OPERATOR'S MANUAL

HS870-Series Programmable Eurocard Controller

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Extended warranties of up to four years are available for purchase for most EMS products. Contact EMS or your distributor for more information.

TABLE OF CONTENTS

1   INTRODUCTION

Escort Memory Systems provides a complete family of field-proven Read/Write Radio-Frequency Identification (RFID) products. The system consists of Tags, Reader/Writers, Controllers, Antennas, and ancillary equipment. Tags can be attached to a product or its carrier and act as an electronic identifier, job sheet, portable database or manifest. They are read and updated via a Escort Memory Systems Reader/Writer or Controller and Antenna through non-conductive materials while moving or standing still.

The HS870-Series Eurocard Controller incorporates high-level language capability, two fully-buffered bi-directional serial ports, a 16K byte non-volatile file system, 32K bytes of RAM, 32 TTL-level I/O points and an interface of up to four HS-Series Antennas. The connection between the Controller and each Antenna is via two twisted pair wires (four wires) with a maximum cable length of 1,200 meters. Ten status LEDs are mounted on the front of the Controller to aid in system debug and
maintenance. Programs can be created in BASIC or C on a PC-compatible computer using any editor and downloaded to the Controller.

The HS403B Industrial I/O board can be used to convert the TTL-level signals on the HS870-Series to 24VDC optically-isolated industrial I/O.

2   GETTING STARTED

To become familiar with the operation of the HS870-Series Controllers, read the instruction manuals completely and exercise the system using either a standard ASCII terminal or an IBM Personal Computer (PC) or a compatible computer using the software available from Escort
Memory Systems.

2.1   Programmable Controller Software

See the appropriate Development Package for details.

2.2   Evaluation Cable Connections

To exercise the Controller using a standard terminal or IBM PC-Compatible host computer, insert the Controller into an HS640B-870 Eurocard Enclosure. The Controller may also be used with an HS403 Eurocard Industrial I/O Board, which provides 24 Volt optically isolated I/O. The Controller and I/O board would then be mounted in an HS641B-870 2-Card Enclosure. Connect the terminal blocks on the rack to the COM1: serial port of the computer, to a 24 Volt power supply, and to an HS-Series Antenna according to the pinouts given in this manual.

2.3   Exercising the Controller

Once the connections are properly made, set the terminal to 9600 baud, no parity, 8 data bits (the default settings of the Controller) and connect the Controller to the evaluation cable. A prompt will appear on the
terminal screen indicating that the Controller is ready to respond to commands. The programs available on the Controller can be quickly seen by typing a FILES command.

3   SPECIFICATIONS AND DIMENSIONS

3.1   HS870-Series Specifications

Table 1 lists the specifications for the HS870-Series Eurocard.

Table 1 — HS870-Series Specifications	
Electrical	
Supply Voltage	— 21 to 28 VDC
Max. Current	— 300 mA
Max. Ripple	— 2% of DC voltage
Memory	
EEPROM	— 32K bytes
RAM *	— 32K bytes, for user variables and programs
Interface With Antenna	
Max. Cable Length	— 4,000 ft. (1,200 m)
Typical Data Transfer Rate	— 3,000 bytes/second
Input/Output	— 32 DC I/O points, TTL-level
Communication With Host	
Interface Options	— Two RS232 or RS422 bi-directional serial ports
Baud Rate	— 300, 1200, 4800, 9600, 19200
Parity	— Odd, Even or None
Data Bits	— 7 or 8
Stop Bits	— 1
Mechanical Specifications	
Dimensions	
(W× H × D)	— 3.9 × 6.3 in. (100 × 160 mm)
Connector —	64-pin DIN (32 x 2)
Indicators	— On, Error, RX, TX and Antenna LEDs
Environment	
Operating Temp	— +32 to +140°F (0 to +60°C)
Storage Temp	— -40 to +185°F (-40 to +85°C)
Humidity	— 5% to 95% non-condensing
Protection Class	— NEMA 1 in HS640 or HS641 enclosure

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*Static RAM is battery-backed in the HS876.
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3.2   LED Indicators

Ten LEDs are mounted on the front of the Eurocard Controller for status indication as shown in Figure 1. The LEDS function as follows:

ON   —   The ON LED emits RED whenever
                          the Controller is powered.

ER(Error)   —   The ER LED emits RED light
                          to indicate that the Controller
                          is reset or fails self-test.

