ESCORT MEMORY SYSTEMS

A Datalogic Group Company

COBALT HS

CHS1265-TCP-01

TCP/IP RFID Controller

OPERATOR'S MANUAL

Document P/N: 17-1339

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P/N: 17-1339 REV 02 (02/08)

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ESCORT MEMORY SYSTEMS

CHS1265-TCP-01

TCP/IP RFID Controller

OPERATOR'S MANUAL

How to Install, Configure and Operate
Escort Memory Systems'
CHS1265-TCP-01 TCP/IP RFID Controller

REGULATORY COMPLIANCE

FCC Part 15

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 in a residential installation. This equipment uses, generates, and can radiate radio frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Users are cautioned that changes or modifications to the unit not expressly approved by Escort Memory Systems may void the user's authority to operate the equipment. 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 that may cause undesired operation.

This product complies with CFR Title 21 Part 15.

CONTENTS

CHAPTER 1: GETTING STARTED

1.1 INTRODUCTION

Welcome to the ***CHS1265-TCP-01 - Operator's Manual***. This manual will assist you in the installation, configuration and operation of Escort Memory Systems' CHS1265-TCP-01 TCP/IP RFID Controller.

The CHS1265-TCP-01 is a complete read/write Radio-Frequency Identification solution. It is designed to be reliable and rugged, in order to meet and exceed the requirements of the industrial automation industry. The CHS1265-TCP-01 provides RFID data collection and control solutions to shop floor, item-level tracking and material handling applications.

1.2 ABOUT THIS MANUAL

This document provides guidelines and instructions on how to install, configure and operate the CHS1265-TCP-01 TCP/IP RFID Controller. Descriptions of the RFID command set are also included, as are instructions detailing how to issue commands from a host computer to the CHS1265-TCP-01.

1.2.1 Who Should Read this Manual?

Those who will be installing, configuring and operating the CHS1265-TCP-01 should read this manual. This may include the following people:

- **Hardware Installers**
- **System Integrators**
- **Project Managers**
- **IT Personnel**
- **System and Database Administrators**
- **Software Application Engineers**
- **Service and Maintenance Engineers**

1.2.2 Package Contents

The CHS1265-TCP-01 product package contains the following components:

PART NUMBER	QTY	DESCRIPTION
CHS1265-TCP-01	1	Cobalt HS TCP/IP RFID Controller
17-3151	1	CHS1265-TCP-01 - Installation Guide
CBL-1487	1	Field Mountable Connector (5-Pin, female M12, for connecting to power)
CBL-1531	1	Cap Closure for 5 or 8-pin, male M12 connectors

