inside the device and operating instructions.

5 Install in accordance with the manufacturer's instructions only.

6 Only use attachments, accessories and connecting cables supplied by the manufacturer.

7 All error handling other than the error handling listed in chapter 6 of this manual must be carried out by the manufacturer.

8 People with hearing aids should remember that radio signals transmitted by the device might cause a very unpleasant buzzing noise in their hearing aids.

9 Do not connect the device to any kind of power supply such as a standard household power supply. The device should be connected to a power supply of the type described in these instructions only.

10 When you disconnect a cable, pull on its conductor and not on the cable itself. Keep the connector evenly aligned to avoid bending any connector pins. When you connect a cable, ensure that the connector pins are positioned correctly.

11 Never over bend the antenna cable or expose it to mechanical loads.

12 When replacement parts are required, use the replacement parts specified by the manufacturer only. Unauthorized substitutions may result in fire, electric shock, or other hazards.

All antenna resonant circuit components carry high voltage!

The installer is responsible for installing the device to comply with FCC requirements of human exposure to radio frequency.

To prevent fire, shock hazard, or annoying interference, use recommended accessories only.

Remove the housing lid carefully to prevent damage! Do not operate the device when the housing lid is removed!

Do NOT operate this device without a proper antenna attached. Proper antennas are antennas supplied by the manufacturer and listed in section „Accessories“.

Never locate the antenna so that it is very close to or touching parts of the body while transmitting.

2.3 ESD Instructions

Static electricity can harm electronic components inside the device. All persons who install or maintain the device must be trained in ESD protection. ESD protection measures must be observed when opening the device.

- ☞ **Before removing or inserting components, disconnect the power supply.**
- ☞ **To prevent electrostatic damage, static electricity must be discharged from the body and tools before touching components inside the device.**
- ☞ **Touch electro sensitive components carefully at their edges only.**

2.4 Proper Use

This product was developed for reading and writing transponders only. Any other use of this device would constitute abuse and would render the user's authority to install and operate the device invalid.

This product is designed to be mounted and operated in an industrial environment as a built-in-device only. It is not designed to be used as a stand-alone or a portable device or in a non-industrial environment, such as a household, vehicle or open-air environment.

2.5 Qualified Personnel

This manual is designed for specially trained personnel only. This device must be installed and maintained by the manufacturer or its specially trained representatives.

Intervention or error handling not expressively approved in this manual must be carried out by the manufacturer's personnel only. If you are unsure about the qualifications that are actually required, contact the manufacturer.

Unqualified interventions may result in personal injury or damage to the device!

2.6 Declaration of Conformity

2.6.1 USA – Federal Communications Commission (FCC)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) This device may not cause harmful interference and
2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC ID N5GHF80

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

2.6.2 Europe – CE Conformity

Konformitätserklärung gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE)
Declaration of Conformity in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/FC (R&TTE Directive)

Hersteller / Verantwortliche Person *Manufacturer / responsible person*	**BROOKS Automation (Germany) GmbH / Herr Dittrich**
erklärt, dass das Produkt *declares that the product*	HF80
Type (ggf. Anlagenkonfiguration mit Angabe der Module): *Type (if applicable, configuration including the modules)*	
☑ Telekommunikations(Tk-)end-einrichtung *Telecommunications terminal equipment*	Funkanlage *Radio equipment*
Verwendungszweck *Intended purpose*	**Identification system**
Geräteklasse */ Equipment class*	**2**

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.
complies with the essential requirements of §3 and the other relevant provisions of the FTEG
(Article 3 of the R&TTE Directive), when used for its intended purpose.

Gesundheit und Sicherheit gemäß § 3 (1) 1. (Artikel 3 (1) a))
Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a))

angewendete harmonisierte Normen *Harmonized standards applied*	**EN 60950**

Schutzanforderungen in Bezug auf die elektromagnetische Verträglichkeit (§ 3 (1) 2, Artikel 3 *(1) b)*
Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))

angewendete harmonisierte Normen *Harmonized standards applied*	**EN 301 489-3 (2002-08)** **EN 301 489-1 (2005-09)**
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards / Spezifikationen) *Other means of proving conformity with the essential requirements (standards/specifications used)*	

Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums
Measures for the efficient use of the radio frequency spectrum

Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2))
Air interface of the radio systems pursuant to § 3(2) (Article 3(2))

Angewendete harmonisierte Normen *Harmonized standards applied*	
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards / Schnittstellenbeschreibungen) *Other means of proving conformity with the essential requirements (standards/interface specifications used)*	**EN 300 330-1 V1.3.1** **EN 300 330-2 V1.3.1**

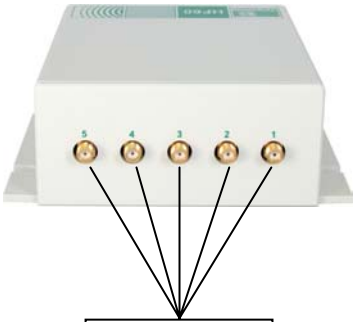
BROOKS Automation (Germany)
GmbH
Gartenstr. 19
D-95490 Mistelgau
Germany
Phone +49 9279 991 910
Fax +49 9279 991 900

Mistelgau, 01.08.2008 Gerald Dittrich

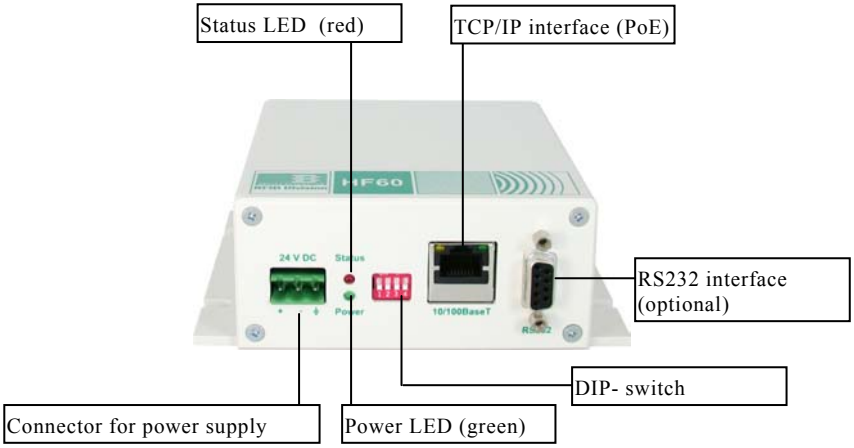
(Place and date of issue) (Name and signature)

3 PRODUCT DESCRIPTION

3.1 Indicating and Operating Elements



Reader option without external I/O's



3.2 Description of Components

Power LED

If the device is connected to a power supply, the LED is illuminated green and the reader is ready for use.

Status LED

The Status-LED is used as feedback for reading and writing action in test mode and polling mode. If the reader is in test mode or polling mode and the read action was successful the red LED is on. In case of a reading error the LED is off.

RS232 interface (optional)

The device can communicate via the serial interface (9 pin Sub-D female plug). Baud rates between 1200 Bd and 57600 Bd are possible. Optional a 10/100BaseT interface is available.

Ethernet interface

The device can communicate via the 10/100 BaseT interface. Optional a RS232 interface is available. The Device supports Power over Ethernet (PoE).

DIP-Switches

The 4 DIP switches are used to set some parameters of the reader.

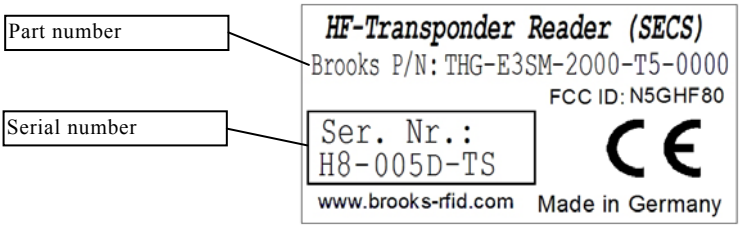
Connector power supply

Plug for the 24 VDC power supply.

Antenna plugs 1 to 5:

The number of the antenna plugs corresponds to the HeadID of the communication protocol.

3.3 Labeling Information



3.4 Technical Data

3.4.1 Transponder Reader

Parameter	Value
Operation temperature	0°C to +50°C 32°F to 122°F
Stock temperature	-25°C to +70°C -13°F to +158°F
Permissible humidity @ 50C°	25 - 80 %
Transmitter frequency	13.56 MHz
Max. transmitting level	1W
Output impedance	50Ω
Protection mode	IP 40
Housing material	PS
Weight (without/with IO-module)	about 280g
Fuse type TR5	500mA (T)
Serial interface RS232	1200 Bd – 57600 Bd
Ethernet-Interface	10/100BaseT

3.4.2 Power Supply and Current Input

Description	Min	Type	Max	Unit
Voltage (proof against connecting to the wrong terminal)	12	24	42	VDC
Current without presence sensor (starting process excluded)		80 – 300		mA

Electrical Power: max. 7W

☞ **Pay attention to the power consumption to ensure that your PoE infrastructure has a sufficient power supply.**

Take care that you connect only one type of power supply to the reader at the same time. PoE (via Ethernet cable) or external power supply, but not both together. Otherwise the reader hardware or the external power supply can be damaged.

3.5 Contents of Delivery

Number	Description
1	HF80 Transponder Reader Ethernet/RS232
1	User manual (on CD-ROM)
1	Accompanying letter

☞ **For available or required accessories, e.g. antennas, adapters and cables, see section “Accessories” on page 147 in this manual.**

3.6 Warranty and Liability

The warranty period is 12 months and begins with the moment of delivery of the device as proved by an invoice or other documents.

The warranty includes the repair of all damages to the device that occur within the warranty period, and which are evidently caused by faults of the material or production defects.

The warranty does not include damages caused by incorrect connection, inappropriate handling and non-observance of the technical reports.

4 INSTALLATION

4.1 Installation Environment

This device is designed for use in an indoor industrial environment only. Installation is only permitted in an environmental indoor climate with a constant temperature of between 0°C and +50°C / 32°F and 122°F, humidity between 25% and 80%, and a maximum temperature of +50°C / 122°F.

Do not install or use this device in or near water. Never spill liquids of any kind onto the device. Should spillage occur, unplug the device and have it checked by a technician.

Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Do not install the device in a flammable environment.

Never expose the device to intense changes in temperature, otherwise condensation can develop inside the device and cause damages.

Do not locate the device near overhead power lines or other electric lights, or power circuits or where it can encounter such circuits. When installing the device, take extreme care not to encounter such circuits as they can cause serious injury or death.

The device should not be used in the immediate vicinity of electrical units (such as medical units, monitors, telephones, televisions and energy-saver lamps), magnetic data carriers, or metallic objects. This could result in reduced reading/writing ranges.

Never use the device in potentially explosive areas (such as paint shops).

Do not position the device in a location where it can suffer from vibration or shock.

When the device is installed, the installation location must be adequately illuminated.

Do not install the device during periods of lightning.

Ensure the installation location complies with FCC requirements for human exposure to radio frequency.

☞ When determining the assembly location, consider the length of the antenna cable that will be used, and the reading and writing range. See section „Accessories/Antennas“ for further information.

4.2 Qualified Installation Personnel

The installation shall be carried out by specially trained personnel only. If you are uncertain about the qualification, contact the manufacturer.

Operating the device without special skills can result in damage to the reader and/or connected devices!

4.3 Unpacking

This device and its accessories were packed under clean room conditions. To preserve these conditions, the device must be unpacked under clean room conditions.

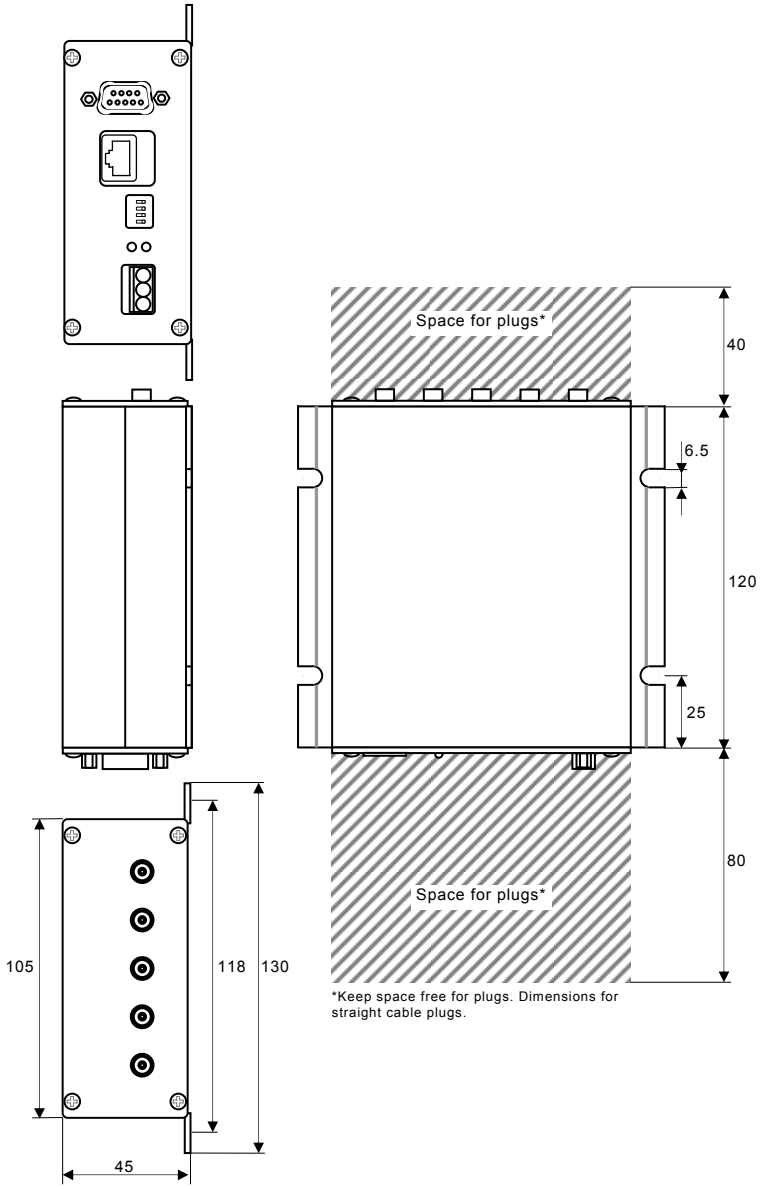
4.3.1 Disposal of Packing Material

The packing material consists of cardboard and film. Dispose of these materials separately in accordance with the relevant legislation in your country.

4.4 Mounting the Transponder Reader

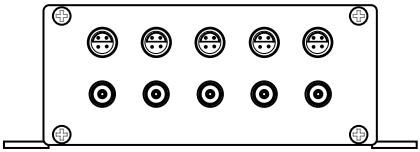
☞ **The mounting surface must be stable, non-flammable, dry and clean. If necessary, clean it before installing the device.**

4.4.1 Dimensions for Planning



*Keep space free for plugs. Dimensions for straight cable plugs.

Drawing with external I/O's



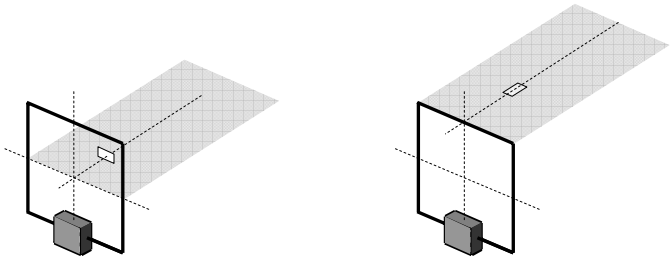
4.5 Installing the Antenna

☞ **When installing the antenna, consider the required reading and writing ranges. The reader can be used properly only if the transponder is located within the individual reading/writing range of the antenna!**

4.5.1 Positioning

Reliable reading and writing depends on the range and position of the transponder to the antenna.

Optimal position of the transponder and antenna for different orientations of the transponder.



4.5.2 Available Antenna Types

Different types of antennas are available on request.

4.6 Connecting the Transponder Reader

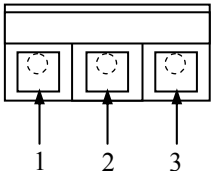
4.6.1 Antenna

Connect the antenna to the antenna plug (see illustration page 17).

4.7 Power Connection

Built-in male plug, plastic (power supply)

PIN	Signal
1	+24V
2	0V
3	Screen / PE



The device can be connected to an interior DC power circuit of the equipment or to a DC adapter (see section “Accessories”, page 147).

Note the required voltage (see technical data, page 20). Use cables, plugs and adapters provided by the manufacturer only!

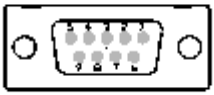
Once the device is connected to the power supply, the power LED is illuminated (see illustration page 17). If it is not illuminated, see section 6 for help.