RX1(Receive) —   The RX1 LED emits GREEN light
                          when data is being received by the
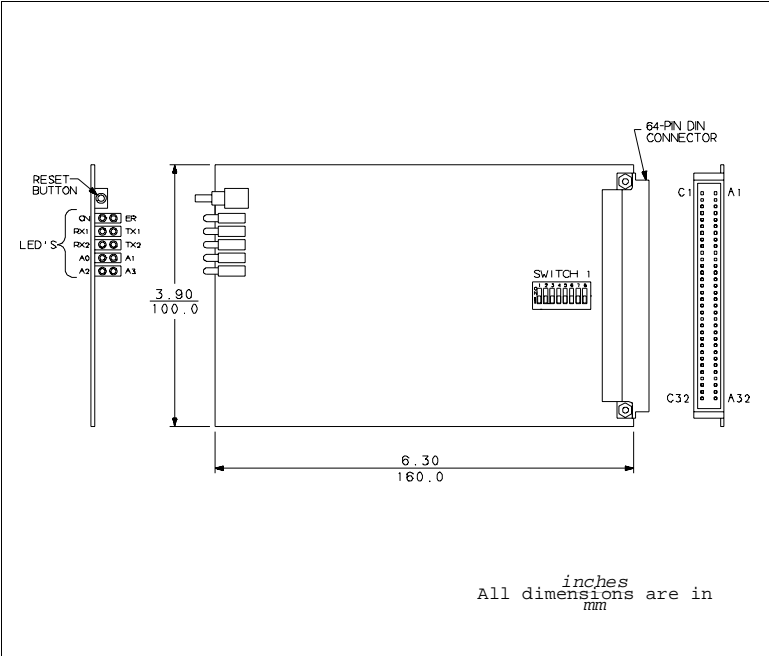   Controller on serial port 1.

Figure 1 — Controller Layout

TX1(Transmit) — The TX1 LED emits GREEN light when data is being transmitted from the Controller to the host on serial port 1.

RX2(Receive) — The RX2 LED emits GREEN light when data is being received by the Controller on serial port 2.

TX2 (Transmit) — The TX2 LED emits GREEN light when data is being transmitted from the Controller to the host on serial port 2.

A0-A3 (Antennas) — The A0 - A3 LEDs emit YELLOW light whenever the corresponding Antenna is transmitting.

4 INTERFACE AND POWER

4.1 DC Inputs

Sixteen TTL-Level DC Inputs are provided for interface either directly with TTL-Level equipment or with high voltage AC or DC equipment by using solid state relays (such as Opto-22 IAC5 for 90 - 140 VAC input).

The DC Input specifications are shown in Table 2.

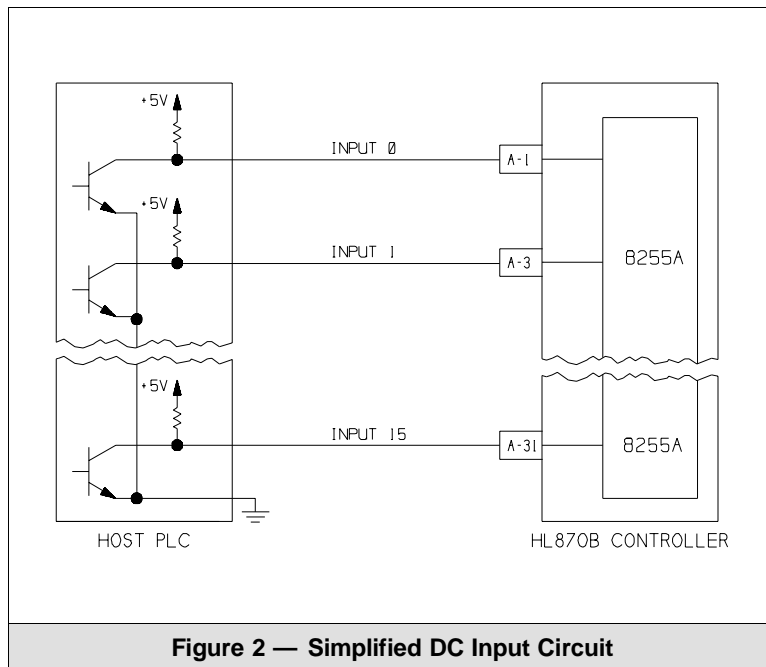| Table 2 — DC Input Specifications |
| --- |
| Logical One Input Voltage — 2.0V min
Logical Zero Input Voltage — 0.8V max

Compatible with Opto 22 module types IAC5, IAC5A, IDC5, IDC5B, IDC5D, IDC5G. |

Figure 2 — Simplified DC Input Circuit

4.2   DC Outputs

Sixteen TTL-Level DC outputs are provided for interface either directly with TTL-Level equipment or with high voltage AC or DC equipment by using solid state relays (such as Opto-22 OAC5 for 90 - 140 VAC output).

The DC Output specifications are shown in Table 3.