Table 1-1: Package Contents

1.3 COBALT HS - DIMENSIONS

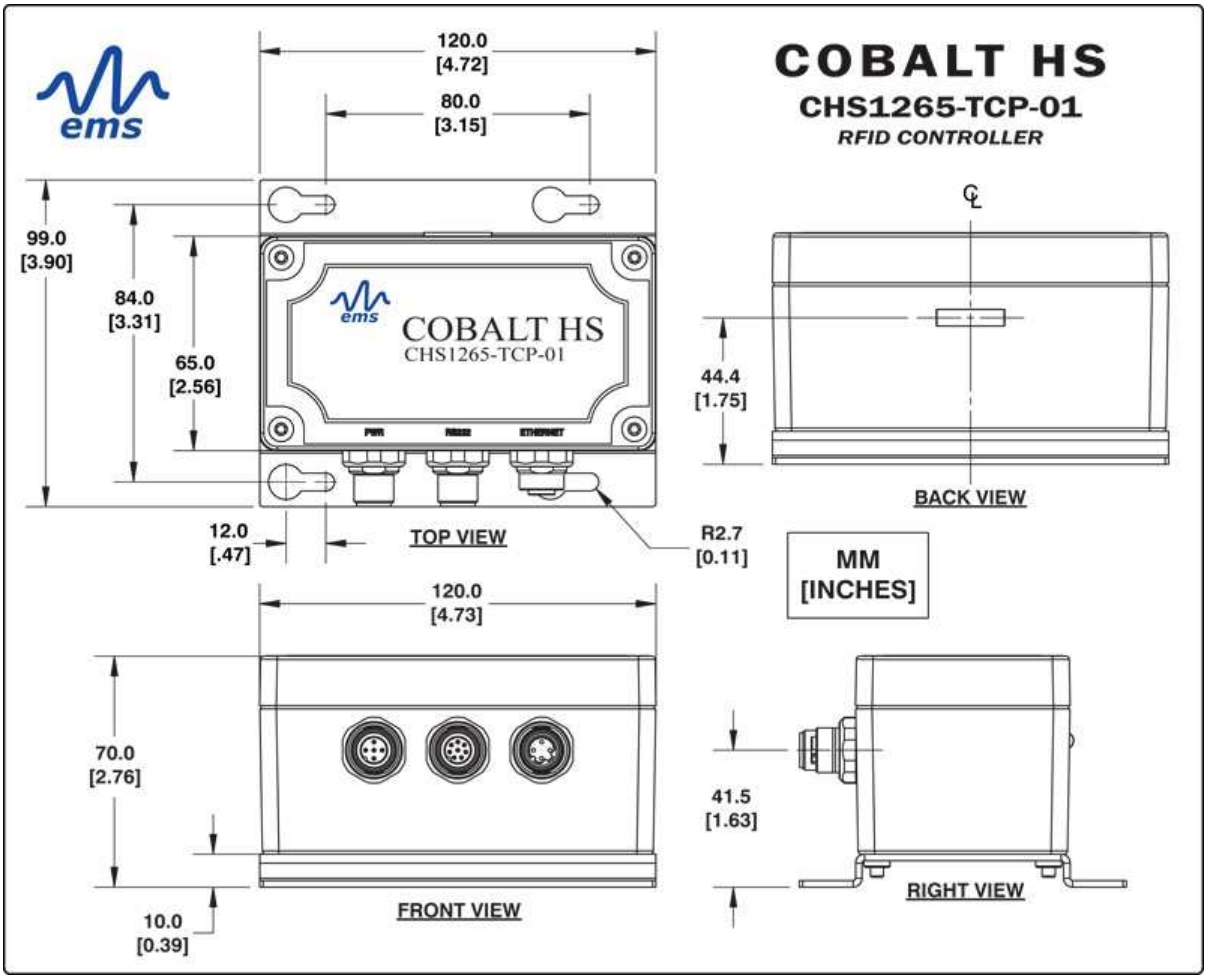


Figure 1-1: Cobalt HS - Dimensions

1.4 COBALT HS - PINOUTS

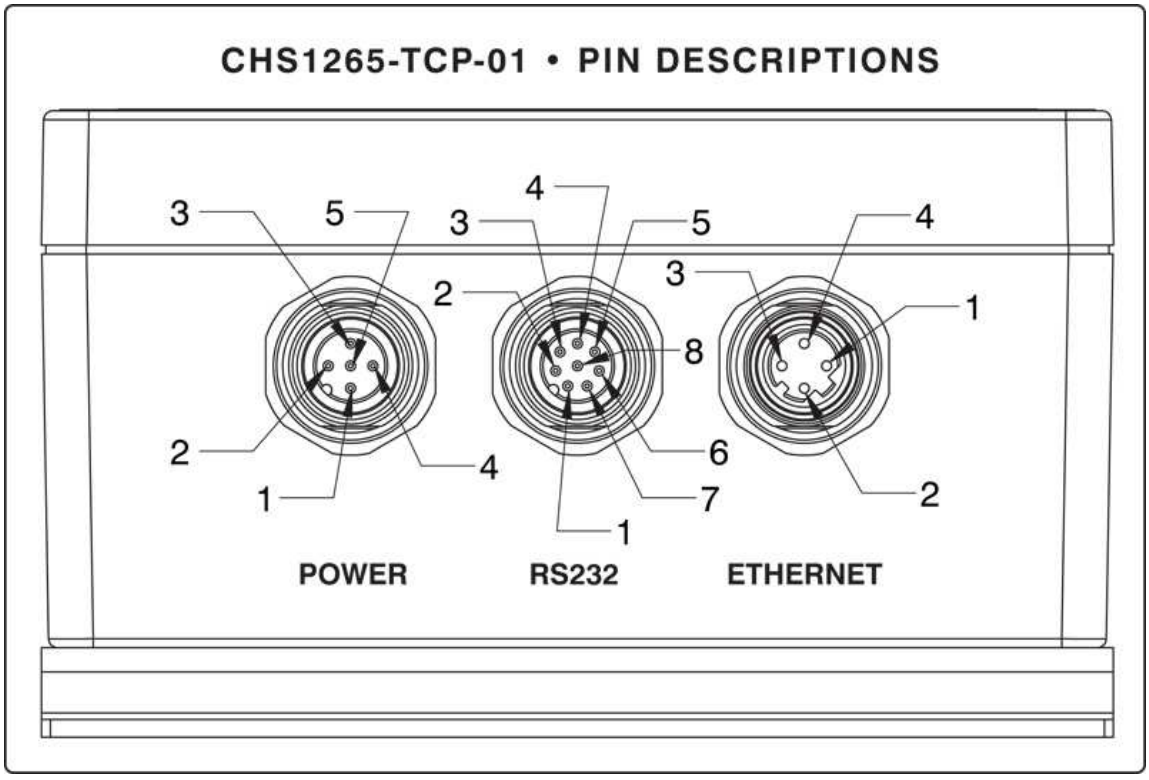


Figure 1-2: CHS1265 - Rear View (Pinouts)

PIN #	POWER (5-PIN MALE M12)
1	SHIELD GROUND
2	10~30VDC POWER
3	0VDC POWER GROUND
4	NOT CONNECTED
5	NOT CONNECTED

PIN #	RS232 (8-PIN MALE M12)
1	NOT CONNECTED
2	NOT CONNECTED
3	NOT CONNECTED
4	NOT CONNECTED

5	NOT CONNECTED
6	RX
7	TX
8	SIGNAL GROUND

PIN #	ETHERNET (4-PIN FEMALE M12 REVERSE KEYED)
1	TX+
2	RX+
3	TX-
4	RX-

1.4.1 LED Descriptions

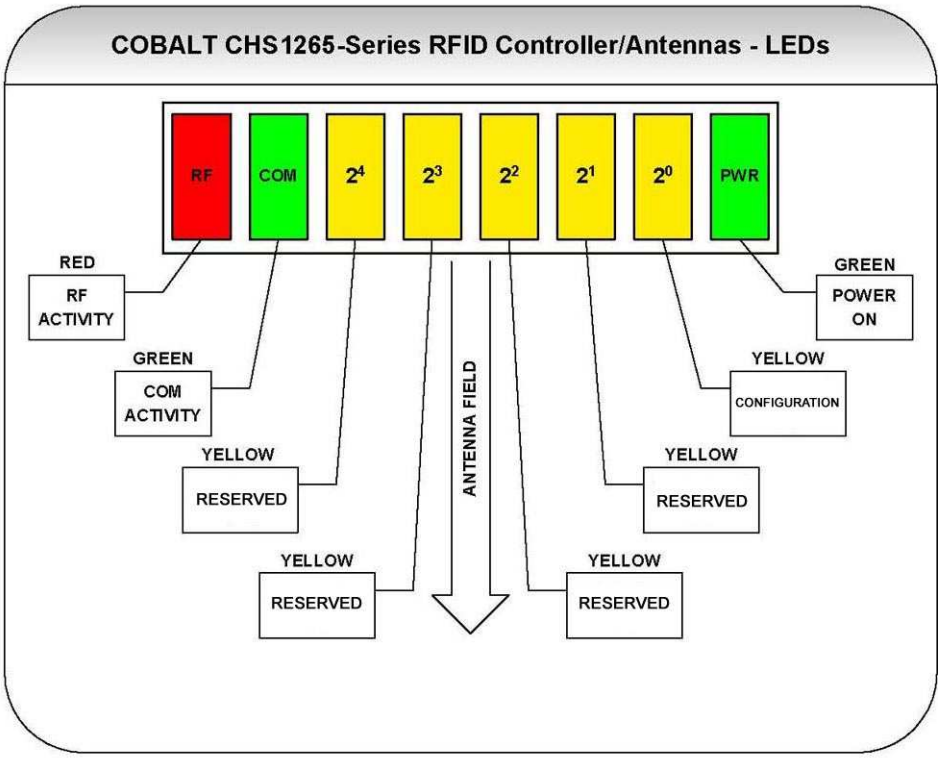


Figure 1-3: LED Description

NOTE: Proximity to metal, water and RF interference can affect read/write range, performance and results. All RFID applications should be tested to ensure that adequate RF performance can be achieved.