Take care that you connect only one type of power supply to the reader at the same time. PoE (via Ethernet cable) or external power supply, but not both together. Otherwise the reader hardware or the external power supply can be damaged.

4.8 Terminal Connection

Built-in female plug (RS232 interface) - optional

PIN	DB9
1	NC
2	TxD
3	RxD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

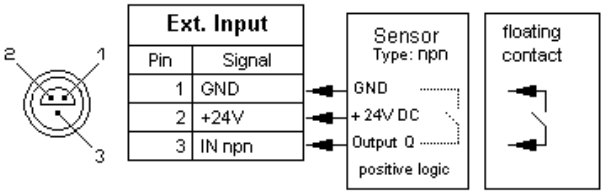


The serial interface is a Sub-D female plug (9 contacts); a serial connection line (switched 1:1) can be used.

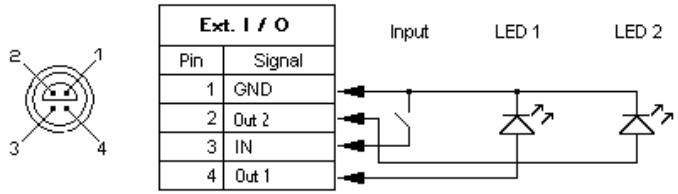
4.9 External Input and Output (optional)

There are two different versions available:

1. One input per antenna head.



2. One input and two outputs per antenna head.



4.10 DIP-Switches

The DIP switches can be used to change the behavior of some features of the reader. Parameter 100 enables or disables the functionality of the DIP-switches.

DIP-switch 1: Communication-Port

OFF: RS232
ON: Ethernet

DIP-switch 2: Test-Mode

OFF: Normal operation mode
ON: Test mode for antenna 1 enabled

DIP-switch 3: not used in this version

DIP-switch 4: Behavior for test mode / polling mode

Test mode:
OFF: Scan UID of all possible tag types
ON: Reading and writing of one page of a ISO15693 tag

Notes:

1. Only DIP-switch 1 is ON by default.
2. If the test mode is active, the test mode has priority.
3. The use of the DIP switches depends on the setting of parameter ‚DIP switches enabled'. All DIP switches are activated by default.

4.11 Starting Up

4.11.1 Required Operating Conditions

To operate the reader, the following requirements must be met:

- ☞ **An antenna must be connected correctly to the reader.**
- ☞ **The power supply must be connected (except POE is used).**
- ☞ **The transponder must be located within the individual reading/writing range of the antenna.**
- ☞ **Setting of the DIP switches is correct.**

4.11.2 Parameter of Serial Interface

Baud rate	19200
Databits	8
Stopbit	1
Parity	none

4.11.3 Parameter of Ethernet Interface

The connection to the Ethernet is realized by an independent Ethernet component. There are small tools available to configure the Ethernet component. Using a discovery tool all readers available in the network can be found. A double click on the IP address in the list opens a Webserver applet in a web browser window to configure the Ethernet component. If the IP address of the reader is known a web browser can be used to access the web server directly. The following pictures show the login page of the web server.

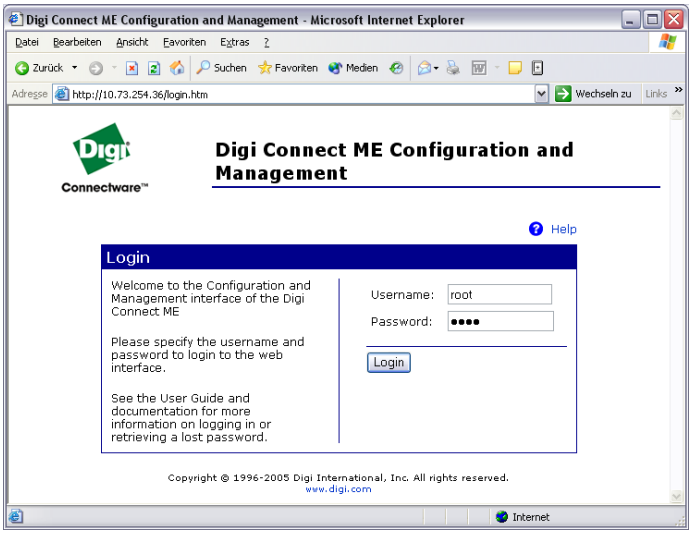
http://xxx.xxx.xxx.xxx/

Username: "root"

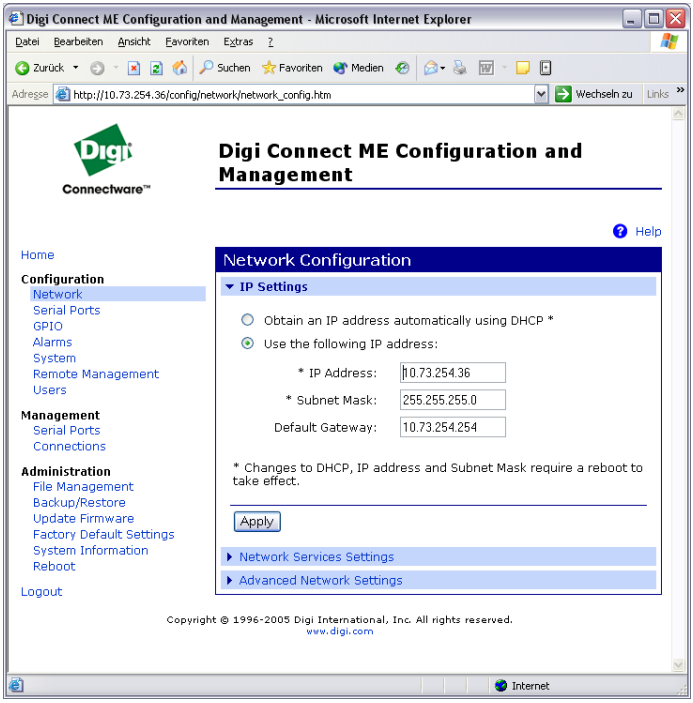
Password: "dbps"

xxx.xxx.xxx.xxx – current IP address of the device

Login dialog:



The link ‚Network' opens the page to change the IP address. The button 'Apply' confirms the change and starts a reboot of the device.



The TCP/IP port used by the HSMS protocol is set to 3**241** by default. If you want to set another port please contact the manufacturer.

5 OPERATION

5.1 Operating Personnel

The HF80 Transponder Reader is designed to be operated by specially trained personnel only. If you have doubts about the qualification required, contact the manufacturer. Operating the device without special skills can result in damage to the reader and/or connected devices!

5.2 Introduction

The SEMI Equipment Communications Standard E4 (SECS-1) defines a communication interface that is suitable for exchanging messages between semiconductor processing equipment and a host. A host is a computer or network of computers that exchanges information with the equipment to perform/execute the production.
The standard does not define the data contained within a message. The meaning of messages must be determined through a message contents standard such as SEMI Equipment Communications Standard E5 (SECS-2).
This standard provides the means for independent manufacturers to produce equipment and hosts that can be connected without requiring specific knowledge of each other.
The SECS-1 protocol can be seen as a layered protocol used for point-to-point communication. The layers within SECS-1 are the physical link, block transfer protocol and message protocol.
It is not intent of the standard to meet the communication needs of all possible applications. For example, the speed of RS232 may be insufficient to meet the needs of transferring mass amounts of data or programs in a short period, such as may be required by high-speed functional test applications.
In a network, the roles of host and equipment may be assumed by any party in the network. In this situation, one end of the communications link must assume the role of the equipment and the other the role of the host.
High-speed SECS Message services (HSMS) is intended as an alternative to SEMI E4 for applications where higher speed communication is needed or when a simple point to point topology is insufficient.

Electronic Industries Association Standards:

EIA RS-232-C Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.

5.3 Modes

The HF80 reader offers the possibility to work as SECS1 and HSMS reader. You can easily change between the two modes by switching one of the DIP- switches on the front panel of the reader.
The second possibility to switch the modes is changing reader parameter 13. (communication port).

SECS1 uses the serial interface to establish the direction of communication for passing message blocks. The SECS1 message set describes the communication between the reader and a host.

If the reader uses the HSMS mode, it works as HSMS-server. That means that it waits for a connection inquiry of any HOST-PC.

TCP/IP: IP-Address xxx.xxx.xxx.xxx Port 3241

If a connection inquiry of any HOST takes place, the reader initializes the HSMS-connection, and the SECS II messages defined in the message set are forwarded from the reader to the respective HOST and vice versa.

It is possible to operate all readers connected to the network via one or also via several HOST-PC's.

But one HSMS reader can only be connected to one HOST at the same time.

5.4 SECS-1 Implementation

This message set describes the communication between a SECS-1 reader and a host. The host and the transponder reader communicate via a RS232 interface (SECS-1).

5.4.1 Character Structure

Data will be transmitted or received in a serial bit stream of 10 bits per character at one of the specified data rates. The standard character has one start bit (0), 8 data bits and one stop bit (1). All bit transmissions are of the same duration.

SECS1 performs no parity or other verification of the individual bytes.

5.4.2 Block Transfer Protocol

The reader will use an interpretation of SECS-1 by a serial transport layer. The following are some points to note about this implementation.

5.4.2.1 Master Slave

The host connects to the reader. If there is contention, the host "gives in" (i.e. receives before sending).

In the course of communication, the reader takes on the role of the master, and the host takes on the role of the slave.

5.4.2.2 Control Characters

The four standard handshake codes used in the block transfer protocol are displayed in the table below.

<ENQ>	0x05	Request to Send
<EOT>	0x04	Ready to Receive
<ACK>	0x06	Correct Reception
<NAK>	0x15	Incorrect Reception

5.4.2.3 Message Block Structure

SECS message blocks have the form:

	Byte	msb	Description
Length	0	Length without checksum , 10 – 254	
Header	1	R	Upper Device ID (Reader ID)
	2	Lower Device ID (Gateway ID)	
	3	W	Upper Message ID (Stream)
	4	Lower Message ID (Function)	
	5	E	Upper Block number
	6	Lower Block number	
System Bytes	7	System Byte 1	
	8	System Byte 2	
	9	System Byte 3	
	10	System Byte 4	
Text	11 – 254	message text, user data	
Checksum	255, 256	16 Bit unsigned checksum	

The operation of all communication functions above the block transfer protocol is linked in information contained in a 10-byte data element, called the header.

The **header** is always the first 10 bytes of every block sent by the block transfer protocol.

The **length** includes all bytes sent after the length byte, excluding the two checksum bytes. The maximum block length allowed by SECS-1 is 254 bytes and the minimum is 10 bytes (header only).

The **reverse bit** (R-bit) signifies the direction of a message. The R-bit (msb) is set to 0 for messages to the equipment, and set to 1 for messages to the host.

The **device ID** is a definite number to contact the reader.

The device ID consists of the 8 bit gateway ID (bit0-bit7), which is identical with the last two characters of the readers serial number (default), and a 5 bit fixed reader number (bit8-bit14 = 0x01).

Of course, the ID can be changed within the valid scope.

Upper Device ID	R-Bit	0	0	0	0	0	0	1
Lower Device ID	serial number of the reader							

Direction reader to host: 0x81xx *

Direction Host to equipment (BROOKS HF5x reader): 0x01xx *

* … the serial number is located on a label on the housing lid of each reader

The **W-Bit** indicates that the sender of a primary message expects a reply. A value of one in the W-bit means that a reply is expected.

The **message ID** identifies the format and content of the message being sent.

A primary message is defined as any odd-numbered message.

A secondary message is defined as any even-numbered message.

The **end bit** determines whether a block is the last block of the message. A value of 1 means that the block is the last block.

A message sent as more than one block is called a **multi-block message**. A block number of one is given to the first block, and the block number is incremented by one for each subsequent block until the entire message is sent.

As all messages can be sent in one block, the block number always has the value 1.

The **system bytes** in the header of each message for a given device ID must meet the following requirements:

- The system bytes of a primary message must be distinct from those bytes of all currently open transactions initiated from the same end of the communications link.
- The system bytes of the reply message are required to be the same as the system bytes of the corresponding primary message.

The system bytes are incremented for each primary message.

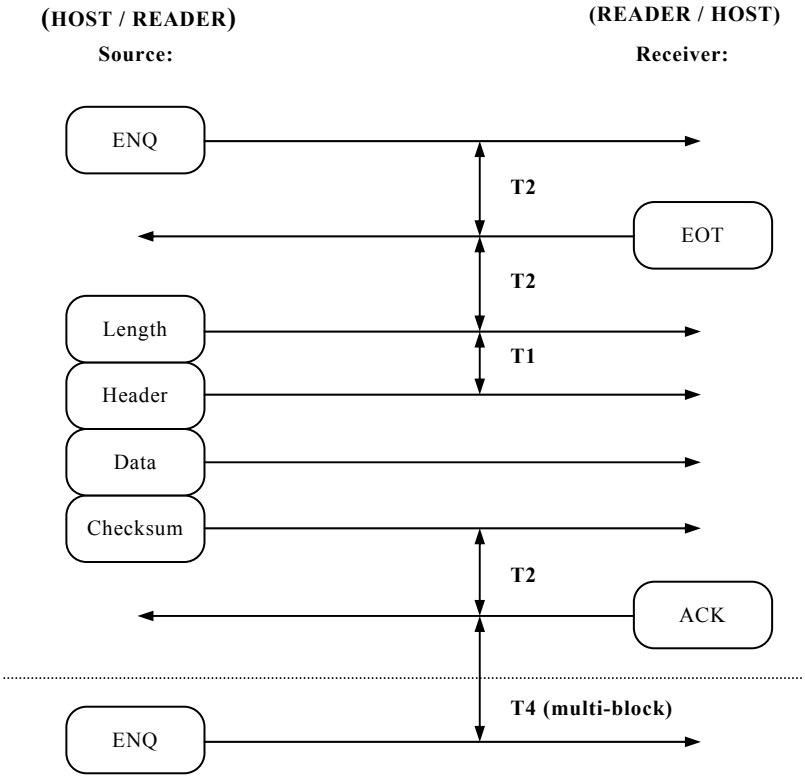
The **checksum** is calculated as the numeric sum of the unsigned binary values of all the bytes, after the length byte and before the checksum in a single block.

5.4.2.4 Block Transfer Protocol

The drawing below illustrates some simple message interactions between the host and the equipment. The figure shows the handshake sequence possible to acquire the status of the equipment.

When the host wants to send, it first sends an **<ENQ>** and then tries to read.

If it receives an **<EOT>**, it sends its message and then expects an **<ACK>**.



If it receives an **<ENQ>**, it puts off sending its message, sends an **<EOT>** and then reads the other message.

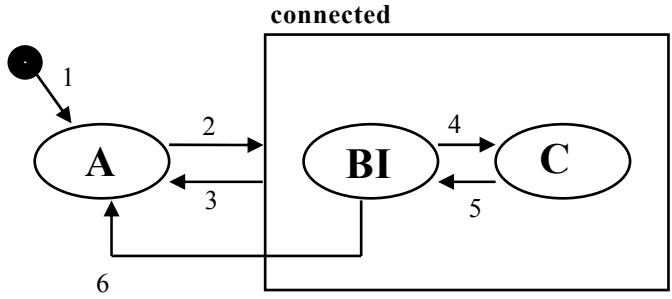
When both the host and the equipment try to send at the same time, the host must cancel its inquiry because the host works in slave mode. First, it must receive the equipment message because the reader is the master. After that the host can send its message.

For more detailed information about all possible cases, see SEMI E4.

(SEMI Equipment Communication Standard 1 Message Transfer SECS-1)

5.5 HSMS Implementation

HSMS defines the procedure for all messages exchanges between entities across the TCP/IP. The HSMS Connection State Diagram - The HSMS state machine is illustrated in the diagram below. The behavior described in this diagram defines the basic requirements of HSMS:



State Description:

A - NOT CONNECTED

The entity is ready to listen for or initiate TCP/IP connections, but either has not yet established any connections or all previously established TCP/IP connections have been terminated.

CONNECTED

A TCP/IP connection has been established. This state has two substates, NOT SELECTED and SELECTED.

B - NOT SELECTED

A sub state of CONNECTED in which no HSMS session has been established or any previously established HSMS session has ended.