1.5 PRE-INSTALLATION INFORMATION

1.5.1 Installation Precautions

Mounting Guidelines

- Avoid mounting the CHS1265-TCP-01 near sources of EMI (electro-magnetic interference) or near devices that generate high ESD (electro-static discharge) levels. Avoid routing cables near motors and solenoids.
- Do not route cables near unshielded cables or near wiring carrying high voltage or high current. Cross cables only at perpendicular intersections (if at all)

Power Requirements

The Cobalt HS requires a power supply that can provide ***0.5A @ 24VDC (12W)***.

Network Planning

Plan to perform a test phase and construct a small scale, independent network that includes only the essential devices required to test your RFID application. It is recommended that installers attach and configure only one CHS1265-TCP-01 unit at a time. To avoid possible interference with other devices, do not initially connect your RFID testing environment to an existing office network.

1.5.2 Point-to-Point Network Diagram

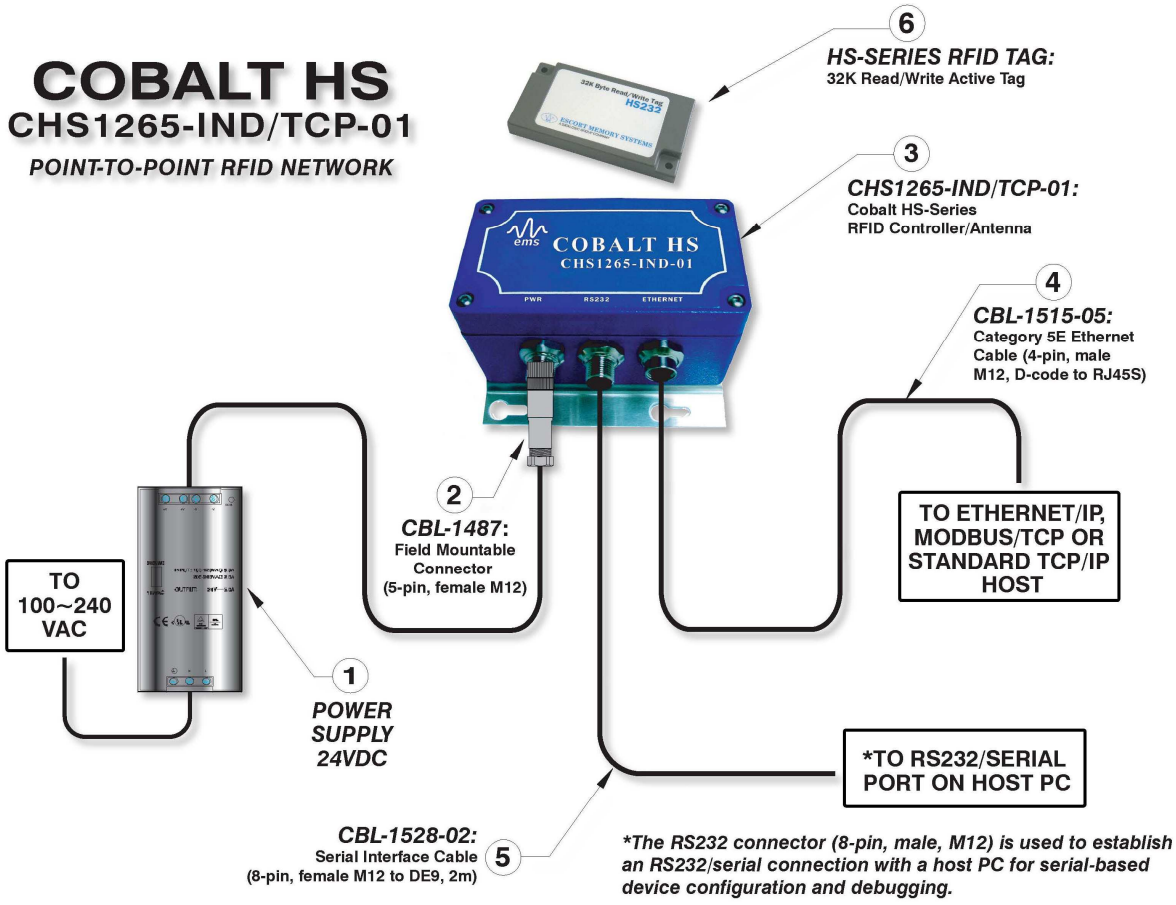


Figure 1-4: Cobalt HS - Point-to-Point Network Diagram

1.6 INSTALLING THE CHS1265-TCP-01

1. Unpack and inspect the CHS1265-TCP-01 hardware and accessories. If an item appears to be damaged, notify your EMS distributor immediately.
2. Securely mount the CHS1265-TCP-01 to your chosen location using four (4) #10 [M5] screws and matching locking washers and nuts (not included). The CHS1265-TCP-01 must be mounted so that the unit's antenna is properly oriented along the path your RFID tags will travel. The Cobalt HS should also be aligned in such a manner that the LED indicators can be seen during normal operation.
3. Attach the 4-pin, male M12 end of a compatible Category 5E Ethernet cable (*EMS P/N: CBL-1515-05*) to the connector labeled "**ETHERNET**" on the Cobalt HS.

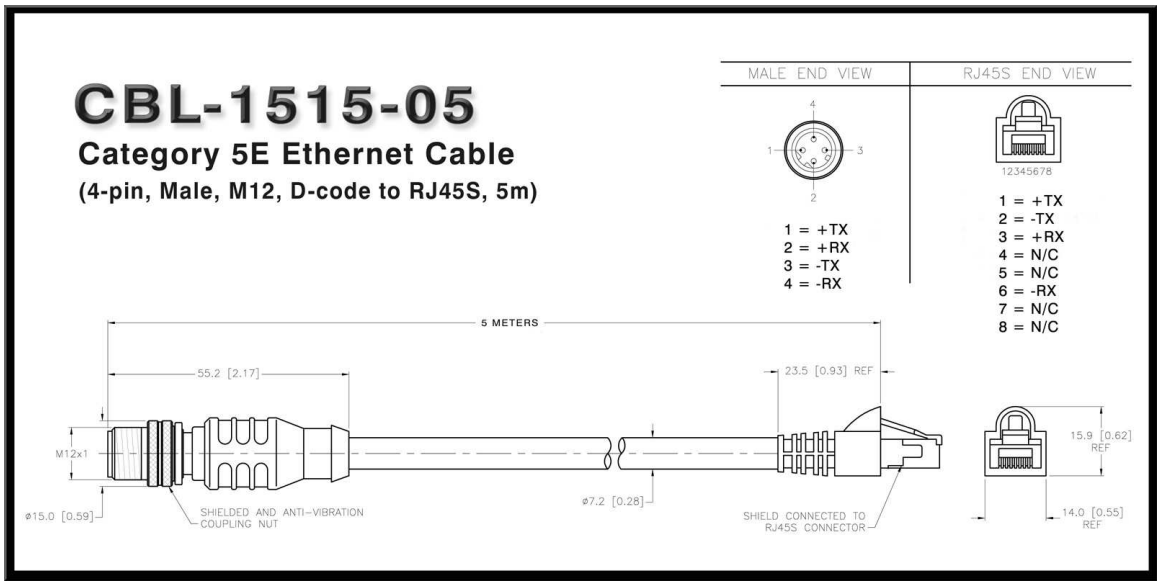


Figure 1-5: CBL-1515-05 CAT5E Ethernet Cable

4 Connect the other end of the Ethernet cable to your application environment, PLC network or LAN. An Ethernet crossover cable (*P/N: CBL-1479*) may be required if connecting the CHS1265-TCP-01 directly to a host computer (rather than to a network switch, hub or router).

5 Connect the three wires from your power supply to pins 1-3 on the included 5-pin, female, field mountable, M12 mating connector (*P/N: CBL-1487*).

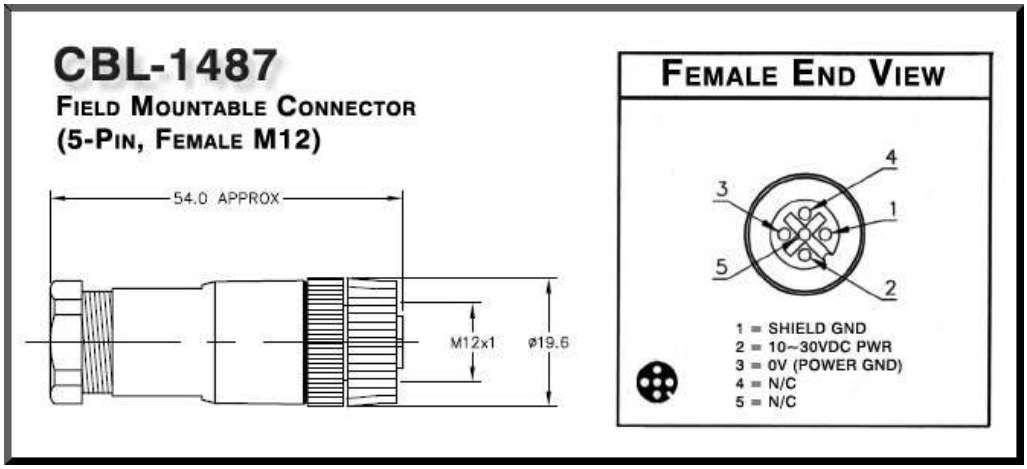


Figure 1-6: CBL-1487 Field Mountable Connector (for Power)

6 Attach the mating connector to the 5-pin, male M12 connector labeled "**PWR**" on the CHS1265-TCP-01.

7 Turn the power supply ON. The green power LED on the Cobalt HS will illuminate.

8 Repeat these steps for each CHS1265-TCP-01 to be installed.

1.7 Optional Configuration Procedure

Follow the optional steps below to modify the internal configuration of your Cobalt CHS1265-TCP-01:

9 Connect the 8-pin, female end of an RS232-compatible serial interface cable (*P/N: CBL-1528-02, not included*) to the "**RS232**" connector on the Cobalt HS.

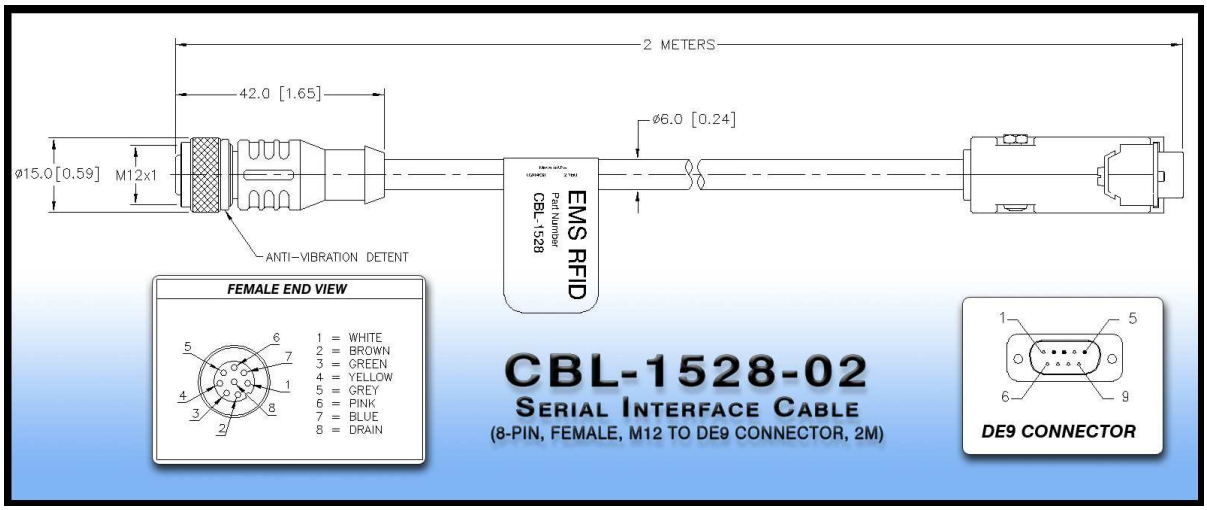


Figure 1-7: CBL-1528-02 Serial Interface Cable

10 Attach the 9-pin, DE9 connector end from the serial interface cable to a serial port on your host computer.

11 Download the serial version of the ***Cobalt HF Dashboard Utility*** from ***www.ems-rfid.com.*** Install and open the application on your host computer.

12 Cycle power to the Cobalt HS. While the unit is rebooting, the yellow Node ID 1 LED will flash for approximately five seconds. During this five-second period, click the button labeled "***CONNECT***" in the Cobalt HF Dashboard Utility to establish a serial connection with the Cobalt HS. You will then be able to use the Cobalt HF Dashboard Utility to further configure the CHS1265-TCP-01 and send RFID commands to the unit for testing purposes. Note that when the five-second period expires, the unit boots normally into TCP/IP mode and the RS232 connector becomes disabled.