C - SELECTED

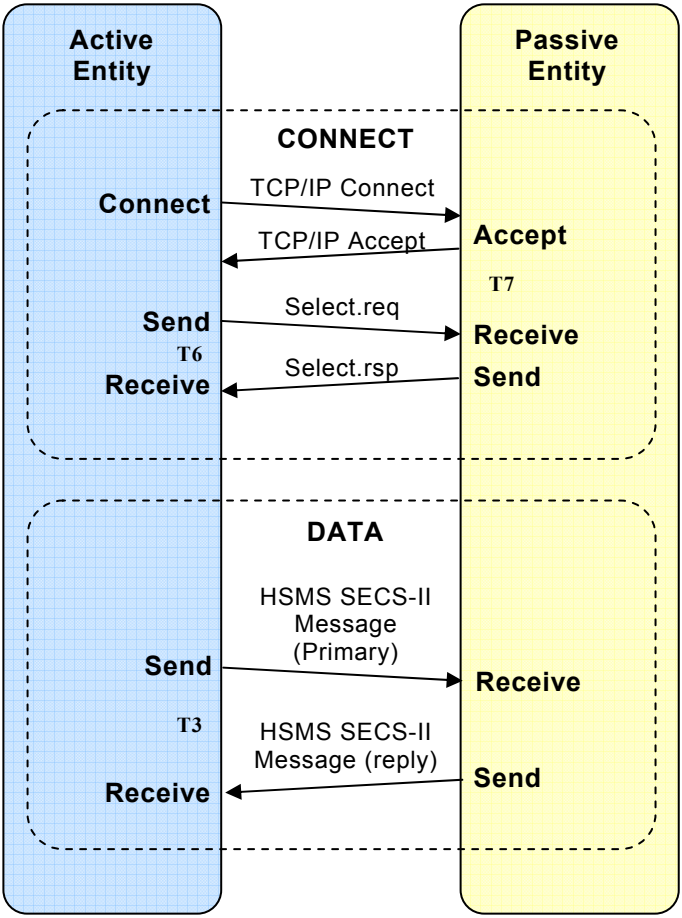
A sub state of CONNECTED in which at least one HSMS session has been established. This is the normal "operating" state of HSMS: data messages may be exchanged in this state.

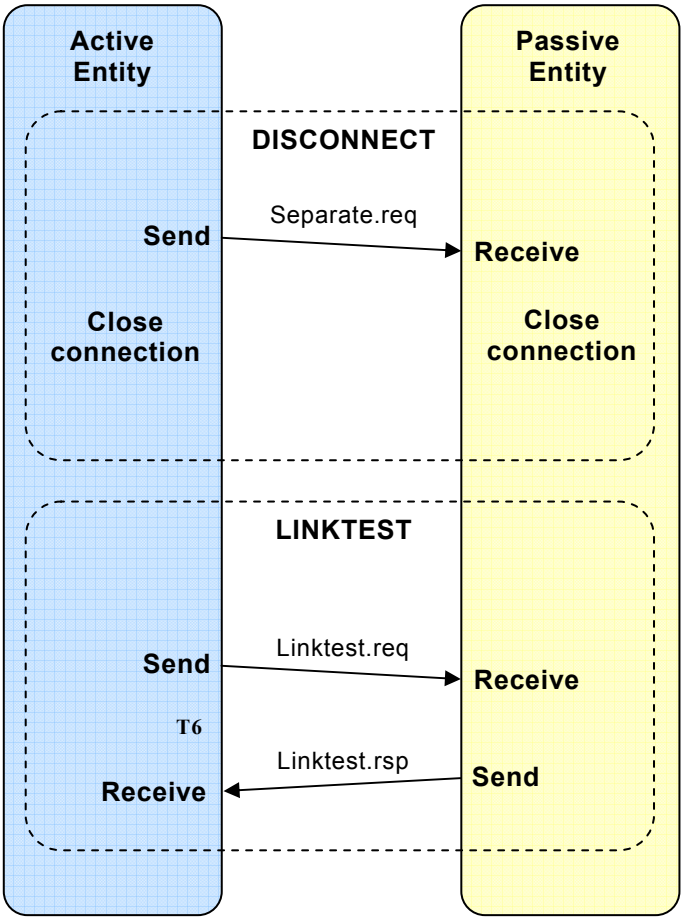
#	Current State	Trigger	New State	Comment
1	...	Local entity-specific preparation for TCP/IP communication	Not Connected	Action depends on connection procedure to be used: active or passive.
2	Not connected	A TCP/IP connection is established for HSMS communication.	Connected - Not Selected	None
3	Connected	Breaking of TCP connection.	Not Connected	HSMS only permits termination of the connection when the connection is in the Not Selected sub state.
4	Not Selected	Successful completion of HSMS Select procedure.	Selected	HSMS communication is now fully established: data messages exchange is permitted.
5	Selected	Successful completion of HSMS Deselect or Separate.	Not Selected	This transition normally indicates the end of HSMS communication, and so an entity would immediately proceed to break the TCP/IP connection
6	Not Selected	T7 Connection Timeout	Not Connected	There is a Time limit on how long an entity is required to remain in the Not Selected state before either entering in the Selected state or returning to Not Connected state.

The specification of a required TCP Application Program Interface (API) for use in implementations is outside the scope of HSMS. A HSMS implementation may use any TCP/IP API - sockets, TLI (Transport Layer Interface), etc.

5.5.1 HSMS Message Exchange Procedures

HSMS defines the procedures for all message exchanges between entities across the TCP/IP connection established according to the procedures in the previous section. As explained in the overview, once the connection is established, the two entities establish HSMS communications with the Select procedure. The data messages may be exchanged in any direction at any time. When the entities wish to finish HSMS communication, the Deselect or Separate procedure is used to terminate the HSMS communication.




Active Entity
Passive Entity
DISCONNECT
Separate.req
Send
Receive
Close connection
Close connection
LINKTEST
Linktest.req
Send
Receive
T6
Linktest.rsp
Receive
Send

5.5.2 HSMS Message Format

This section defines the detailed format of the messages used by the procedures in the previous section. A HSMS Message is transmitted as a single contiguous stream of bytes in the following order:

Number of Bytes	Description
4 Bytes	Message Length. MSB first. Specifies the number of bytes in the Message Header plus the Message Text.
10 Bytes	Message Header
0 - n Bytes	Message Text. Format is further specified by P-Type field of message header. The message text corresponds to message data by SECSII encoding.

The minimum possible message length is 10 (Header only)

The maximum possible message length depends on SECS I specific.

5.5.3 HSMS Message Header

The Message Header is a ten byte field. The bytes in the header are numbered from byte 0 (first byte transmitted) to byte 9. The format of the Message Header is as follows:

Bytes	Description
0 - 1	Session ID (Device ID)
2	Header Byte 2
3	Header Byte 3
4	Ptype
5	Stype
6 - 9	System Bytes

The physical byte order is designed to correspond as closely as possible to the SECS-I header.

Session ID is a 16-bit unsigned integer values, which occupies bytes 0 and 1 of the header(byte 0 is MSB). Its purpose is to provide an association by reference between control messages and subsequent messages.

Header Byte 2 is used in different ways for different HSMS messages. For Control Messages it contains zero or a status code. For a Data Message it contains the W-Bit and SECS stream.

Header Byte 3 contains for control messages zero or status code. For data messages it contains the SECS function.

P-Type is an 8 bit unsigned integer value which occupies byte 4 of the message header and message text are encoded. Only PType = 0 is defined by HSMS to mean SECS II message encoding. For non-zero PType values, see "special considerations".

Value	Description
0	SECS-II Encoding
1 - 127	Reserved for subsidiary standards
128 - 255	Reserved, not used

S-Type (Session Type) is a one-byte unsigned integer value which occupies header byte 5.

Value	Description	Value	Description
0	Data Message	6	Linktest.rsp
1	Select.req	7	Reject.req
2	Select.rsp	8	Not used
3	Deselect.req	9	Separate.req
4	Deselect.rsp	10	Not used
5	Linktest.req	11-255	Reserved , not used

The system bytes are used to identify a transaction uniquely among the set of open transaction. The system bytes are also defined as in SECS-I specific.

5.5.4 HSMS Message Format Summary

Message Header							
Message Type	Bytes 0 – 1 Session ID	Byte 2	Byte 3	Byte 4 PType	Byte 5 SType	Bytes 6 - 9 System Bytes	Message Text
Data Message	* (no R-Bit)	W-bit and SECS stream	SECS Function	0	0	Primary: Unique Reply: Same as primary	Text
Select.req	*	0	0	0	1	Unique	None
Select.rsp	Same as.req	0	Select Status	0	2	Same as.req	None
Deselect.req	*	0	0	0	3	Unique	None
Deselect.rsp	Same as.req	0	Deselect Status	0	4	Same as.req	None
Linktest.req	0xFFFF	0	0	0	5	Unique	None
Linktest.rsp	0xFFFF	0	0	0	6	Same as.req	None
Reject.req	Same as message being rejected	PType or Stype of message being rejected	Reason Code	0	7	Same as message being rejected	None
Separate.req	*	0	0	0	9	Unique	None

* Indicates further specification by subsidiary standards

5.6 SECS-2 Implementation

5.6.1 Introduction

The SEMI Equipment Communication Standard Part 2 (SECS-2) defines details how messages exchanged between intelligent equipment and a host are interpreted.

It is the intent of this standard to be fully compatible with SEMI Equipment Communication Standard E4 (SECS-1).

The messages defined in this specification support the typical activities required for the BROOKS transponder reader.

SECS-2 gives form and meaning to messages exchanged between the equipment and the host using a message transfer protocol, such as SECS-1. SECS-2 defines the method of conveying information between the equipment and the host in the form of messages.

These messages are organized into categories of activities, called streams, which contain specific messages, called functions. In SECS-2, messages are identified by a stream code (0-127, 7bits) and a function code (0-255, 8 bits). Each combination of stream and function represents a unique message identification.

SECS-2 defines the structure of messages into entities called items and lists of items. These data structures define the logical divisions of the message, as distinct from the physical division of the message transfer protocol.

An item is an information packet that has a length and format defined by the first 2, 3, or 4 bytes of the item. These bytes are called the item header. The item header consists of the format byte and the length byte as shown below.

Byte	Name	Description
0	Format and number of the length bytes	The data format is coded in the upper 6 bits. The two less significant bits determine the number of the following length bytes.
1 1-2 1-3	Length-bytes	The length corresponds to the number of the bytes of a data element. In the “List” format, the length corresponds to the number of the list elements. The standard does not require the minimum possible number of length-bytes for a given data length
Next <Length>	Data	Data bytes of a data element or number of the data elements in case of the “List” format.

A list is an ordered set of elements, where an element can be either an item or a list. The list header has the same form as an item header with format type 0. However, the length byte refers to the number of elements in the list rather than to the number of bytes.

5.6.2 Data Items

The formats represent arrays of types: <type>[number of elements] where <type> is one of the following:

Oct-Code	Hex-Code	Format	Meaning	Example

00	01	List	List element with the number of the "Length" data elements	`<L2>`
				`<A "Hello">`
				`<B 0x00>`

11	25	Boolean	1 – Byte Boolean false = 00 ; true != 00	`<Boolean1 0x00>`
10	21	Binary	Byte sequence of the length "Length"	`<B1 0x01>`
20	41	ASCII	Printable ASCII signs	`<A "Hello">`
31	65	I1	1 - Byte signed Integer	`<I1 123>`
32	69	I2	2 - Byte signed Integer	`<I2 –12345>`
34	71	I4	4 - Byte signed Integer	`<I4 2147483647>`
30	61	I8	8 - Byte signed Integer	`<I8 931372980293834>`
51	A5	U1	1 - Byte unsigned Integer	`<U1 0>`
52	A9	U2	2 - Byte unsigned Integer	`<U2 #empty>`
54	B1	U4	4 - Byte unsigned Integer	`<U4 429489725>`
50	A1	U8	8 - Byte unsigned Integer	`<U8 763468676756767>`
40	91	F8	8 - Byte floating point	`<F8 1.223 e204>`
44	81	F4	4 - Byte floating point	`<F4 -1.23 >`

Data item examples:

Meaning	Format	Length						
1- Byte Integer	65	01	xx					
4- Byte Integer	71	04	MSB	...	...	LSB		
ASCII	41	06	1.chr	2.chr	3.chr	4.chr	5.chr	6.chr
zero-length	xx	00						
List Data Item	01	03	1. element		2. element		3. element	

5.6.3 Message set

The SECSII-message-set used by the BROOKS transponder reader consist of six different stream types.

Stream 1: (Equipment status)

- S1F1 and S1F2 Are you there request
- S1F15 and S1F16 Request offline
- S1F17 and S1F18 Request online

Stream 2: (Equipment control)

- S2F13 and S2F14 Equipment constant request
- S2F15 and S2F16 New equipment constant request
- S2F19 and S2F20 Reset send

Stream 9: (System errors)

- S9F1 Unrecognized device ID
- S9F3 Unrecognized stream type
- S9F5 Unrecognized function type
- S9F7 Illegal data
- S9F9 Transaction timer timeout

According to SEMI E99 carrier ID read/writer functional standard for SECS-1 and SECS-2 protocol, the BROOKS reader supports the defined stream 18 messages.

Stream 18: (Equipment status)

- S18F1 and S18F2 Read attribute request
- S18F3 and S18F4 Write attribute request
- S18F5 and S18F6 Read request
- S18F7 and S18F8 Write request
- S18F9 and S18F10 Read ID request
- S18F11 and S18F12 Write ID request
- S18F13 and S18F14 Subsystem command request
- S18F65 and S18F66 Scan Transponder
- S18F67 and S18F68 Read data request – UID
- S18F69 and S18F70 Write data request – UID
- S18F71 and S18F72 Sensor State
- S18F73 and S18F74 Read ID request –UID
- S18F75 and S18F76 Write ID request – UID
- S18F77 and S18F78 Set Output State
- S18F79 and S18F80 Get Output State
- S18F85 and S18F86 Scan and Read ID request
- S18F87 and S18F88 Read Write-Counter
- S18F89 and S18F90 Read Write-Counter with UID

5.6.4 Data Items

This section defines the data items used in the standard SECS-2 messages described in the section “Message Details”.

Syntax:

Name: A unique name for this data item. This name is used in the message definitions.

Format: The permitted item format code which can be used for this standard data item. Item format codes are shown in hex and octal, as described in section data items (page 45). The notification “3()” indicates any of the signed integer formats (30, 31, 32, 34).

Description: A description of the data item, with the meanings of specific values.

Where used: The standard messages in which the data item appears.

ALARM STATUS	Format: A[1]

Description: The value of the alarm status refers to the last reading process. If a read or write error occurs, the alarm status is set. A successful read or write resets the alarm status. When leaving maintenance mode, the alarm status is also deleted.

0 … No alarm

1 … Alarm

Where used: STATUS

ATTRID	Format: A[max25]

Description: Identifier for an attribute for a specific type of object.

CIDRW Attribute Definitions:

"Configuration"…	Number of heads
"AlarmStatus"	Current CIDRW sub state of ALARM STATUS
"OperationalStatus"	Current CIDRW sub state of OPERATIONAL
"SoftwareRevisionLevel"	Revision (version) of software - 8 byte maximum
"CarrierIDOffset"	Offset of CID in CID field (MID area)
"CarrierIDLength"	Length of CID in CID field (MID area)
"S1Status"	Status of external I/O 01 (read only)
"S2Status"	Status of external I/O 02 (read only)
"S3Status"	Status of external I/O 03 (read only)
"S4Status"	Status of external I/O 04 (read only)
"S5Status"	Status of external I/O 05 (read only)

"ECID_00" → parameter 0 – Gateway ID
"ECID_01" → parameter 1 – Baudrate
"ECID_02" → parameter 2 – Inter-Character-Timeout T1
"ECID_03" → parameter 3 – Block-Protocol-Timeout T2
"ECID_04" → parameter 4 – Reply-Timeout T3
"ECID_05" → parameter 5 – Inter-Block-Timeout T4
"ECID_06" → parameter 6 – Retry-Limit RTY
"ECID_07" → parameter 7 – TARGETID high Byte
"ECID_08" → parameter 8 – TARGETID low Byte
"ECID_09" → parameter 9 – Heartbeat time
"ECID_11" → parameter 11 – Reader ID
"ECID_12" → parameter 12 – Acknowledgment Error Message
"ECID_13" → parameter 13 – Communication Port
"ECID_16" → parameter 16 – antenna power level
"ECID_20" → parameter 20 – sensor activity
"ECID_21" → parameter 21 – sensor 1 delay
"ECID_22" → parameter 22 – sensor 2 delay
"ECID_23" → parameter 23 – sensor 3 delay
"ECID_24" → parameter 24 – sensor 4 delay

"ECID_25" → parameter 25 – sensor 5 delay
"ECID_26" → parameter 26 – watchport for sensor 1
"ECID_27" → parameter 27 – watchport for sensor 2
"ECID_28" → parameter 28 – watchport for sensor 3
"ECID_29" → parameter 29 – watchport for sensor 4
"ECID_30" → parameter 30 – watchport for sensor 5
"ECID_31" → parameter 31 – r/w max repeat
"ECID_32" → parameter 32 – type of transponder
"ECID_37" → parameter 37 – MID area
"ECID_38" → parameter 38 – Test after software reset
"ECID_42" → parameter 42 – CarrierIDOffset
"ECID_43" → parameter 43 – CarrierIDLength
"ECID_44" → parameter 44 – FixedMID
"ECID_45" → parameter 45 – MIDFormat
"ECID_56" → parameter 56 – Transmitter Delay
"ECID_57" → parameter 57 – Modulation
"ECID_99" → parameter 99 – Customer settings
"ECID100" → parameter 100 – DIP switches enabled

Head Attribute Definitions: *

"HeadStatus"	The current state
"HeadID"	Head number 01-05 (2 digits)

* In case of a HF80 Transponder Reader, the head attribute definition "HeadStatus" is equal to the "OperationalStatus" of the CIDRW. The "HeadID" is equal to the antenna connector.