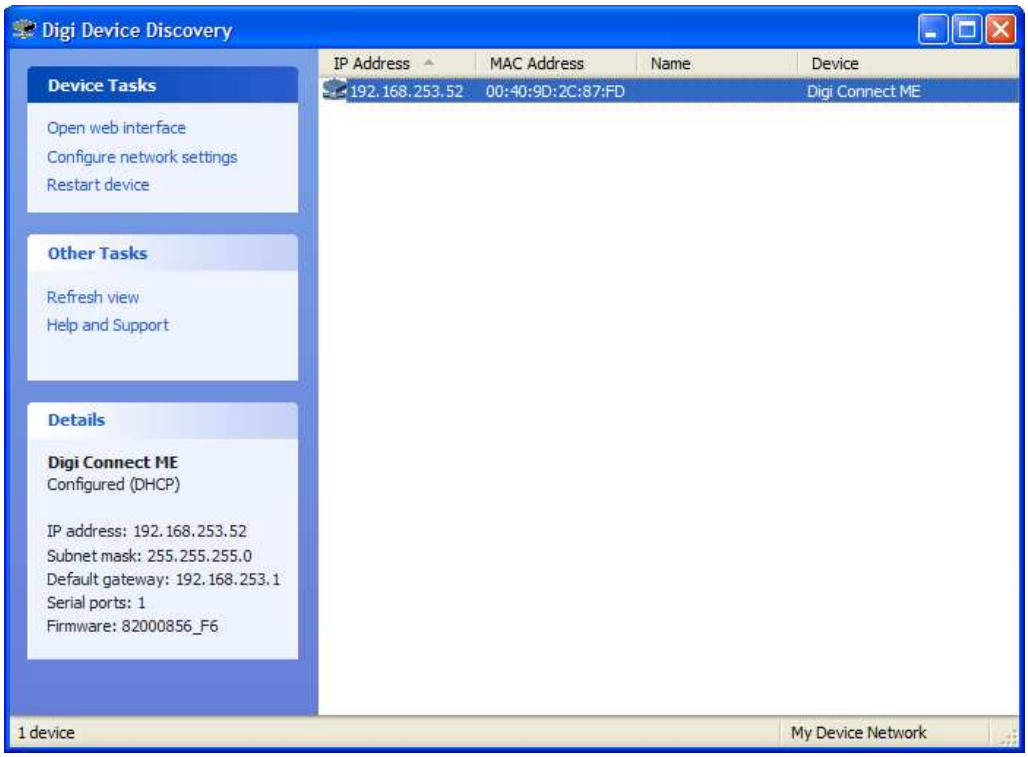
1.8 IP Address Configuration

The Cobalt HS TCP Controller (CHS1265-TCP-01) is shipped configured to automatically receive its TCP/IP address from a DHCP server. You need to make sure that there is a DHCP server on the network, otherwise the device will use a random generated IP address.

To find out what IP address the device has received, you have to use the "***Digi Device Discovery***" software utility.
This utility is available for download at ***www.ems-rfid.com*** - filename: "***GWY TCP dgdiscvr.zip.***"

Running the *Digi Device Discovery* will show the IP address of your EMS' TCP-based RFID device. You may need to click on "Refresh view" button a few times if the DHCP server is slow in assigning the IP address to the device.

NOTE: Disable any firewall services running on the host computer. Firewalls can potentially block communications between the host and the CHS1265-TCP-01.

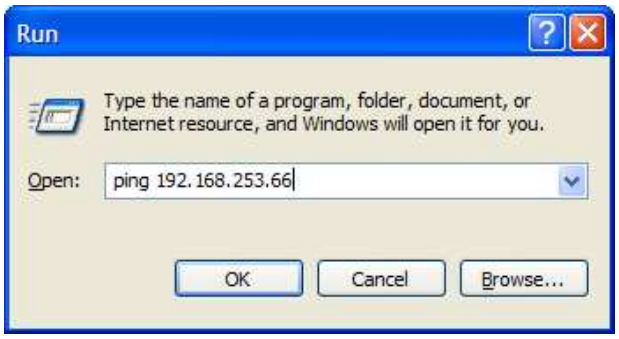


1.9 Network Connection Test

To make sure your PC and the CHS-1265-TCP-01 can communicate over TCP/IP, you can use the *ping.exe* tool, a connection test program which is supplied with Microsoft Windows system. Using a Ping utility helps verify that the CHS1265-TCP-01 is accessible across the network.

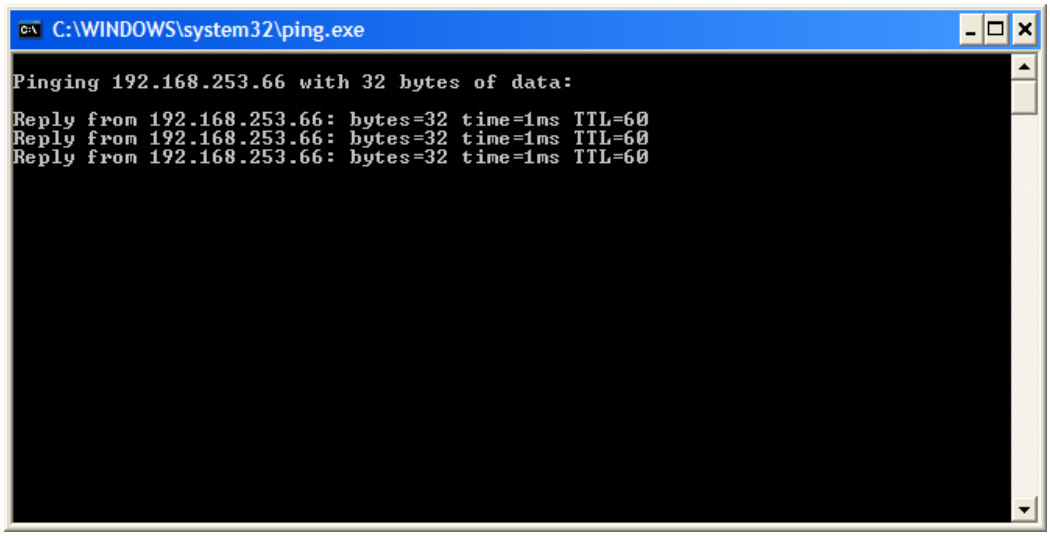
To do that, select Start, then Run and type a command like this:

```
Ping (IP Address)
```

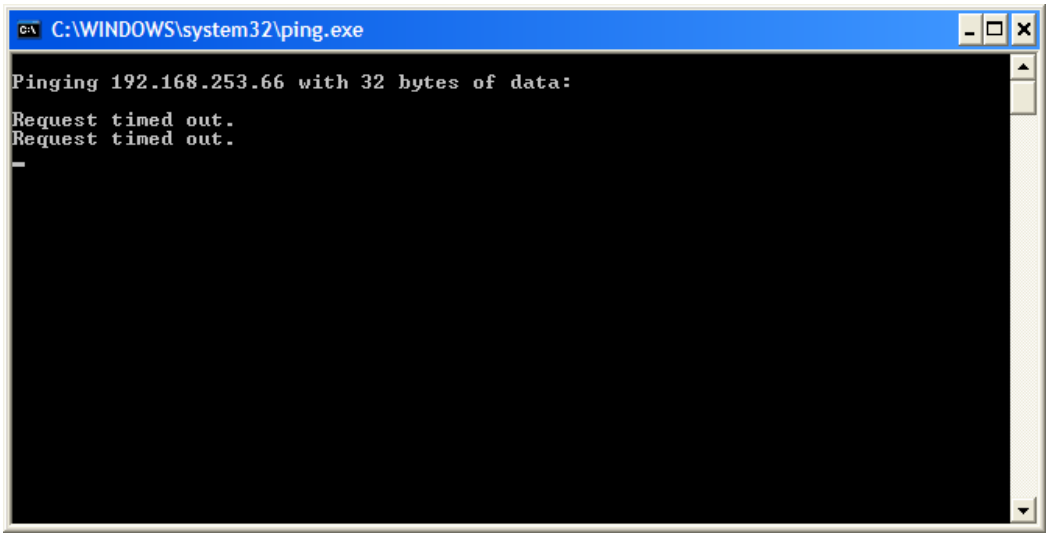


where *"IP Address*" is the same one assigned to the CHS1265-TCP-01 from the Digi Device Discovery program.

If the CHS1265-IND-01 is online and functioning, you will see a successful response like this on a DOS pop-up window:



If, on the contrary, the PC and the CHS1265-TCP-01 cannot communicate, you will see a different message:



In case you get a similar response, you have to make sure the PC and the CHS1265-TCP-01 have addresses on the same subnet (normally this is managed directly by the DHCP server).

If you have problems at this point, please consult your system administrator.

CHAPTER 2:
ABx FAST RFID COMMAND PROTOCOL

2.1 ABx FAST COMMAND PROTOCOL OVERVIEW

In order to execute RFID commands properly, an RFID controller and host computer must be able to communicate using the same language. The language that is used to communicate is referred to as the ***Command Protocol***.

The CHS-1265-TCP-01 makes use of the ABx Fast Command Protocol. ABx Fast has a single-byte oriented packet structure that permits the rapid execution of RFID commands while requiring the transfer of a minimal number of bytes.

The protocol also supports the inclusion of an optional ***Checksum*** byte. When increased data integrity is required, the checksum should be utilized. See ***Section 2.2.2.6*** for more on using the checksum parameter.

NOTE: HEX NOTATION

In this manual, numbers expressed in Hexadecimal notation are prefaced with “0x”. For example, the number "10" in decimal is expressed as "0x0A" in hexadecimal. If need be, the user should refer to a chart containing Hex values and their corresponding decimal integers.

2.1.1 ABx Fast Command Procedure

To issue an RFID command from the host, a packet of data, called the “***Command Packet,***” is sent to the RFID controller. The command packet contains information that instructs the controller to perform a certain task.

The controller automatically parses an incoming data packet, searching for a specific pair of start characters, known as the “***Command Header.***” In ABx Fast, the Command Header characters are ***0x02, 0x02***. When a Command Header is recognized, the controller then checks for proper formatting and the presence of a single-byte “***Command Terminator.***” In ABx Fast, the Command Terminator byte is ***0x03***.

Having identified a valid command, the controller will attempt to execute the instructions, after which it will generate a host-bound response message containing ***EITHER*** the results of the attempted command or an error code if the operation failed.

2.2 ABx Fast Command Protocol Packet Structures

2.2.1 ABx Fast Command Packet Structure

The packet structure of all ABx Fast RFID commands contains certain basic elements, including ***Command Header***, ***Command Size***, ***Command ID*** and ***Command Terminator***. Packet element and parameter availability depends on the command being performed.