Where used: S18F1, S18F3

ATTRVAL	Format: A[max4]

Description: Value of the specified attribute.

CIDRW Attribute Definitions:

"Configuration" Number of heads "**05**"

"AlarmStatus" Current CIDRW sub state of ALARM STATUS

"**0**" … NO
"**1**" … ALARMS

"OperationalStatus" Current CIDRW sub state of OPERATIONAL

"**IDLE**"… reader in IDLE mode
"**BUSY**"… reader is busy
"**MANT**"… maintenance mode

"SoftwareRevisionLevel" Revision (version) of Software – 8 byte maximum

"S1Status" – "S5Status" "**ON**" – Sensor is occupied
"**OFF**" – Sensor is unoccupied

ECID_00 to ECID_99 see data item **ECV** parameter 0 to parameter 45

Head Attribute Definitions:

"HeadStatus" The current state

"**IDLE**"… reader in IDLE mode
"**BUSY**"… reader is busy
"**NOOP**"… not operating

"HeadID" Head number 01-05 (2 digits)

"**01**" … Antenna 1
…
"**05**" … Antenna 5

Where used: S18F2, S18F3

CPVAL	Format: A[max2]

Description: State request value

"**OP**" … operating state
"**MT**" … maintenance state

Where used: S18F13

DATA	Format: A [max 200]

Description: A vector or string of unformatted data. It depends on the size of the MID area.

Where used: S18F6, S18F7, S18F68, S18F69

DATAB	Format: B [max 200]

Description: Byte array of transponder data. It depends on the size of the MID area.

Where used: S18F6, S18F7, S18F68, S18F69

DATALENGTH	Format: U2

Description: Total bytes to be sent.

The DATALENGTH corresponds to the quantity of bytes that should be read or written.

Where used: S18F5, S18F7, S18F67, S18F69

DATASEG	Format:A[2]

Description: Used to identify the data requested.

The DATASEG corresponds to the page number (PAGEID) of the ISO 15693 transponder.

"00": First page of any type of transponder or first page of the DATA area.

Where used: S18F5, S18F7, S18F67, S18F69

DATASEGB	Format:B[1]

Description: Used to identify the data requested.

The DATASEG corresponds to the real byte of the ISO 15693 transponder.

Empty First byte of DATA area (depends on MID settings).

Where used: S18F5, S18F7, S18F67, S18F69

EAC	Format: B[1]

Acknowledge code for new reader constant

0 … Parameter was set successfully

1 … Parameter could not be set

Where used: S2F16

ECID	Format: U1

Parameter number of reader (see data item ECV)

Where used: S2F13, S2F15

ECV	Format: U1

Reader parameter definition.

The values are displayed as decimal values!

Where used: S2F14, S2F15

Parameters:

Parameter 0: Gateway ID

The gateway ID is a part of the device ID. The BROOKS reader works simultaneously as a gateway and a reader (CIDRW with integrated head).

It is the “lower message ID” in the message header.

00 .. 255

Default: 0x00

Parameter 1: Baudrate

Data transmission rate to the SECS-Host

12:	1200 Baud
24:	2400 Baud
48:	4800 Baud
96:	9600 Baud
192:	**19200 Baud**
200:	38400 Baud
201:	57600 Baud

Default :(192) 19200 Baud (see accompanying letter of the reader)

Parameter 2: Inter-Character-Timeout T1

1 .. 100 1/10s

Default: (10) 1s

Parameter 3 : Block-Protocol-Timeout T2

2 .. 250 1/10s

Default: (20) 2s

Parameter 4: Reply-Timeout T3

1 .. 120 1s

Default: (45) 45s

Parameter 5: Inter-Block Timeout T4

This parameter is ineffective if the used messages are not larger than one block.

1 .. 120 1s

Default: (45) 45s

Parameter 6: Retry limit RTY

Number how often a question or a message shall be repeated.

0 .. 31

Default: 3

Parameter 7: TARGETID HighByte

Highbyte of the predefined TARGETID (not changeable).

Parameter 8: TARGETID LowByte

Lowbyte of the predefined TARGETID (not changeable).

Parameter 9: Heartbeattime

The reader offers the option of generating a regular heartbeat. This means the reader sends a S1F1 message to the host in the defined interval.

0 … No heartbeat

1 … 255 10s (10s - 2550s)

Default: 0 no heartbeat

Parameter 10: Not defined!

Parameter 11: Reader-ID

The reader ID is a part of the device ID. In the message header, it corresponds to the 7 LSB (last significant bits) of the “upper message ID”.

00 .. 127

Default: 0x00

The BROOKS reader works as a gateway (CIDRW) with up to 5 integrated heads. Therefore the reader ID is predefined as 0x00. Of course, the ID can be changed within the valid scope.

Parameter 12: Acknowledgment Error Message

Defines whether an error message has to be confirmed by the host or not.

0 – no confirmation expected
1 – confirmation expected

default: 1

Parameter 13: Communication port

The communication with the host can be done by by HSMS (TCP/IP) or optional by SECS1 (RS232) interface. The following options are possible:

0x11:	Host	→	Reader:	HSMS
	Reader	→	Host:	HSMS
0x22:	Host	→	Reader:	SECS1
	Reader	→	Host:	SECS1

The setting of the DIP switch 1 affects this parameter! The setting of the DIP switch has priority and will be stored in the parameter after a reset.

Attention! If the reader has only one interface (TCP/IP or RS232) the changing of parameter 13 to a value where the not installed interface option will be activated and the DIP switch 1 is deactivated will set the reader to a mode where no communication with the reader is possible. Then the parameter can not be switched back to correct value.

default: (0x11) Ethernet

Parameter 14, 15, 17, 18 and 19 are not defined!

Parameter 16: Antenna Power Level

Defines the power level at antenna. Minimum 200mW and maximum 1000mW.

00 .. 31

default: 0x1F (highest power)

Parameter 20: sensor activity

The transponder reader offers the option of deactivating the connected sensors.

0x00000000	all 5 Sensors deactivated
0x00000001	Sensor 1 activated
0x00011111	all 5 Sensors activated
Default:	0x00011111 (31)

Parameter 21: sensor delay for presence sensor 1

Delay time for sensor signal to start a defined action.

0 .. 255 1/10 s

Default: (10) 1s

Parameter 22: sensor delay for presence sensor 2

Delay time for sensor signal to start a defined action.

0 .. 255 1/10 s

Default: (10) 1s

Parameter 23: sensor delay for presence sensor 3

Delay time for sensor signal to start a defined action.

0 .. 255 1/10 s

Default: (10) 1s

Parameter 24: sensor delay for presence sensor 4

Delay time for sensor signal to start a defined action.

0 .. 255 1/10 s

Default: (10) 1s

Parameter 25: sensor delay for presence sensor 5

Delay time for sensor signal to start a defined action.

0 .. 255 1/10 s

Default: (10) 1s

Parameter 26: watchport for presence sensor 1

Enables a message to the host if a cassette/FOUP is detected on the I/O port, or if it is removed from I/O port.

A sensor is required to use this capability!

Bit 0: 0 – Report cassette/FOUP removed is disabled

1 – Report cassette/FOUP removed is enabled

Bit 1: 0 – Report cassette/FOUP detected is disabled

1 – Report cassette/FOUP detected is enabled

Bit 2 – 5: not used!

Bit 6: 0 – Message S18F71 expects no reply message

1 – Message S18F71 expects a reply message

Bit 7: 0 – The input signal is not inverted (normal)

1 – The input signal is inverted

Input signal is normal(Bit 7) and no reply is expected (Bit 6):

0x00000000	Report nothing
0x00000001	Report cassette/FOUP is removed
0x00000010	Report cassette/FOUP is detected
0x00000011	Report cassette/FOUP is detected and cassette is removed

Input signal is inverted (Bit 7) and a reply is expected (Bit 6):

0x11000000	Report nothing
0x11000001	Report cassette/FOUP is removed
0x11000010	Report cassette/FOUP is detected
0x11000011	Report cassette/FOUP is detected and cassette is removed

Default: 0x00000011 (3)

Parameter 27: watchport for presence sensor 2

See parameter 26.

Parameter 28: watchport for presence sensor 3

See parameter 26.

Parameter 29: watchport for presence sensor 4

See parameter 26.

Parameter 30: watchport for presence sensor 5

See parameter 26.

Parameter 31: r/w maxrepeat

If a read/write error occurs, this parameter defines the maximum number of attempts to read or write a transponder.

0 .. 5

Default: 5

Parameter 32: type of transponder

Defines the type of tag. The type is used in case of some reading and writing messages which do not use the UID to identify the type of the tag. Therefore, the device has to know the type of tag before trying to read or write. If a tag of another type supports the same messages like the defined type, the reader can read/write this tag too.

0x04	…	Philips ICS20
0x05	…	Infineon tag
0x07	…	TI tag (Tag-it)
0x85	…	Infineon My D Light

Default: 5 (Infineon tag)

Parameter 37: MID area

This parameter defines the range of the MID.

‘0’ … ‘10’ pages

Default: ‘4’ – MID area = 4 pages = 16 bytes (depends on transponder type).

See also parameter 42 – 45 and 99.

Parameter 38: Test After Soft Reset

This parameter enables/disables the initial test after a software reset.

0x00	No initial test after software reset
0x01	Initial test after software reset
0x11	polling Inventory on head 1 after software reset
0x12	polling Inventory on head 2 after software reset
0x13	polling Inventory on head 3 after software reset
0x14	polling Inventory on head 4 after software reset
0x15	polling Inventory on head 5 after software reset
0x21	polling read and write on head 1 after software reset
0x22	polling read and write on head 2 after software reset
0x23	polling read and write on head 3 after software reset
0x24	polling read and write on head 4 after software reset
0x25	polling read and write on head 5 after software reset
Default:	(0) No initial test after software reset

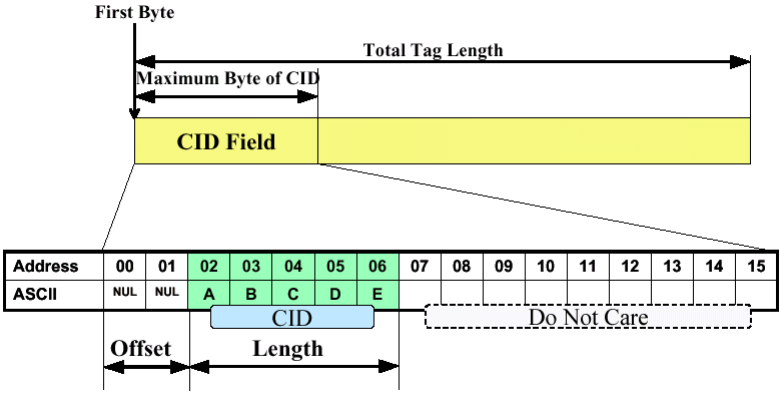
Parameter 42: CarrierIDOffset

Defines the offset of the CID within the CID field (MID area – parameter 37).

The valid value range depends on the value of the MID area and the value of CarrierIDLength.

Valid range: 0 … maximum bytes of CID -1

Default: 0



Offset + Length can not be larger than the length of CID field.

Parameter 43: CarrierIDLength

Defines the length of the CID within the CID field (MID area – parameter 37).

The valid value range depends on the value of the MID area and the value of CarrierIDOffset. (see parameter 42: CarrierIDOffset)

Valid range: 1 … maximum bytes of CID field

Default: 16

Parameter 44: FixedMID

Defines the read, write and error behavior regarding CarrierIDLength defined in SEMI E99-0303.

0	Dynamic CID length (to ensure compatibility with older versions) MID length is variable for writing to the tag. Reading up to the first non-visible ASCII character.
1	Fixed CID length (to meet the new standard revision) Length of MID in the tag must be the same as the reader settings. If there is a non-visible ASCII character within the CID field, an error occurs.

Default: 0

Parameter 45: MIDFormat

Defines the physical format of the MID data in the transponder memory.

0	E99 standard format left aligned – meets the requirement of the SEMI standard E99
1	MID format right aligned – filler byte is ASCII ‘0’ (0x30) Reading: leading ‘0’ will displayed.
2	MID format right aligned – filler byte is ASCII ‘0’ (0x30) Reading: leading ‘0’ will not displayed.

If parameter 45 is not ‘0’ the parameters 42, 43 and 44 are not effective.

Default: 0

Examples: MID string is ‘123456789ABC’

Parameter 45 = ‘0’:

tag memory:

Page 3, 4	9	A	B	C	0x00	0x00	0x00	0x00
Memory address	15	14	13	12	11	10	9	8
Page 1, 2	1	2	3	4	5	6	7	8
Memory address	7	6	5	4	3	2	1	0

→ Output string: ‘123456789ABC’

Parameter 45 = ‘1’ or ‘2’:

tag memory:

Page 3, 4	0	0	0	0	1	2	3	4
Memory address	15	14	13	12	11	10	9	8
Page 1, 2	5	6	7	8	9	A	B	C
Memory address	7	6	5	4	3	2	1	0

→ Output string (parameter 45 = ‘1’): ‘0000123456789ABC’

→ Output string (parameter 45 = ‘2’): ‘123456789ABC’

Parameter 99: custom code

If the customer requires special parameter settings that deviate from the default values, a customer code can be assigned by BROOKS to set several parameter values via one parameter. Parameter 99 will not be stored in the reader and can not be read out. The following values are defined to change several parameters in one step.

0x04	…	Settings for Philips ICS20 tag
0x05	…	Settings for Infineon tag
0x07	…	Settings for TI tag (Tag-it)
0x85	…	Settings for Infineon My D Light
0x00	…	Resets all parameters to default settings

☞ **Attention! After reset all parameter to default settings the reader performs a hardwarereset!**

These settings change the following parameters:

Parameter 99 = 0x04	
Parameter#	**Value**
32 – Tag type	0x04
37 – MID area	0x04
53 – Readmode	Low
54 – Writemode	Low

Parameter 99 = 0x05	
Parameter#	**Value**
32 – Tag type	0x05
37 – MID area	0x02
53 – Readmode	Low
54 – Writemode	High

Parameter 99 = 0x07	
Parameter#	**Value**
32 – Tag type	0x07
37 – MID area	0x04
53 – Readmode	Low
54 – Writemode	High

Parameter 99 = 0x85	
Parameter#	**Value**
32 – Tag type	0x85
37 – MID area	0x04
53 – Readmode	Low
54 – Writemode	Low

Parameter 100: (0x64) DIP-Switch Enabled

Defines which DIP switches are enabled and have influence to the behavior.

Via bit 0 to bit 3 the individual DIP switches can be enabled or disabled.

Attention! Have a look to parameter 13 and value of DIP switch 1 before changing this value!

0 – 0x0F

default: 0x0F

Parameter 123: (0x7B) Fineversion

Can be used to request the fineversion of the firmware.

MDLN	Format: A[6]

Equipment model number.

Where used: S1F2

MHEAD	Format: B[10]

SECS message block header associated with message block in error.

Where used: S9F1, S9F3, S9F5, S9F7

MID	Format: A

Description: Material ID

Depending on the type of transponder, it is possible to modify the length of the MID.

MID length can be set from “0” (no MID) to “10” (MID occupies the first 10 pages (writeable)) See parameter 37.

Where used: S18F10, S18F11, S18F74, S18F75

OFLACK	Format: B[1]

Acknowledge code for OFF-LINE request.

0 … OFF-LINE acknowledge (reader is offline)

Where used: S1F16

ONLACK	Format: B[1]

Acknowledge code for ON-LINE request.

0 … ON-LINE accepted (reader is online)

Where used: S1F18

OUTPUT	Format: A[2]

Number of the output of the antenna head indicated by TARGETID.

"01" … Output 1

"02" … Output 2

Where used: S18F77

PM Information	Format: A[2]

Description: Preventive maintenance information

"NE" … Normal execution

"MR" … Maintenance required

Where used: STATUS

RAC	Format: B[1]

Reset acknowledge code.

0 … Reset to be done

1 … Reset could not be done

Where used: S2F20

RIC	Format: B[1]

Reset code.

1 … Power up reset

2 … Software reset (without reset of Ethernet component)

Where used: S2F19

SHEAD	Format: B[10]

Stored SECS message block header. Only the last message is stored, which must still be confirmed by the host!