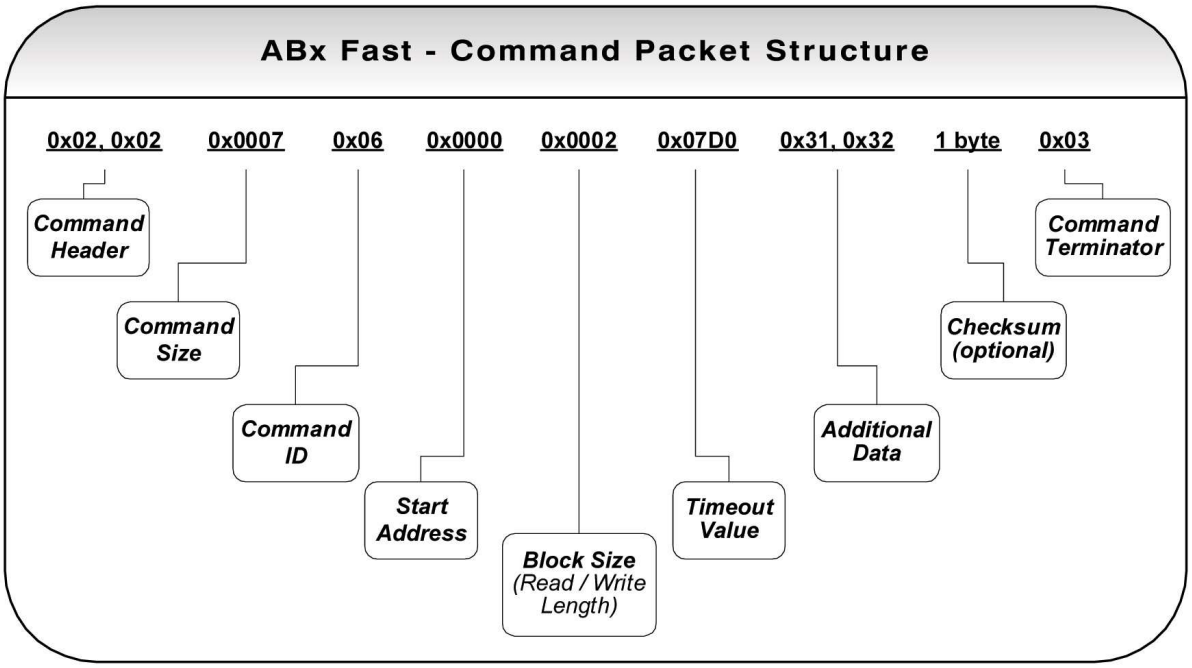


Figure 2-1: ABx Fast - Command Packet Structure

ABx Fast Command Packet Structure

COMMAND PACKET ELEMENT	CONTENT	SIZE
COMMAND HEADER: These are the first two bytes of an ABx Fast command.	0x02, 0x02	2 bytes
COMMAND SIZE: This two-byte integer defines the number of bytes in the packet (*excluding Header, Command Size, Checksum and Terminator*).	0x0007 + (number of bytes of additional data)	2-byte integer
COMMAND ID: This single-byte value indicates the RFID command to execute.	0x06 (*Write Data*)	1 byte
START ADDRESS: This two-byte integer indicates the location of tag memory where a read or write operation shall begin.	0x0000	2-byte integer
BLOCK SIZE: This two-byte integer represents the number of bytes that are to be read from or written to the RFID tag during the operation.	0x0001	2-byte integer
TIMEOUT VALUE: This two-byte integer indicates the maximum length of time for which the controller will attempt to complete the command. Measured in milliseconds, this value can have a range of 0x0001 to 0xFFFE or between 1 and 65,534 msecs.	0x07D0 (0x07D0 = 2000 x .001 = 2 seconds)	2-byte integer
ADDITIONAL DATA: This parameter uses one byte to hold a single character for fill operations and supports the use of multiple bytes when several characters are needed for write commands (when applicable).	0x00	1 or more bytes
CHECKSUM: This optional parameter holds a single-byte checksum (only applicable when using *ABx Fast with Checksum*).	Optional	1 byte (when applicable)
COMMAND TERMINATOR: The single-byte command packet terminator is always *0x03* for ABx Fast.	0x03	1 byte

Table 2-1: ABx Fast Command Packet Structure

2.2.2 ABx Fast Command Packet Elements

2.2.2.1 Command Size

The ABx Fast protocol requires that the byte count, known as the ***Command Size***, be specified as a two-byte integer within each command packet. To calculate the Command Size, add the total number of bytes within the command packet while excluding the two byte ***Command Header***, the two byte ***Command Size***, the one byte ***Checksum*** (if present) and the one byte ***Command Terminator*** (see example below).

Command Size = number of bytes in these fields

COMMAND PACKET ELEMENT	# OF BYTES	INCLUDED IN COMMAND SIZE?
Command Header	2	No
Command Size	2	No
Command ID	1	Yes
Start Address	2	Yes
Read/Block Size	2	Yes
Timeout Value	2	Yes
Additional Data Bytes	1	Yes (if present)
Checksum	1	No
Command Terminator	1	No

Table 2-2: ABx Fast Command Size Parameter

In the above command packet, there are eight bytes of data (located between the *Command Size* parameter and the *Checksum* parameter) that are included in the *Command Size*. Therefore, the *Command Size* for this example is ***0x0008***.

2.2.2.2 Command ID

The one-byte ***Command ID*** parameter identifies the Hex value of the RFID command to perform (see *Chapter 2 – Section 2.3: RFID Commands Table*.)

2.2.2.3 Start Address

The ***Start Address*** parameter holds a two-byte integer representing the tag memory address location where a read or write operation is to begin.

2.2.2.4 Block Size (Read/Write Length)

The two-byte ***Block Size*** parameter (which is also sometimes called the ***Read / Write Length*** parameter) indicates the number of bytes that are to be read from or written to the RFID tag.

2.2.2.5 Timeout Value

Most ABx Fast commands include a two-byte ***Timeout Value***, which is used to limit the length of time that the controller will attempt to complete the specified operation.

The ***Timeout Value*** is measured in 1-millisecond increments and has a maximum supported value of ***0xFFFE*** or 65,534 milliseconds (which is slightly longer than one minute).

Setting a long ***Timeout Value*** does not necessarily mean that a command will take any longer to execute. This value only represents the period of time for which the controller will attempt execution of the command.

IMPORTANT:

During write commands, the tag must remain within the antenna's RF field until the write operation completes successfully, or until the Timeout Value has expired.

If a write operation is not completed before the tag leaves the controller's RF field, data may be incompletely written.

2.2.2.6 Checksum

The ABx Fast Command Protocol supports the inclusion of an additional ***Checksum*** byte that is used to verify the integrity of data being transmitted between host and controller.

The ***Checksum*** is calculated by adding together (summing) the byte values in the command packet (less the ***Command Header***, ***Checksum*** and ***Command Terminator*** parameters), and then subtracting the total byte sum from 0xFF.

Therefore, when the byte values of each parameter (from ***Command Size*** to ***Checksum***) are added together, the byte value sum will equal 0xFF.

CHECKSUM EXAMPLE

The following example depicts *Command 0x05* (*Read Data*) when using a Checksum.

COMMAND ELEMENT	CONTENTS	USED IN CHECKSUM
Header	0x02, 0x02	n/a
Command Size	**0x0007**	**0x00, 0x07**
Command ID	**0x05**	**0x05**
Start Address	**0x0001**	**0x00, 0x01**
Block Size	**0x0004**	**0x00, 0x04**
Timeout Value	**0x07D0**	**0x07, 0xD0**
Checksum	**0x17**	n/a
Terminator	0x03	n/a

Checksum = [0xFF – (sum of these fields)]

Table 2-3: ABx Fast - Checksum Example

Add the byte values from the ***Command Size, Command ID, Start Address, Block Size*** and ***Timeout Value*** parameters together and subtract from 0xFF. The resulting value will be the Checksum.

[0x07 + 0x05 + 0x01 + 0x04 + 0x07 + 0xD0] = **0xE8**

The checksum equation is: [0xFF – 0xE8] = **0x17**

2.2.3 ABx Fast Response Packet Structure

After performing a command, the controller, in most cases, will generate a host-bound response packet. ABx Fast responses contain a ***Response Header***, ***Response Size***, ***Command Echo***, one or more ***Response Values*** / ***Retrieved Data*** (when applicable), and a ***Response Terminator***.