Where used: S9F9

SOFTREV	Format: A[max 6]

Software revision code.

Where used: S1F2

SSACK	Format: A[2]

Description: Result information on the status of the request concerning the service request.

"NO"	…	Normal operation Indicates the success of the requested action
"EE"	…	Execute error Cannot read tag data . Cannot read ID sequence. But equipment is normal.
"CE"	…	Communication error Syntax error of message or message format or value.
"HE"	…	Hardware error ID reader/writer head fault, ID reader/writer head is powered off.
"TE"	…	Tag error

Where used: S18F2, S18F4, S18F6, S18F8, S18F10, S18F12, S18F14, S18F66, S18F68, S18F70, S18F72, S18F74, S18F76, S18F78, S18F80

SSCMD	Format: A[max18]

Description: Indicates an action to be performed by the subsystem.

Used to differentiate between the different subsystem commands indicated.

"ChangeState"	…	Change state
"GetStatus"	…	Get state
"PerformDiagnostics"	…	Perform diagnostics
"Reset"	…	Reset CIDRW

Where used: S18F13

SSTATE	Format: A[max 3]

Description: Provides status information of the external I/O of a specific head.

"ON" - Sensor is occupied

"OFF" - Sensor is unoccupied

Where used: S18F71

STATE	Format: A[max 5]

Description: State of the external outputs of a specific head.

"ON"	…	Output is ON
"OFF"	…	Output is OFF
"FLASH"	…	Output is flashing
"KEEP"	…	Output remains current state

Where used: S18F77

STATUS	Format: A[2]

Description: Provides status information of a subsystem component.

Consists of PM Information and the current values of the CIDRW attributes AlarmStatus, OperationalStatus, and HeadStatus.

List of a Status

L,4

<PMInformation>

<AlarmStatus>

<OperationalStatus>

<HeadStatus>

For data items OperationalStatus and HeadStatus see data item ATTRVAL.

Where used: S18F2, S18F4, S18F8, S18F10, S18F12, S18F14, S18F70, S18F74, S18F76, S18F78, S18F80

TARGETID	Format: A[max10]

Description: Identifies where a request for action or data is to be applied. The TARGETID corresponds to the last four characters of the serial number on a label on top of the reader.

The reader uses the 2 digit HeadID as TARGETID to address the right antenna connector.

See also reader parameter definitions (data item ECV) parameter 7 and 8.

Example : "H8-xxxx-TS" (xxxx … dependent on the individual reader)

The 4 ASCII character TARGETID xxxx is set by delivery (is used as serial number).

The predefined **TARGETID is fixed** and cannot be changed.

The 2 ASCII character HeadID corresponds to the antenna connectors 01 - 05.

Where used: all stream 18 messages

UID	Format: B[8-12]

Description: Unified identifier of the tag.

In case of ISO15693 the UID has a length of 8 Bytes.

Where used: S18F66, S18F67, S18F69, S18F73, S18F75

Write Counter	Format: B[4]

Description: Write Counter. Part of Tag data which counts the number of write actions to this specific tag.

Where used: S18F88, S18F90

Write Counter Length	Format: U1

Description: Length of write counter data on tag.

Where used: S18F87, S18F89

5.7 SEMI E99

5.7.1 Introduction

The purpose of the Carrier ID Reader/Writer functional standard is to provide a common specification for concepts, behavior, and services provided by a Carrier ID Reader/Writer to an upstream controller. A standard interface will increase the interchangeability of a Carrier ID Reader/Writer, so that users and equipment suppliers have a wide range of choice.

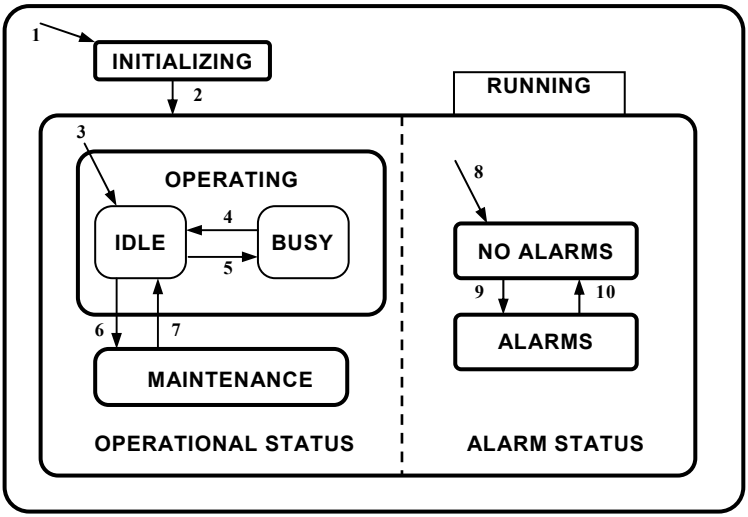
Scope:

1. The interface standard addresses the functional requirements for a generic Carrier ID Reader/Writer interface with an upstream controller.
2. The specification includes the required behavior and required communications for a Carrier ID Reader and Writer.
3. The specification does not require, define or prohibit asynchronous messages sent by the Carrier ID Reader or Writer.
4. This standard does not purport to address safety issues, if any, associated with its use.

5.7.2 State Models

To facilitate independent control of the individual heads, there are two separate state models defined, one for CIDRW subsystem and one for each individual head. The BROOKS reader combines the CIDRW subsystem with the head.

The state model for the BROOKS reader is displayed in the state model below.



The table below defines the states of the BROOKS transponder reader.

State	Definition
ALARM STATUS	Displays the presence or absence of alarms.
ALARMS	An alarm condition exists.
BUSY	A service is being performed that affects the state of the hardware
CIDRW	Super-state of CIDRW state model. Always active when the CIDRW is powered on.
IDLE	No service is performed. All heads are idle.
INITIALIZING	CIDRW is performing initialization and self diagnostic. Presence or absence of alarms is initially determined in this state.
NO ALARMS	No alarm condition exists.
OPERATING	Normal operational states where reading and/or writing operations can be performed
OPERATIONAL STATUS	The CIDRW is fully capable of performing all services that it supports.
RUNNING	The CIDRW is operational and able to communicate.
MAINTENANCE	Internal setup and maintenance activities.

The table below defines the transitions of the BROOKS SECS-1 state model of the transponder reader.

#	Previous State	Trigger	New State	Actions	Comment
1	Any	Power up or reset	INITIALIZING	Initialize hard- and software	Default entry on power up
2	INITIALIZING	Initialization is complete	RUNNING	None	The CIDRW is now able to communicate
3	INITIALIZING	Default entry into OPERATING	IDLE	None	Internal
4	IDLE	A service request to read or write or perform diagnostic is received.	BUSY	None	
5	BUSY	All services request that affect	IDLE	None	
6	IDLE	A user selects the MAINTENANCE state and all heads are IDLE	MAINTENANCE	None	The upstream controller may send a request or the operator may set a switch to select the MAINTENANCE state. Maintenance and setup activities may now be performed.
7	MAINTENANCE	A user selects the OPERATING state and all heads are IDLE	IDLE	None	The upstream controller may send a request or the operator may set a switch to select the OPERATING state. Normal operating activities may now be performed.
8	INITIALIZING	Default entry into ALARM STATUS	ALARMS or NO ALARMS	None	
9	NO ALARMS	An alarm condition is detected.	ALARMS	None	
10	ALARMS	All alarm conditions have cleared.	NO ALARMS	None	
11	Any	A reset service request is received	CIDRW	None	

5.7.3 Valid Services per State

The following table shows which of the various services can be performed by the reader when the reader is in various individual states.

	Service									
	Write ID	Write Data	Set Attributes	Reset	Read ID	Read Data	Perform Diag.	Get Status	Get Attributes	Change State
Reader State										
INIT										
IDLE/BUSY		X	X	X	X	X	X	X	X	X
MANT	X		X	X	X		X	X	X	X

☞ **Note that when in the initializing state after power up or the reset service, the CIDRW may not be able to communicate.**

5.8 Message Details

5.8.1 Equipment status

S1F0: ABORT TRANSACTION (reader <-> host)

Used instead of an expected reply to abort a transaction. Function 0 is defined in every stream and has the same meaning in every stream.

S1F0 W . * Header Only

S1F1: ARE YOU THERE REQUEST (reader <-> host, reply)

Establishes if the gateway/reader or host is online.

S1F1 W . * Header Only

S1F2: ON-LINE DATA (host -> reader)

The host signifies that it is online.

S1F2
<L[2]
<MDLN >
<SOFTREV >
>.

S1F2: ON-LINE (reader -> host)

The reader signifies that it is online.

S1F2

<L[2]

<MDLN >

<SOFTREV >

>.

S1F15: REQUEST OFF_LINE (host ->reader, reply)

The reader is requested to change the communication state to offline.

The reader can only be set online again by using message S1F17 (or reset S2F19), all other messages will be aborted by the SxF0 message!

S1F15 W. *Header Only

S1F16: OFFLINE ACKNOWLEDGE (reader -> host)

Acknowledge.

S1F16

<OFLACK>.

S1F17: REQUEST ON_LINE (host ->reader, reply)

The reader is requested to change the communication state to online.

S1F17 W. *Header Only

S1F18: ONLINE ACKNOWLEDGE (reader -> host)

Acknowledge.

S1F18

<ONLACK>.

5.8.2 Equipment Control

S2F0: ABORT TRANSACTION (reader <-> host)

Used instead of an expected reply to abort a transaction. Function 0 is defined in every stream and has the same meaning in every stream.

S2F0 W . * Header Only

S2F13: EQUIPMENT CONSTANT REQUEST (host-> reader, reply)

The host requests one constant from the reader.

S2F13 W

<L[1]

<ECID>

>.

S2F14: EQUIPMENT CONSTANT DATA (reader -> host)

The reader sends the requested constant to the host.

S2F14

<L[1]

<ECV>

>.

S2F15: NEW EQUIPMENT CONSTANT SEND (host-> reader, reply)

The host changes one reader constant.

S2F15 W

<L[1]

<L[2]

<ECID>

<ECV>

>

>.

S2F16: NEW EQUIPMENT CONSTANT ACKNOWLEDGE (reader -> host)

The reader acknowledges the setting of the reader constant.

S2F16

< EAC>.

S2F19: RESET SEND (host -> reader, reply)

The host requests the reader to reset the hardware and software.

If a heartbeat time is set (parameter 9) the reader sends a S1F1 message when the reset was finished.

The power up reset requires a few seconds.

S2F19 W

< RIC>.

S2F20: RESET ACKNOWLEDGE (reader -> host)

The reader acknowledges the reset (only in case of software reset).

In case of a power up reset, the reader sends no S2F20 message.

S2F20

< RAC>.

5.8.3 System Errors

S9F1: UNRECOGNIZED DEVICE ID (reader -> host)

The device ID in the message block header does not correspond to the equipment device ID.

S9F1

< MHEAD > .

S9F3: UNRECOGNIZED STREAM TYPE (reader -> host)

The reader does not recognize the stream type in the message block header.

S9F3

< MHEAD > .

S9F5: UNRECOGNIZED FUNCTION TYPE (reader -> host)

The reader does not recognize the function number in the message block header.

S9F5

< MHEAD > .

S9F7: ILLEGAL DATA (reader -> host)

The reader does not recognize the data in the message.

S9F7

< MHEAD > .

S9F9: TRANSACTION TIMER TIME-OUT (reader -> host)

This message indicates that a transaction timer has timed out and that the corresponding transaction was aborted. Only the last sent message (which must be confirmed by the host) is stored and controlled.

S9F9

< SHEAD > .

5.8.4 Subsystem Control and Data

S18F0: ABORT TRANSACTION (reader <-> host)

Used instead of an expected reply to abort a transaction. Function 0 is defined in every stream and has the same meaning in every stream.

S18F0 W . * Header Only

S18F1: READ ATTRIBUTE REQUEST (RAR) (host -> reader, reply)

This message requests the current values of specific attributes of the subsystem component indicated in TARGETID.

S18F1 W

L,2
1. <TARGETID>
2. L,n
    1. <ATTRID$_1$>
    …
    n. <ATTRID$_n$>

S18F2: READ ATTRIBUTE DATA (RAD) (reader -> host)

This message returns the current values of the requested attributes and the current status of the requested component indicated in TARGETID.

S18F2

L,4
1. <TARGETID>
2. <SSACK>
3. L,n
    1. <ATTRVAL$_1$>
    …
    n. <ATTRVAL$_n$>
4. L,1
    L,s
        1. <STATUS$_1$>
        …
        s. <STATUS$_s$>

If the ATTRID of the S18F1 message is unknown, the corresponding ATTRVAL has the value <nothing>.

S18F3: WRITE ATTRIBUTE REQUEST (WAR) (host -> reader, reply)

This message requests the subsystem to set the value of read/write attributes of the component specified in TARGETID.

S18F3 ,W

L,2

1. <TARGETID>
2. L,n
    1. L,2
        1. <ATTRID$_1$>
        2. <ATTRVAL$_1$>
        …
    n. L,2
        1. <ATTRID$_n$>
        2. <ATTRVAL$_n$>

S18F4: WRITE ATTRIBUTE ACKNOWLEDGE (WAA) (reader -> host)

This message acknowledges the success or reports failure of the request to write attribute data to the subsystem indicated in TARGETID.

S18F4

L,3

1. <TARGETID>
2. <SSACK>
3. L,1

    L,s

    1. <STATUS$_1$>
    …
    s. <STATUS$_s$>

If the ATTRID of the S18F3 message is unknown, a communication error (CE) occurs.

S18F5: READ REQUEST (RR) (host -> reader, reply)

The host requests the subsystem indicated in TARGETID to read information. DATASEG may be used to indicate a specific section of data to be read. DATALENGTH is used to limit the amount of data for that section.

S18F5 W

L,3

1. <TARGETID>
2. <DATASEG>
3. <DATALENGTH>

If DATASEG and DATALENGTH are both omitted (zero length items) then up to 200 bytes of the data area are requested. If only DATALENGTH is omitted, then all data within the indicated section are requested.

S18F6: READ DATA (RD) (reader -> host)

This message is used to return requested information from the subsystem indicated in TARGETID, or to acknowledge the result of the request.

S18F6

L,3

1. <TARGETID>
2. <SSACK>
3. <DATA>

If TARGETID is unknown, then a communication error (CE) occurs.

S18F5: READ REQUEST BINARY (RR) (host -> reader, reply)

The host requests the subsystem indicated in TARGETID to read information. DATASEGB may be used to indicate a specific section of data to be read. DATALENGTH is used to limit the amount of data for that section.

S18F5 W

L,3

1. <TARGETID>
2. <DATASEGB>
3. <DATALENGTH>

If DATASEGB and DATALENGTH are both omitted (zero length items) then up to 200 bytes of the data area are requested. If only DATALENGTH is omitted, then only one byte starting from DATASEGB is requested.

S18F6: READ DATA (RD) (reader -> host)

This message is used to return requested information from the subsystem indicated in TARGETID, or to acknowledge the result of the request.

S18F6

L,3

1. <TARGETID>
2. <SSACK>
3. <DATAB>

If TARGETID is unknown, then a communication error (CE) occurs.

S18F7: WRITE DATA REQUEST (WAR) (host -> reader, reply)

This message requests to write data to the subsystem component indicated in TARGETID. DATASEG may be used to indicate a specific section of the data area to be written or overwritten.

S18F7 W

L,4
1. <TARGETID>
2. <DATASEG>
3. <DATALENGTH
4. <DATA>

If DATASEG and DATALENGTH are both omitted (zero length items), then up to 200 bytes in the data area are to be overwritten. If only DATALENGTH is omitted or if DATALENGTH has a value of zero, then all data within the indicated section are to be written.

If DATASEG is omitted (zero length items) the value of DATALENGTH set the length of data that shall be written. If the length of the data that shall be written is longer than the value of DATALENGTH, a communication error (CE) occurs.

S18F8: WRITE DATA ACKNOWLEDGE (WDA) (reader -> host)

This message acknowledges the success or failure of writing data to the subsystem indicated in TARGETID.

S18F8

L,3
1. <TARGETID>
2. <SSACK>
3. L,1
   L,s
   1. <$STATUS_1$>
   …
   s. <$STATUS_s$>

If the TARGETID is unknown, a communication error (CE) occurs.

S18F7: WRITE DATA REQUEST BINARY (host -> reader, reply)

This message requests to write data to the subsystem component indicated in TARGETID. DATASEGB may be used to indicate a specific section of the data area to be written or overwritten.

S18F7 W

L,4

1. <TARGETID>
2. <DATASEGB>
3. <DATALENGTH
4. <DATAB>

If DATASEGB and DATALENGTH are both omitted (zero length items), then length of DATAB will be written to the tag. If length of DATAB is smaller than 200 bytes the rest of the 200 bytes will be filled up with 0x00. If only DATALENGTH is omitted then the first byte or only byte of DATAB starting from DATASEGB will be written.