RESPONSE PACKET ELEMENT	CONTENT	SIZE
RESPONSE HEADER: The first two bytes of an ABx Fast response packet	0x02, 0x02	2 bytes
RESPONSE SIZE: This two-byte integer indicates the total number of bytes in the response packet (excluding Response Header, Response Size, Checksum and Terminator).	0x0001 + (number of bytes of retrieved data)	2-byte integer
COMMAND ECHO: This single-byte parameter reiterates the Hex value of the command for which the response packet was generated.	0x06	1 byte
RESPONSE VALUES / RETRIEVED DATA: This parameter is used to hold one or more bytes of the data that was requested by the command (when applicable).	Data	1 or more bytes (when applicable)
CHECKSUM: This optional parameter holds a single-byte checksum (only applicable when using *ABx Fast with Checksum*).	Optional	1 byte (when applicable)
RESPONSE TERMINATOR: Single-byte response packet terminator (*always 0x03*)	0x03	1 byte

Table 2-4: ABx Fast Response Packet Structure

2.2.4 Abx Fast Error Response Structure

ABx Fast error responses contain a two-byte Header, a two-byte Response Size parameter followed by a single-byte **Error Flag** (0xFF) and a single-byte **Error Code** parameter, which identifies the error that occurred.

ERROR RESPONSE ELEMENT	CONTENT
Header	0x02, 0x02
Response Size	0x0002
Error Flag	0xFF
Error Code	Single-byte Error Code
Terminator	0x03

Table 2-5: ABx Fast - Error Response Structure

ABx FAST ERROR RESPONSE EXAMPLE

Below is an example of an ABx Fast error response for a failed Write Data command (*error code 0x06*).

ERROR RESPONSE ELEMENT	CONTENT
Header	0x02, 0x02
Response Size	0x0002
Error Flag	0xFF
Error Code	0x06
Terminator	0x03

2.3 RFID COMMANDS TABLE

COMMAND ID	COMMAND NAME	DESCRIPTION
0x04	Fill Tag	Fills a specified tag address range with a one-byte value
0x05	Read Data	Reads a specified length of data from a contiguous (sequential) area of tag memory
0x06	Write Data	Writes a specified number of bytes to a contiguous area of tag memory
0x08	Tag Search	Instructs the controller to search for a tag in its RF field
0x35	Reset Controller	Resets power to the controller
0x36	Set Controller Configuration	Used to set (configure or modify) the controller's configuration parameters and settings
0x37	Get Controller Configuration	Retrieves the controller's configuration settings
0x38	Get Controller Info	Retrieves hardware, firmware and serial number information from the controller
0x72	Execute Controller Macro	Instructs the controller to execute one of its eight macros
RFID CONTROLLER COMMANDS		
0x5F	Reset Tag Battery Counter	Resets the value of a tag's internal battery counter to zero (0x00)

Table 2-6: RFID Commands Table

NOTE:

For more information regarding ABx Fast RFID commands and error codes, see publication ***17-1333: ABx Fast Command Protocol – Reference Manual,*** available online at **www.ems-rfid.com.**

ABx Fast Command 0x5F: Reset Tag Battery Counter

Command 0x5F - Description

The ***Reset Tag Battery Counter Command*** resets the value of a tag's *Battery Counter* to zero (*0x00*). This command is designed to be used when replacing the batteries in an active RFID tag.

Located at tag address 0x0000, the *Battery Counter* is a one-byte value that indicates the number of operating hours that the tag has been in use since it has last had its internal batteries replaced. When this value reaches *0x0F*, battery life is in a condition of decay (batteries should be replaced after the tag has accumulated 15 hours of use).

To retrieve the *Battery Counter Value*, execute Command 0x05 (Read Data) and note the value stored at address *0x0000* on the tag. Reading address zero on the tag should only be performed by one station in a typical assembly line.

Command 0x5F - ABx Fast Example

This example resets the tag's battery counter to zero (0x00).

Command from Host

PARAMETER FIELD	CONTENT
Header (0x02, 0x02 = header for all ABx Fast commands)	0x02, 0x02
Command Size (2-byte integer for the number of bytes in the command - excluding Header, Command Size, Checksum and Terminator)	0x0001
Command ID (1-byte value for the command to perform)	0x5F
Checksum (1-byte optional)	Optional
Terminator (0x03 = terminator for all ABx Fast commands)	0x03

Response from Controller

PARAMETER FIELD	CONTENT
Header	0x02, 0x02
Response Size	0x0001
Command Echo	0x5F
Checksum	Optional
Terminator	0x03

CHAPTER 3: STANDARD TCP/IP PROTOCOL

3.1 STANDARD TCP/IP OVERVIEW

Communication with the CHS1265-TCP-01 is through the TCP/IP protocol.

Here the CHS1265-TCP-01 acts as server and the host or PLC acts as client.

Standard TCP/IP sessions are established between the host and the CHS1265-TCP-01 via user supplied TCP/IP client software. A TCP/IP session generally consists of three stages: *connection setup, data transactions* and *connection termination*.

The client software is responsible for opening, maintaining, and closing all TCP/IP sessions. After establishing a successful connection, communications between the host and the CHS1265-TCP-01 can proceed.

If an existing connection terminates unexpectedly, the CHS1265-TCP-01 will not attempt to contact the client software or re-establish a connection. When communication is no longer necessary, it is the responsibility of the client side application to terminate the connection.

NOTE:

The TCP/IP client software (on the host or PLC) must connect to the TCP/IP server (CHS1265-TCP-01) on port **2101**.

Maximum number of bytes that can be transferred to/from an RFID tag per read/write cycle: **8192.**

APPENDIX A: TECHNICAL SPECIFICATIONS

ELECTRICAL

Supply Voltage	18~30VDC
Power Consumption	12W (500mA @ 24VDC)

COMMUNICATION

Communication Interfaces	TCP/IP
RFID Interface	Cobalt HS-Series RFID System
RF Output Power	1W
Air Protocols	ISO 15693, ISO 14443 A
Air Protocol Speed	26.5k Baud/106k Baud with CRC error detection
Baud Rates	9600 (default), 19.2k, 38.4k, 57.6k, 115.2k

MECHANICAL

Dimensions (L x W x H)	120mm x 99mm x 70mm (4.72in x 3.90in x 2.76in)
Weight	440 grams (.97 lbs)
Enclosure	Polycarbonate / Powder-coated Aluminum

ENVIRONMENTAL

Operating Temperature	-20°to 50℃ (-4°to 122℉),
Storage Temperature	-40°to 85℃ (-40°to 185℉)
Humidity	100%
Protection Class	IP66
Shock Resistance	IEC 68-2-27 Test EA 30g, 11 milliseconds, 3 shocks each axis
Vibration Resistance	IEC 68-2-6 Test FC 1.5mm; 10 to 55Hz; 2 hours each axis

NOTE: Specifications are subject to change without notice.

ESCORT MEMORY SYSTEMS
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