If DATASEGB is omitted (zero length items) the value of DATALENGTH set the length of data that shall be written.

S18F8: WRITE DATA ACKNOWLEDGE BINARY (reader -> host)

This message acknowledges the success or failure of writing data to the subsystem indicated in TARGETID.

S18F8

L,3

1. <TARGETID>
2. <SSACK>
3. L,1
   L,s
   1. $<STATUS_1>$
   …
   s. $<STATUS_s>$

If the TARGETID is unknown, a communication error (CE) occurs.

S18F9: READ ID REQUEST (RIR) (host -> reader, reply)

This message is used to request the subsystem indicated by TARGETID to read the MID.

S18F9,W

<TARGETID>

S18F10: READ ID DATA (RID) (reader -> host)

This message returns a requested material identifier MID as read by the subsystem indicated in TARGETID.

S18F10

L,4

1. <TARGETID>
2. <SSACK>
3. <MID>
4. L,1

   L,s

   1. $<STATUS_1>$

   …

   s. $<STATUS_s>$

The reader can be in operational or maintenance mode to read the MID with message S18F9.

S18F11: WRITE ID REQUEST (WIR) (host -> reader, reply)

This message is used to request the subsystem indicated by TARGETID to write the MID.

S18F11 W

L,2

1. <TARGETID>
2. <MID>

Pay attention: The reader must be in maintenance mode to write the MID with message S18F11.

S18F12: WRITE ID ACKNOWLEDGE (WIA) (reader -> host)

This message acknowledges the success or failure of writing the MID to the subsystem indicated in TARGETID.

S18F12

L,3

1. <TARGETID>
2. <SSACK>
3. L,1

   L,s

   1. $<STATUS_1>$

   …

   s. $<STATUS_s>$

If the TARGETID is unknown a communication error (CE) occurs.

S18F13: SUBSYSTEM COMMAND REQUEST (SCR) (host -> reader, reply)

This message is used to request the subsystem indicated in TARGETID to perform a specific action.

S18F13 W

L,3

1. <TARGETID>
2. <SSCMD>
3. L,n
   1. <CPVAL>
   …
   n. <CPVAL$_n$>

S18F14: SUBSYSTEM COMMAND ACKNOWLEDGE (SCA) (reader -> host)

This message reports the result from the subsystem specified in TARGETID for the requested action.

S18F14

L,3

1. <TARGETID>
2. <SSACK>
3. L,1

   L,s

   1. <STATUS$_1$>
   …
   s. <STATUS$_s$>

If the TARGETID is unknown, a communication error (CE) occurs.

S18F65: SCAN TRANSPONDER REQUEST (STR)
(host -> reader, reply)

This message is used to request the subsystem indicated in TARGETID to perform a scan.

S18F65 W

<TARGETID>

S18F66: SCAN TRANSPONDER ACKNOWLEDGE (STA)
(reader -> host)

This message reports the result from the subsystem specified in TARGETID for the requested action.

S18F66

L,3

1. <TARGETID>
2. <SSACK>
3. L,s
   1. <UID_1>
   …
   s. <UID_s>

If the TARGETID is unknown, a communication error (CE) occurs.

The action returns a UID list of all ISO-tags found in the reading range.

S18F67: READ REQUEST UID (RRU) (host -> reader, reply)

The host requests the subsystem indicated in TARGETID to read information from the transponder indicated in UID. DATASEG may be used to indicate a specific section of data to be read. DATALENGTH is used to limit the amount of data for that section.

S18F67 W

L,4

1. <TARGETID>
2. <UID>
3. <DATASEG>
4. <DATALENGTH>

If DATASEG and DATALENGTH are both omitted (zero length items) then up to 200 bytes of the data area are requested. If only DATALENGTH is omitted, then all data within the indicated section are requested.

S18F68: READ DATA UID (RDU) (reader -> host)

This message is used to return requested information from the subsystem indicated in TARGETID and the transponder indicated in UID, or to acknowledge the result of the request.

S18F68

L,3

1. <TARGETID>
2. <SSACK>
3. <DATA>

If TARGETID is unknown, then a communication error (CE) occurs.

S18F67: READ REQUEST UID BINARY (host -> reader, reply)

The host requests the subsystem indicated in TARGETID to read information from the transponder indicated in UID. DATASEGB may be used to indicate a specific section of data to be read. DATALENGTH is used to limit the amount of data for that section.

S18F67 W

L,4

1. <TARGETID>
2. <UID>
3. <DATASEGB>
4. <DATALENGTH>

If DATASEGB and DATALENGTH are both omitted (zero length items) then up to 200 bytes of the data area are requested. If only DATALENGTH is omitted, then only one byte starting from DATASEGB is requested.

S18F68: READ DATA UID BINARY (RDU) (reader -> host)

This message is used to return requested information from the subsystem indicated in TARGETID and the transponder indicated in UID, or to acknowledge the result of the request.

S18F68

L,3

1. <TARGETID>
2. <SSACK>
3. <DATAB>

If TARGETID is unknown, then a communication error (CE) occurs.

S18F69: WRITE DATA REQUEST UID (WARU) (host -> reader, reply)

This message requests to write data to the subsystem component indicated in TARGETID to the transponder indicated in UID. DATASEG may be used to indicate a specific section of the data area to be written or overwritten.

S18F69 W

L,4

1. <TARGETID>
2. <UID>
3. <DATASEG>
4. <DATALENGTH>
5. <DATA>

If DATASEG and DATALENGTH are both omitted (zero length items), then up to 200 bytes in the data area are to be overwritten. If only DATALENGTH is omitted or if DATALENGTH has a value of zero, then all data within the indicated section are to be written.

If DATASEG is omitted (zero length items) the value of DATALENGTH set the length of data that shall be written. If the length of the data that shall be written is longer than the value of DATALENGTH, a communication error (CE) occurs.

S18F70: WRITE DATA ACKNOWLEDGE (WDA) (reader -> host)

This message acknowledges the success or failure of writing data to the subsystem indicated in TARGETID.

S18F70

L,3

1. <TARGETID>
2. <SSACK>
3. L,1
   L,s
   1. <STATUS$_1$>
   …
   s. <STATUS$_s$>

If the TARGETID is unknown, a communication error (CE) occurs.

S18F69: WRITE DATA REQUEST UID BINARY (WARU) (host -> reader, reply)

This message requests to write data to the subsystem component indicated in TARGETID to the transponder indicated in UID. DATASEGB may be used to indicate a specific section of the data area to be written or overwritten.

S18F69 W

L,5

1. <TARGETID>
2. <UID>
3. <DATASEGB>
4. <DATALENGTH>
5. <DATAB>

If DATASEGB and DATALENGTH are both omitted (zero length items), then up to 200 bytes in the data area are to be overwritten. If only DATALENGTH is omitted then all data within the indicated section are to be written.

If DATASEGB is omitted (zero length items) the value of DATALENGTH set the length of data that shall be written.

S18F70: WRITE DATA ACKNOWLEDGE (WDA) (reader -> host)

This message acknowledges the success or failure of writing data to the subsystem indicated in TARGETID.

S18F70

L,3

1. <TARGETID>
2. <SSACK>
3. L,1
   L,s
   1. $<STATUS_1>$
   …
   t. $<STATUS_s>$

If the TARGETID is unknown, a communication error (CE) occurs.

S18F71: SENSOR STATE (SS) (reader -> host)

This message reports the change of the state of one of the 5 presence sensors of the reader. The TARGETID corresponds to the number of the sensor. There are two states of the sensor. ON – the sensor is covered, OFF – the sensor is uncovered in case of the sensor polarity is not inverted.

S18F71

L,2

1. <TARGETID>
2. <SSTATE>

S18F72 SENSOR STATE ACKNOWLEDGE (SSA) (host -> reader)

The host has to acknowledge all incoming S18F71 messages.

S18F72

L,2

1. <TARGETID>
2. <SSACK> → "NO"

S18F73 READ ID REQUEST UID (RIRU) (host -> reader)

This message is used to request the antenna head indicated by TARGETID to read the MID of the tag indicated by UID.

S18F73,W

L,2

1. <TARGETID>
2. <UID>

S18F74 READ ID DATA (RID) (reader -> host)

This message returns a requested material identifier MID of the tag indicated by UID which was read by the antenna head indicated in TARGETID.

S18F74

L,4

1. <TARGETID>
2. <SSACK>
3. <MID>
4. L,1

   L,s

   1. <$STATUS_1$>

   …

   s. <$STATUS_s$>

The reader can be in operational or maintenance mode to read the MID with message S18F73.

S18F75 WRITE ID REQUEST UID (WIDU) (host -> reader)

This message is used to request the antenna head indicated by TARGETID to write the MID to the tag indicated by UID.

S18F75 W

L,3

1. <TARGETID>
2. <UID>
3. <MID>

Pay attention: The reader must be in maintenance mode to write the MID with message S18F75.

S18F76 WRITE ID ACKNOWLEDGE (WIA) (reader -> host)

This message acknowledges the success or failure of writing the MID to the antenna head indicated in TARGETID.

S18F76

L,3

1. <TARGETID>
2. <SSACK>
3. L,1

   L,s

   1. <STATUS$_1$>
   …
   s. <STATUS$_s$>

S18F77 SET OUTPUT STATE (SOS) (host -> reader)

This message sets the output states of the antenna head indicated in TARGETID.

S18F77

L,2

1. <TARGETID>
2. L,2

L,2

1. <OUTPUT>
2. <STATE>

L,2

1. <OUTPUT>
2. <STATE>

S18F78 SENSOR STATE ACKNOWLEDGE (SSA) (reader – host)

This message acknowledges the setting of the output state of the antenna head indicated by TARGETID.

S18F78

L,3

1. <TARGETID>
2. <SSACK>
3. L,1

L,s

1. $<STATUS_1>$

…

s. $<STATUS_s>$

S18F79 GET OUTPUT STATE (GOS) (reader -> host)

This message requests the output states of the antenna head indicated by TARGETID.

S18F79

<TARGETID>

S18F80 OUTPUT STATE (GOSA) (reader -> host)

This message provides the output states of the antenna head indicated by TARGETID.

S18F80

L,4

1. <TARGETID>
2. <SSACK>
3. L,2
   <STATE>
   <STATE>
4. L,1
   L,s
   1. <STATUS$_1$>
   …
   s. <STATUS$_s$>

S18F85: SCAN UID AND READ ID REQUEST (STR) (host -> reader, reply)

This message is used to request the subsystem indicated in TARGETID to perform a scan and the read of the MID.

S18F85 W

<TARGETID>

S18F86: SCAN UID AND READ ID ACKNOWLEDGE (STA) (reader -> host)

This message reports the result from the subsystem specified in TARGETID for the requested action.

S18F86

L,3

1. <TARGETID>
2. <SSACK>
3. L,s

<L[2]

<UID_1>

<MID_1>

<L[2]

<UID_s>

<MID_s>

If the TARGETID is unknown, a communication error (CE) occurs.

The action returns a UID and MID list of all ISO-tags found in the reading range. The list is restricted to 7 tags. If there are more than 7 tags within the antenna field the first 7 tags will be displayed only! For versions smaller than RS2P16 the list of tags is restricted to 3 tags.

S18F87: Read Write-Counter (host -> reader, reply)

This message is used to request the subsystem indicated in TARGETID to read out the write counter of the tag.

```
<S18F87 W
      <L2
            <TARGETID>
            <Write Counter Length>
      >
>
```

S18F88: Read Write-Counter Response (reader -> host)

This message reports the result from the subsystem specified in TARGETID for the requested action.

```
<S18F88
      <L[3/1]
            <TARGETID>
            <SSACK>
            <Write Counter>
      >
>
```

S18F89: Read Write-Counter with UID (host -> reader, reply)

This message is used to request the subsystem indicated in TARGETID to read out the write counter of the tag specified by his UID.

```
<S18F89 W
      <L3
            <TARGETID>
            <UID>
            <Write Counter Length>
      >
>
```

S18F90: Read Write-Counter Response with UID (reader -> host)

This message reports the result from the subsystem specified in TARGETID for the requested action.

```
<S18F90
      <L3
            <TARGETID>
            <SSACK>
            <Write Counter>
      >
>
```

5.9 SECS-1 MESSAGE EXAMPLES

All examples are produced with the default DeviceID 0x00 !

S1F1 Message from the reader to the host

Reader to Host: S1F1

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0A )
In:    Header ( 80 00 81 01 80 01 00 01 00 01 )
In:    Checksum ( 01 85 )
Out:   ACK ( 06 )
```

Host to Reader: S1F2

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 10 )
Out:   Header ( 00 00 01 02 80 01 00 01 00 01 )
Out:   Data ( 01 02 41 00 41 00 )
Out:   Checksum ( 0A 02 )
In:    ACK ( 06 )
```

S1F1 Message from the host to the reader

Host to Reader: S1F1

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0A )
Out:   Header ( 00 00 81 01 80 01 00 00 00 02 )
Out:   Checksum ( 05 02 )
In:    ACK ( 06 )
```

Reader to Host: S1F2

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 1C )
In:    Header ( 80 00 01 02 80 01 00 00 00 02 )
In:    Data 01 02
               41 06 52 44 31 2E 30 20
               41 06 52 53 32 48 32 37
In:  Checksum ( 04 64 )
Out: ACK ( 06 )
```

Message S1F15 sets the reader offline

Host to Reader: S1F15

```
Out:    ENQ ( 05 )
In:     EOT ( 04 )
Out:    Length Byte ( 0A )
Out:    Header ( 00 00 81 0F 80 01 00 00 00 03 )
Out:    Checksum ( 14 02 )
In:     ACK ( 06 )
```

Reader to Host: S1F16

```
In:     ENQ ( 05 )
Out:    EOT ( 04 )
In:     Length Byte ( 0D )
In:     Header ( 80 00 01 10 80 01 00 00 00 03 )
In:     Data  21 01 00
In:     Checksum ( 01 37 )
Out:    ACK ( 06 )
```

Message S1F17 sets the reader online

Host to Reader: S1F17

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0A )
Out:   Header ( 00 00 81 11 80 01 00 00 00 04 )
Out:   Checksum ( 17 02 )
In:    ACK ( 06 )
```

Reader to Host: S1F18

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0D )
In:    Header ( 80 00 01 12 80 01 00 00 00 04 )
In:    Data  21 01 00
In:    Checksum ( 01 3A )
Out:   ACK ( 06 )
```

Request reader constant with message S2F13

Host to Reader (Gateway): S2F13

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0F )
Out:   Header ( 00 00 82 0D 80 01 00 00 00 05 )
Out:   Data 01 01
               A5 01 01 )    →Parameter 1
Out:   Checksum ( BE 02 )
In:    ACK ( 06 )
```

Reader to Host: S2F14

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0F )
In:    Header ( 80 00 02 0E 80 01 00 00 00 05 )
In:    Data 01 01
               A5 01 C0      →Value 192
In:    Checksum ( 02 7E )
Out:   ACK ( 06 )
```

The host requests the reader parameter “1” (transmission rate).

The reader sends the value “C0” (192) that confirms the 19200 baud.

New Reader constant send with S2F15

Host to Reader: S2F15

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 14 )
Out:   Header ( 00 00 82 0F 80 01 00 00 00 06 )
Out:   Data 01 01
               01 02
                  A5 01 14   →Parameter 20
                  A5 01 05   →Value 5
Out:   Checksum ( 82 02 )
In:    ACK ( 06 )
```

Reader to Host: S2F16

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0D )
In:    Header ( 80 00 02 10 80 01 00 00 00 06 )
In:    Data  21 01 00        →EAC 0
In:    Checksum ( 01 3B )
Out:   ACK ( 06 )
```

The Host sets the reader parameter “20” (sensordelay) to the value “5”. The reader acknowledges the new constant with EAC = 0.

Host requests a software reset with S2F19

Host to Reader: S2F19

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0D )
Out:   Header ( 00 00 82 13 80 01 00 00 00 09 )
Out:   Data  21 01 02                →Software reset
Out:   Checksum ( 43 02 )
In:    ACK ( 06 )
```

Reader to Host: S2F20

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0D )
In:    Header ( 80 00 02 14 80 01 00 00 00 09 )
In:    Data  21 01 00                →RAC
In:    Checksum ( 01 42 )
```

The reader detects an unrecognized device ID and sends the message S9F1.

Host to Reader: S1F1

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0A )
Out:   Header ( 00 FF 81 01 80 01 00 00 00 0A )
Out:   Checksum ( 0C 02 )
In:    ACK ( 06 )
```

Reader to Host: S9F1

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 16 )
In:    Header ( 80 00 09 01 80 01 00 01 00 03 )
In:    Data 21 0A 00 FF 81 01 80 01 00 00 00 0A →MHEAD
In:    Checksum ( 03 46 )
Out:   ACK ( 06 )
```

The device ID in the message block header does not correspond to the device ID in the reader detecting the error.

The reader detects a wrong stream number and sends the S9F3 message

Host to Reader: S4F1

```
Out:    ENQ ( 05 )
In:     EOT ( 04 )
Out:    Length Byte ( 0A )
Out:    Header ( 00 00 84 01 80 01 00 00 00 0B )
Out:    Checksum ( 11 02 )
In:     ACK ( 06 )
```

Reader to Host: S9F3

```
In:     ENQ ( 05 )
Out:    EOT ( 04 )
In:     Length Byte ( 16 )
In:     Header ( 80 00 09 03 80 01 00 01 00 04 )
In:     Data 21 0A 00 00 84 01 80 01 00 00 00 0B
                          → The wrong message header
In:     Checksum ( 02 4E )
Out:    ACK ( 06 )
```

The stream “4” is not part of the BROOKS SECS-2 message set, so a S9F3 error message will appear.

The reader detects an unrecognized function and sends the message S9F5.

Host to Reader: S1F3

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0A )
Out:   Header ( 00 00 81 03 80 01 00 00 00 0C )
Out:   Checksum ( 11 02 )
In:    ACK ( 06 )
```

Reader to Host: S9F5

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 16 )
In:    Header ( 80 00 09 05 80 01 00 01 00 05 )
In:    Data 21 0A 00 00 81 03 80 01 00 00 00 0C
                  → The wrong message header
In:    Checksum ( 02 51 )
Out:   ACK ( 06 )
```

The function “3” is not part of the BROOKS SECSII message set, so a S9F5 error message will appear.

The reader detects wrong data and sends the S9F7 message

Host to Reader: S2F13

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0F )
Out:   Header ( 00 00 82 0D 80 01 00 00 00 0D )
Out:   Data ( 01 01 A5 01 0F )
Out:   Checksum ( D4 02 )
In:    ACK ( 06 )
```

Reader to Host: S2F14

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0E )
In:    Header ( 80 00 02 0E 80 01 00 00 00 0D )
In:    Data ( 01 01 A5 00 )
In:    Checksum ( 01 C5 )
Out:   ACK ( 06 )
```

Reader to Host: S9F7:

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 16 )
In:    Header ( 80 00 09 07 80 01 00 01 00 06 )
In:    Data ( 21 0A 00 00 82 )
In:    Data ( 0D 80 01 00 00 00 0D )
In:    Checksum ( 02 60 )
Out:   ACK ( 06 )
```

The reader replies to the S2F14 equipment constant request message without data, because the parameter was invalid. Additionally, the reader sends the S9F7 illegal data message.

The secondary message fails and the reader sends the S9F9 message

Reader to Host: S1F1

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 0A )
In:    Header 80 00 81 01 80 01 00 01 00 25
In:    Checksum ( 01 A9 )
Out:   ACK ( 06 )
```

Host to Reader: S9F9

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 16 )
In:    Header 80 00 09 09 80 01 00 01 00 26
In:    Data 21 0A 80 00 81 01 80 01 00 01 00 23
                  → The stored header
In:    Checksum ( 03 0C )
Out:   ACK ( 06 )
```

After sending the S1F1 message, the reader waits for an answer from the host.

If the secondary message does not appear, a transaction timeout occurs and the reader sends the S9F9 message.

Host requests reader attributes with S18F1

Host to Reader: S18F1

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 32 )
Out: Header ( 00 00 92 01 80 01 00 00 00 13 )
Out: Data 01 02
             41 02 30 31      → TARGETID "01"
             01 02
             41 07 45 43 49 44 5F 33 37 → ECID_37
             41 15 53 6F 66 74 77 61 72 65 52 65 76
                   69 73 69 6F 6E 4C 65 76 65 6C
                            → SoftwareRevision Level
Out: Checksum ( DF 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F2

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 39 )
In:  Header ( 80 00 12 02 80 01 00 00 00 13 )
In:  Data 01 04
             41 02 30 31      → TARGETID "01"
             41 02 4E 4F      → SSACK "NO"
             01 02
                41 02 30 34                → ECID_37 = 0x04
                41 06 52 53 32 48 32 37    → RS2H27
             01 01
                01 04
                   41 02 4E 45
                   41 01 30
                   41 04 49 44 4C 45
                   41 04 49 44
```

```
In:  Data ( 4C 45 )
In:  Checksum ( 09 3F )
Out:  ACK ( 06 )
```

The host requests all fundamental CIDRW attributes defined in ATTRID. The reader answers with the current attribute values.

Host writes new reader attributes with S18F3

Host to Reader: S18F3

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 21 )
Out:   Header ( 00 00 92 03 80 01 00 00 00 0B )
Out:   Data
        01 02
           41 02 30 31              → TARGETID "01"
           01 01
              01 02
                 41 07 45 43 49 44 5F 33 38
                                    → ATTRID = ECID_38
                 41 02 30 31        → ATTRVAL = "01"
Out:   Checksum ( 97 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F4

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 2B )
In:    Header ( 80 FF 12 04 80 01 00 00 00 0B )
In:    Data
        01 03
           41 02 30 31       → TARGETID "01"
           41 02 4E 4F       → SSACK "NO"
           01 01
              01 04
```

```
                    41 02 4E 45          → PMInformation “NE”
                    41 01 30             → Alarmstatus “0”
                    41 04 49 44 4C 45    → OperationalStatus “ IDLE ”
                    41 04 49 44 4C 45    → HeadStatus “IDLE”
In:     Checksum ( 06 BF )
Out:    ACK ( 06 )
```

The host writes all fundamental CIDRW attributes defined in ATTRID. The reader answers with the current attribute values.

Host reads 8 bytes data beginning from the first byte of the DATA area of a multipage transponder with S18F5

Host to Reader: S18F5

```
Out:    ENQ ( 05 )
In:     EOT ( 04 )
Out:    Length Byte ( 18 )
Out:    Header ( 00 00 92 05 80 01 00 00 00 2A )
Out:    Data
         01 03
            41 02 30 31       → TARGETID “01”
            41 02 30 30       → DATASEG “00”
            A9 02 00 08       → DATALENGTH 0x08
Out:    Checksum ( 3F 02 )
In:     ACK ( 06 )
```

Reader to Host: S18F6

```
In:     ENQ ( 05 )
Out:    EOT ( 04 )
In:     Length Byte ( 1E )
In:     Header ( 80 00 12 06 80 01 00 00 00 2A )
In:     Data
         01 03
            41 02 30 31                      → TARGETID “01”
            41 02 4E 4F                      → SSACK “NO”
            41 08 31 31 31 31 31 31 31 31    → DATA “11111111”
In:     Checksum ( 04 9C )
Out:    ACK ( 06 )
```

The reader shows the success of the operation with SSACK “NO” (normal operation) and with the read values.

S18F5 Read Data: U2 DATASEGB=<> und DATALENGTH=<>
Host to Reader: S18F5

```
Out: Length Byte ( 00 00 00 14 )
Out: Header ( 00 00 92 05 00 00 00 00 00 12 )
Out: Data
       01 03
          41 02 30 31 → Head ID 01
          A9 00       → DATASEGB empty
          A9 00       → DATALENGTH empty
```

Host to Reader: S18F6

```
In: Length Byte ( 00 00 00 DE )
In: Header ( 00 00 12 06 00 00 00 00 00 12 )
In: Data
       01 03
          41 02 30 31  → HeadID 01
          41 02 4E 4F  → SSACK "NO"
          21 C8 31 31 31 31 34 35 36 37 59 5A
                31 31 32 33 34 35 36 37 38 39
                32 31 32 33 34 35 36 37 38 39
                33 31 32 33 34 35 36 37 38 39
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                31 32 33 34 35 36 37 38 39 30
                → 200 Byte Data
```

S18F5 Read Data: U2 DATASEGB=<56> und DATALENGTH=<4>

Host to Reader: S18F5

```
Out: Header (00 00 92 05 00 00 00 00 00 0A)
Out: Data
       01 03
          41 02 30 31 → Head ID 01
          A9 02 00 38 → DATASEGB 56dez
          A9 02 00 04 → DATALENGTH 4dez
```

Host to Reader: S18F6

```
Out: Header (00 00 92 05 00 00 00 00 00 0A)
Out: Data
       01 03
          41 02 30 31 → Head ID 01
          41 02 4E 4F → SSACK "NO"
          21 04 00 00 00 00 → 4 Byte tag data
```

Host writes data on first page of DATA area with S18F7

Host to Reader: S18F7

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 22 )
Out:   Header ( 00 00 92 07 80 01 00 00 00 2B )
Out:   Data
        01 04
           41 02 30 31                      → TARGETID "01"
           41 02 30 30                      → DATASEG  "00"
           A9 02 00 08                      → DATALENGTH 0x08
           41 08 32 32 32 32 32 32 32 32    → DATA "22222222"
Out:   Checksum ( 1C 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F8

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 2B )
In:    Header ( 80 00 12 08 80 01 00 00 00 2B )
In:    Data
        01 03
           41 02 30 31              → TARGETID "01"
           41 02 4E 4F              → SSACK "NO"
           01 01
              01 04
                 41 02 4E 45        → PMInformation "NE"
                 41 01 30           → Alarmstatus "0"
                 41 04 49 44 4C 45  → OperationalStatus "IDLE"
                 41 04 49 44 4C 45  → HeadStatus "IDLE"
In:    Checksum ( 06 E3 )
Out:   ACK ( 06 )
```

The reader confirms the write command with SSACK "NO" in the S18F8 message.

S18F7 Write Data: DATASEG=<56> and DATALENGTH=<4> and DATA[4]

```
< L4
    < A TARGETID = '01' >
    < U2 DATASEGB = 56 >
    < U2 DATALENGTH = 4 >
    < B DATA = 44 45 46 47 >
>
```

S18F8 (WDA) - write data ACK

```
< L3
    < A TARGETID = '01' >
    < A SSACK = 'NO' >
    < L4 - STATUS1
        < PMInformation
            < A  = 'NE' >
            < A  = '0' >
            < A  = 'IDLE' >
            < A  = 'IDLE' >
        >
>
```

Host reads material ID of a multipage transponder with S18F9

Host to Reader: S18F9

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 0E )
Out: Header ( 00 00 92 09 80 01 00 00 00 17 )
Out: Data 41 02 30 31          → TARGETID "01"
Out: Checksum ( D7 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F10

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 3D )
In:  Header ( 80 00 12 0A 80 01 00 00 00 17 )
In:  Data 01 04
             41 02 30 31      → TARGETID "01"
             41 02 4E 4F      → SSACK "NO"
             41 10 4D 49 44 20 30 30 30 30 30
```

```
                    30 30 30 30 30 30 31
                      → MID  “MID0000000000001”
              01 01
                 01 04
                    41 02 4E 45          → PMInformation “NE”
                    41 01 30             → Alarmstatus “0”
                    41 04 49 44 4C 45    → OperationalStatus “IDLE”
                    41 04 49 44 4C 45    → HeadStatus “IDLE”
In:  Checksum ( 0A 5E )
Out: ACK ( 06 )
```

The host wants to read the material ID of any transponder. The reader confirms the success of the read command with SSACK “NO” and returns the material ID. (For chapter data items, see page 45).

Host writes material ID of a multipage transponder with S18F11

Host to Reader: S18F11

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 22 )
Out: Header ( 00 00 92 0B 80 01 00 00 00 18 )
Out: Data 01 02
       41 02 30 31 → TARGETID “01”
       41 10 4D 49 44 20 31 31 31 31 31 31 31 31 31 31
              → MID  “MID 111111111111”
Out: Checksum ( 74 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F12

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 2B )
In:  Header ( 80 00 12 0C 80 01 00 00 00 18 )
In:  Data 01 03
             41 02 30 31 → TARGETID “01”
             41 02 4E 4F → SSACK “NO”
```

```
            01 01
               01 04
                  41 02 4E 45
                  41 01 30
                  41 04 4D 41 4E 54
                  41 04 4E 4F 4F 50
In:  Checksum ( 07 04 )
Out: ACK ( 06 )
```

The host wants to write a new material ID to any transponder. The reader confirms the success of the write MID command with SSACK "NO". Note: the material ID can be changed only if the reader is in the maintenance state. (MANT)

If the reader remains in the IDLE state, the command fails and the reader answers with SSACK "EE" (execute error).

Host changes the reader state from IDLE to MANT with S18F13

Host to Reader: S18F13

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 23 )
Out:   Header ( 00 00 92 0D 80 01 00 00 00 22 )
Out:   Data
        01 03
           41 02 30 31              → TARGETID "01"
           41 0B 43 68 61 6E 67 65 53 74 61 74 65
                                    → SSCMD "ChangeState"
           01 01
              41 02 4D 54 )         → CPVAL "MT"
Out:   Checksum ( 62 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F14

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 2B )
In:    Header ( 80 00 12 0E 80 01 00 00 00 22 )
In:    Data
```

```
        01 03
           41 02 30 31              → TARGETID "01"
           41 02 4E 4F              → SSACK "NO"
           01 01
              01 04
                 41 02 4E 45        → PMInformation "NE"
                 41 01 30           → Alarmstatus "0"
                 41 04 4D 41 4E 54  → OperationalStatus "MANT"
                 41 04 4E 4F 4F 50  → HeadStatus "NOOP"
In: Checksum ( 07 10 )
Out: ACK ( 06 )
```

ChangeState is an optional service that requests the CIDRW to change its operational sub state to MAINTENANCE ("MT") or to OPERATING ("OP").

In the MAINTENANCE state, the reader could not read (S18F5) or write (S18F7) any DATA in the defined DATASEG.

(5.7.3 Valid Services per State).

Host requests a reset with S18F13

Host to Reader: S18F13

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 1B )
Out:   Header ( 00 00 92 0D 80 01 00 00 00 21 )
Out:   Data
        01 03
           41 02 30 31              → TARGETID "01"
           41 05 52 65 73 65 74     → SSCMD "Reset"
           01 01
              41 00                 → CPVAL ""
Out:   Checksum ( 74 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F14

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 2B )
```

```
In:    Header ( 80 00 12 0E 80 01 00 00 00 21 )
In:    Data
        01 03
           41 02 30 31                → TARGETID "01"
           41 02 4E 4F                → SSACK "NO"
           01 01
              01 04
                 41 02 4E 45          → PMInformation "NE"
                 41 01 30             → Alarmstatus "0"
                 41 04 49 44 4C 45    → OperationalStatus "IDLE"
                 41 04 49 44 4C 45    → HeadStatus "IDLE"
In:    Checksum ( 06 DF )
Out:   ACK ( 06 )
```

Reset is an optional service used to reinitialize the reader. If reader parameter 9 is unequal to 0x00, the reset causes a S1F1 "Are you there" message from the reader.

The reader detects a wrong TARGETID

Host to Reader: S18F5

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 18 )
Out:   Header ( 00 00 92 05 80 01 00 00 00 1A )
Out:   Data
        01 03
           41 02 30 36       → TARGETID "06"
           41 02 30 30       → DATASEG "00"
           A9 02 00 08 )     → DATALENGTH 0x08
Out:   Checksum ( 34 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F6

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 16 )
```

```
In:    Header ( 80 00 12 06 80 01 00 00 00 1A )
In:    Data
        01 03
           41 02 30 31        → TARGETID "01"
           41 02 43 45        → SSACK "CE"
           41 00              → DATA ""
In:    Checksum ( 02 E7 )
Out:   ACK ( 06 )
```

The TARGETID in the S18F5 message does not correspond to the TARGETID in the reader detecting the error. The reader therefore answers with a communication error "CE".

The reader detects no tag

Host to Reader: S18F5

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 18 )
Out:   Header ( 00 00 92 05 80 01 00 00 00 18 )
Out:   Data
        01 03
           41 02 30 31       → TARGETID "01"
           41 02 30 30       → DATASEG "00"
           A9 02 00 08       → DATALENGTH 0x08
Out:   Checksum ( 2D 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F6

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 16 )
In:    Header ( 80 00 12 06 80 01 00 00 00 18 )
In:    Data
        01 03
           41 02 30 31       → TARGETID "01"
           41 02 54 45       → SSACK "TE"
           41 00             → DATA ""
In:    Checksum ( 02 F6 )
Out:   ACK ( 06 )
```

The reader receives a valid S18F5 message.

If there is no tag in the reading (writing) range of the antenna, the reader answers with a tag error "TE".

The reader scans for transponders in the surrounding of the antenna.

Host to Reader: S18F65

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 0E )
Out:   Header ( 00 00 92 41 80 01 00 00 00 03 )
Out:   Data ( 41 02 30 31 )          → TARGETID "01"
Out:   Checksum ( FA 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F66

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 2A )
In:    Header ( 80 00 12 42 80 01 00 00 00 03 )
In:    Data
        01 03
           41 02 30 31               → TARGETID "NO"
           41 02 4E 4F               → SSACK "NO"
           01 02
              21 08 E0 07 00 00 01 70 61 03      → UID1
              21 08 E0 07 00 00 01 70 60 EA      → UID2
In:    Checksum ( 07 93 )
Out:   ACK ( 06 )
```

The reader has recognized two tags in the surrounding of the antenna.

The reader reads 8 bytes from a specific tag specified by the data item UID.

Host to Reader: S18F67

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 22 )
Out:   Header ( 00 00 92 43 80 01 00 00 00 14 )
Out:   Data
        01 04
           41 02 30 31                    → TARGETID "01"
           21 08 E0 07 00 00 01 70 61 03  → UID
           41 02 30 30                    → DATASEG "00"
           A9 02 00 08                    → DATALENGTH 0x08
Out:   Checksum ( 4D 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F68

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 1E )
In:    Header ( 80 00 12 44 80 01 00 00 00 14 )
In:    Data
        01 03
           41 02 30 31                    → TARGETID "01"
           41 02 4E 4F                    → SSACK "NO"
           41 08 41 42 43 44 31 32 33 34  → DATA "ABCD1234"
In:    Checksum ( 05 10 )
Out:   ACK ( 06 )
```

The reader writes 8 bytes to a specific tag specified by the data item UID.

Host to Reader: S18F69

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 2C )
Out:   Header ( 00 00 92 45 80 01 00 00 00 15 )
Out:   Data
        01 05
           41 02 30 31                      → TARGETID "01"
           21 08 E0 07 00 00 01 70 61 03    → UID
           41 02 30 30                      → DATASEG "00"
           A9 02 00 08                      → DATALENGTH 0x08
           41 08 31 31 31 31 31 31 31 31    → DATA "11111111"
Out:   Checksum ( 22 02 )
In:    ACK ( 06 )
```

Reader to Host: S18F70

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 2B )
In:    Header ( 80 00 12 46 80 01 00 00 00 15 )
In:    Data
        01 03
           41 02 30 31              → TARGETID "01"
           41 02 4E 4F              → SSACK "NO"
           01 01
              01 04
                 41 02 4E 45
                 41 01 30
                 41 04 49 44 4C 45
                 41 04 49 44 4C 45
In:    Checksum ( 07 0B )
Out:   ACK ( 06 )
```

The sensor of head 01 is occupied. The reader reports this event with a S18F71 message to the host.

Host to Reader: S18F71

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 14 )
In:    Header ( 80 00 92 47 80 01 00 01 00 21 )
In:    Data
        01 02
          41 02 30 31              → TARGETID "01"
          41 02 4F 4E              → SSTATE "ON"
In:    Checksum ( 03 83 )
Out:   ACK ( 06 )
```

Reader to Host: S18F72

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 14 )
Out:   Header ( 00 00 12 48 80 01 00 01 00 21 )
Out:   Data
        01 02
           41 02 30 31             → TARGETID "01"
           41 02 4E 4F             → SSACK "NO"
Out:   Checksum ( 85 01 )
In:    ACK ( 06 )
```

The sensor of head 01 was released. The reader reports this event with a S18F71 message to the host.

Host to Reader: S18F71

```
In:    ENQ ( 05 )
Out:   EOT ( 04 )
In:    Length Byte ( 15 )
In:    Header ( 80 00 92 47 80 01 00 01 00 22 )
In:    Data
        01 02
           41 02 30 31              → TARGETID "01"
           41 03 4F 46 46           → SSTATE "OFF"
In:    Checksum ( 03 C3 )
Out:   ACK ( 06 )
```

Reader to Host: S18F72

```
Out:   ENQ ( 05 )
In:    EOT ( 04 )
Out:   Length Byte ( 14 )
Out:   Header ( 00 00 12 48 80 01 00 01 00 22 )
Out:   Data
        01 02
           41 02 30 31              → TARGETID "01"
           41 02 4E 4F              → SSACK "NO"
Out:   Checksum ( 86 01 )
In:    ACK ( 06 )
```

The reader reads the MID of the tag specified by the data item UID.

Host to Reader: S18F73

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 1A )
Out: Header ( 00 00 92 49 80 01 00 00 00 1F )
Out: Data 01 02
             41 02 30 31 → TARGETID "01"
             21 08 E0 05 00 00 00 01 0C 4E → UID
Out: Checksum ( 8B 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F74

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 3D )
In:  Header ( 80 00 12 4A 80 01 00 00 00 1F )
In:  Data 01 04
             41 02 30 31 → TARGETID "01"
             41 02 4E 4F → "NO"
             41 10 4D 49 44 20 31 31 31 31 31 31 31 31 31
                   31 31 31 → MID
             01 01
                01 04
                   41 02 4E 45
                   41 01 30
                   41 04 49 44 4C 45
                   41 04 49 44 4C 45
In:  Checksum ( 0A B1 )
Out: ACK ( 06 )
```

The reader writes the MID to the tag specified by the data item UID.

Host to Reader: S18F75

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 2C )
Out: Header ( 00 00 92 4B 80 01 00 00 00 23 )
Out: Data 01 03
             41 02 30 31 → TARGETID "01"
             21 08 E0 05 00 00 00 01 0C 4E → UID
             41 10 4D 49 44 20 31 31 31 31 31 31 31 31
                   31 31 31 31 → MID
Out: Checksum ( 29 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F76

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 2B )
In:  Header ( 80 00 12 4C 80 01 00 00 00 23 )
In:  Data 01 03
             41 02 30 31 → TARGETID "01"
             41 02 4E 4F → "NO"
             01 01
                01 04 41 02 4E 45
                41 01 30
                41 04 4D 41 4E 54
                41 04 4E 4F 4F 50
In:  Checksum ( 07 4F )
Out: ACK ( 06 )
```

The host sets the outputs of head 01.

Host to Reader: S18F77

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 29 )
Out: Header ( 00 00 92 4D 80 01 00 00 00 24 )
Out: Data 01 02
             41 02 30 31 → TARGETID "01"
             01 02
                01 02
                   41 02 30 31 → Output1
                   41 02 4F 4E → "ON"
                01 02
                   41 02 30 32 → Output2
                   41 05 46 4C 41 53 48 → "FLASH"
Out: Checksum ( 11 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F78

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 2B )
In:  Header ( 80 00 12 4E 80 01 00 00 00 24 )
In:  Data 01 03
             41 02 30 31 → TARGETID "01"
             41 02 4E 4F → "NO"
             01 01
                01 04
                   41 02 4E 45
                   41 01 30
                   41 04 4D 41 4E 54
                   41 04 4E 4F 4F 50
In:  Checksum ( 07 52 )
```

```
Out: ACK ( 06 )
```

The host requests the state of the outputs of head 01.

Host to Reader: S18F79

```
Out: ENQ ( 05 )
In:  EOT ( 04 )
Out: Length Byte ( 0E )
Out: Header ( 00 00 92 4F 80 01 00 00 00 26 )
Out: Data 41 02 30 31 → TARGETID "01"
Out: Checksum ( 2C 02 )
In:  ACK ( 06 )
```

Reader to Host: S18F80

```
In:  ENQ ( 05 )
Out: EOT ( 04 )
In:  Length Byte ( 36 )
In:  Header ( 80 00 12 50 80 01 00 00 00 26 )
In:  Data 01 04
             41 02 30 31 → TARGETID "01"
             41 02 4E 4F → "NO"
             01 02
                41 02 4F 4E                → STATE1 "ON"
                41 05 46 4C 41 53 48       → STATE2 "FLASH"
             01 04
                41 02 4E 45
                41 01 30
                41 04 4D 41 4E 54
                41 04 4E 4F 4F 50
In:  Checksum ( 09 EC )
Out:  ACK ( 06 )
```

The host requests the write counter of the tag of head 01.

Host to Reader: S18F87

```
Out: Header (00 00 92 57 00 00 00 00 00 0C)
Out: Data 01 02
             41 02 30 31 → TARGETID
             A5 01 04    → Write Counter Length
```

Reader to Host: S18F88

```
In:  Header (00 00 12 58 00 00 00 00 00 0C)
In:  Data 01 03
             41 02 30 31           → TARGETID
             41 02 4E 4F           → SSACK "NO"
             21 04 00 00 00 02     → Write-Counter
```

5.10 HSMS MESSAGE EXAMPLES

Starting routine of the HSMS-protocol

```
Outgoing: Length Byte ( 00 00 00 0A )
Outgoing: Select.req ( FF FF 00 00 00 01 80 00 00 01 )
Incoming: Length Byte ( 00 00 00 0A )
Incoming: Select.rsp ( FF FF 00 00 00 02 80 00 00 01 )
Outgoing: Length Byte ( 00 00 00 0A )
Outgoing: Linktest.req ( FF FF 00 00 00 05 80 00 00 02 )
Incoming: Length Byte ( 00 00 00 0A )
Incoming: Linktest.req ( FF FF 00 00 00 05 80 00 00 01 )
Outgoing: Length Byte ( 00 00 00 0A )
Outgoing: Linktest.rsp ( FF FF 00 00 00 06 80 00 00 01 )
Incoming: Length Byte ( 00 00 00 0A )
Incoming: Linktest.rsp ( FF FF 00 00 00 06 80 00 00 02 )
```

Linktest

```
Incoming: Length Byte ( 00 00 00 0A )
Incoming: Linktest.req ( FF FF 00 00 00 05 80 00 00 1C )
Outgoing: Length Byte ( 00 00 00 0A )
Outgoing: Linktest.rsp ( FF FF 00 00 00 06 80 00 00 1C )
```

Separate request

```
Incoming: Length Byte ( 00 00 00 0A )
Incoming: Separate.req ( FF FF 00 00 00 09 80 00 00 03 )
```

6 SERVICE AND ERROR HANDLING

6.1 General

- ☞ **The transponder reader and its components must be serviced by the manufacturer only.**
- ☞ **If errors occur, follow the instructions in this section. Do not carry out any error eliminating measures other than the ones described in this section.**
- ☞ **If you are uncertain about errors and their handling, contact the manufacturer (see the contact information on page 144 of this manual). Have the serial number of the transponder reader ready as shown on the label (see page 19) when contacting the manufacturer.**

6.2 Qualified Error Handling Personnel

Error handling shall be carried out by specially trained personnel only. If you are uncertain about the qualifications that are required, contact the manufacturer.

Error handling the device without the special skills required and unqualified interference with the device can result in personal injury and damage to the reader and/or connected devices!

6.3 Safety Instructions

All antenna resonant circuit components carry high voltages!

When replacement parts are required, use replacement parts specified by the manufacturer only. Unauthorized substitutions may result in fire, electric shock, or other hazards.

Static electricity can harm electronic components inside the device. ESD protection measures must be observed when opening the device (see page 11).

When removing the housing lid, note that the housing lid is connected to the case with a cable. Remove the lid carefully to prevent damage – do not pull it! Do not operate the device when the housing lid is removed!

Do not short-circuit the fuse. This may result in fire or damage to the device. When changing fuses, use fuses specified by the manufacturer only.

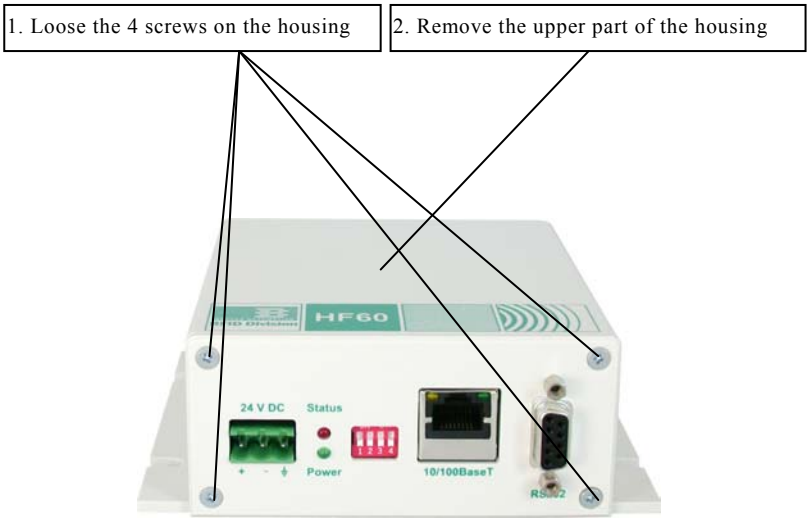
6.4 Errors Indicated by the LEDs

6.4.1 Power LED Not Illuminated

1. Check the power supply and the connection cables.
2. If power LED is not illuminated, disconnect the device from the power supply and carefully remove the fuse (see illustration page 143). Test the fuse. If it is faulty, replace it by a fuse specified by the manufacturer.

If the above measures do not solve the problem, leave the reader disconnected and contact the manufacturer.

Open the device:



6.5 Reader Does Not Respond

1. Check if the interface connection cable is undamaged and correctly connected to both reader and host.
2. Check the status as indicated by the LED's (see page 142).
3. If you are not sure about the active host interface then test both interfaces (RS232 and Ethernet).
4. Contact BROOKS for the firmware file and the Firmware Update Software to update the firmware of the reader.

If these measures do not solve the problem, contact the manufacturer.

6.6 Reset

In the case of software errors, a power reset can be carried out by stopping and restarting the power supply.

After the reset, the reader implements a self-test. While the self-test is running, the status LED is ON. If the test was successful, all LED's except the power LED, are extinguished.

6.7 Power Cut

After a power cut, the reader carries out a reset with self-test. While the self-test is running, the status LED is ON. If the test was successful, all LED's, except for the power LED, are extinguished.

6.8 Software Releases

Release Date	Version	Description
12/2008	RS2P15	First Version. (Fineversion 150)
01/2009	RS2P20	Fineversion 200. Data item DATASEGB and DATAB for messages S18F5/F6, S18F7/F8, S18F67/F68, S18F69/F70 implemented to address the tag data byte by byte. Polling functionality disabled.
02/2009	RS2P21	Messages S18F87 and S18F89 → Read Write Counter without and with UID.

6.9 Customer Service

BROOKS Automation (Germany) GmbH

RFID Division

Gartenstraße 19

D-95490 Mistelgau

Germany

Tel: +49 9279 991 910

Fax: +49 9279 991 900

E-mail: rfid.support@brooks.com

24 hour technical support hotline (Brooks): +1 978 262 2900

7 DEINSTALLATION AND STORAGE

7.1 Deinstallation

1. Disconnect the power supply.
2. Disconnect all cables.
3. Loosen and remove the mounting screws.
4. Remove the reader from its installation surface.

7.2 Storage

Store the reader and its components in a clean and dry environment with the power supply disconnected. Make sure the contacts remain clean. Observe the necessary storage conditions (for technical data, see page 19).

8 TRANSPORTATION AND DISPOSAL

8.1 Transportation

For transportation purposes such as mailing, use a firm cardboard box. Use adequate padding material to protect the device on all sides.

8.2 Disposal

The transponder reader and its components consist of different materials. Dispose of these materials separately in accordance with the relevant legislation in your country. Do not throw them away with everyday household trash.

Separate the interior electronic components from the case. Dispose of

- The case as plastic trash
- The electronic components, antennas and cables as electronic trash.

9 ACCESSORIES

9.1 Device Options

Type	Part-No.
Transponder Reader with 5 antenna ports and Ethernet- and serial interface, no IO's	THG-E3SM-2O00-T5-0000
Transponder Reader with 5 antenna ports and Ethernet- and serial interface, 1 Input and 2 Outputs per antenna head	THG-E3SM-2O00-T5-00E2
Transponder Reader with 5 antenna ports and Ethernet interface, no IO's	THG-T3SM-2O00-T5-0000
Transponder Reader with 5 antenna ports and Ethernet interface, 1 Input and 2 Outputs per antenna head	THG-T3SM-2O00-T5-00E2
Transponder Reader with 1 antenna port and Ethernet- and serial interface, no IO's	THG-E3SM-2O00-T1-0000
Transponder Reader with 1 antenna port and Ethernet- and serial interface, 1 Input and 2 Outputs per antenna head	THG-E3SM-2O00-T1-00E2
Transponder Reader with 1 antenna port and Ethernet interface, no IO's	THG-T3SM-2O00-T1-0000
Transponder Reader with 1 antenna port and Ethernet interface, 1 Input and 2 Outputs per antenna head	THG-T3SM-2O00-T1-00E2

9.2 Antennas

Different antenna types are available on request!

9.2.1 Reading and Writing Ranges

The reading and writing range depends on the type of antenna, the type of tag, the power level at antenna and the installation environment (metal close to antenna and/or tag).

9.3 Power Supply

Type	Part-No.	Picture
Power Supply 24VDC EURO-Plug	SVG 0,33 HF	
Power Supply 24VDC Adapters for different countries	SVG0,6HF-UNI