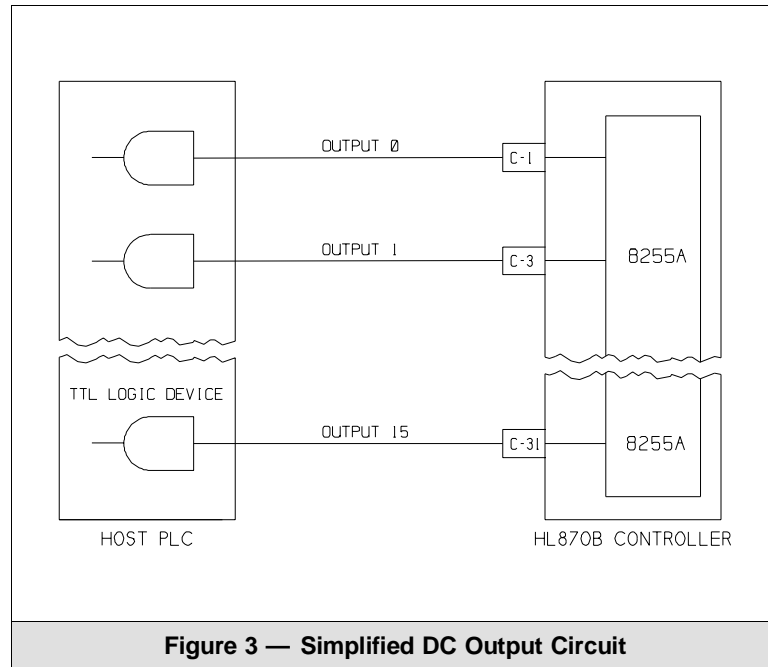| Table 3 — DC Output Specifications		
Logical One Output Voltage	—	3.0V min at Current (Sourcing) = +2.5mA
Logical Zero Output Voltage	—	0.4V min at Current (Sinking) = -2.5mA 1.5V min at Current (Sinking) = +12mA
Compatible with Opto 22 module types OAC5, OAC5A, OAC5A5, ODC5, ODC5A		

Figure 3 — Simplified DC Output Circuit

4.3   64-pin DIN Connector Pinouts

Connections between the Eurocard Controller, the user's host computer, the 32 I/O points, and 24 Volt supply voltage are via the 64-pin DIN type connector, as listed in Table 4.

Table 4 — 64-pin DIN Pinouts			
Row A		**Row C**	
Pin #	**Function**	**Pin #**	**Function**
1	Input 0	1	Output 0
3	Input 1	3	Output 1
5	Input 2	5	Output 2
7	Input 3	7	Output 3
9	Input 4	9	Output 4
11	Input 5	11	Output 5
13	Input 6	13	Output 6
15	Input 7	15	Output 7
17	Input 8	17	Output 8
19	Input 9	19	Output 9
21	Input 10	21	Output 10
23	Input 11	23	Output 11
25	Input 12	25	Output 12
27	Input 13	27	Output 13
29	Input 14	29	Output 14
31	Input 15	31	Output 15
2	Antenna 0 Pin 1	2	Port 1 RS232 TX
4	Antenna 0 Pin 2	4	Port 1 RS232 RX
6	Antenna 0 Pin 3	6	Signal Ground
8	Antenna 0 Pin 4	8	Port 1 RS422 TX+
10	Antenna 1 Pin 1	10	Port 1 RS422 TX-
12	Antenna 1 Pin 2	12	Port 1 RS422 RX+
14	Antenna 1 Pin 3	14	Port 1 RS422 RX-
16	Antenna 1 Pin 4	16	Port 2 RS232 TX
18	Antenna 2 Pin 1	18	Port 2 RS232 RX
20	Antenna 2 Pin 2	20	Signal Ground
22	Antenna 2 Pin 3	22	Port 2 RS422 TX+
24	Antenna 2 Pin 4	24	Port 2 RS422 TX-
26	Antenna 3 Pin 1	26	Port 2 RS422 RX+
28	Antenna 3 Pin 2	28	Port 2 RS422 RX-
30	Antenna 3 Pin 3	30	+ 24 Volt DC
32	Antenna 3 Pin 4	32	Ground

Ground Lug = Frame Ground
NOTE: Cable shields should be connected to Frame Ground on one end only.

4.4 DIP Switch Settings

Switch 1, position 1, controls the Input/Output polarity of the connector pins on the HS870. With switch position 1 ON, outputs and inputs are inverted so that OUTPORT1=0 will set the pins on the connector HIGH. Conversely, with switch position 1 OFF, OUTPORT1=0 will set the pins LOW.

The HS876 uses Switch 1, position 1 as follows:

Switch 1	0	1
Mode	Monitor	Run

Switch positions 2-8 are reserved for future use on both the HS870 and HS876.

4.5 Power Requirements

The HS870-Series Controller must be powered by a power supply capable of providing 250 mA at 21 - 28 Volts DC to the Controller.

The specifications on the input power at the Eurocard Controller terminals are:

Input Voltage	—	21 to 28 Volts DC
Maximum Ripple	—	peak-to-peak ripple 2% of DC voltage
Maximum Current	—	300 mA

## 4.6 Serial Communication Protocols

The HS870-Series Controller has the following communications options available :

Interfaces	—	RS232, RS422
Baud Rates	—	300, 1200, 2400, 4800, 9600, 19200
Parity	—	None, Even, Odd
Data Bits	—	7, 8 bits
Stop Bits	—	1

4.7   RS232 Interface

The connections for the RS232 interface are RS232 TX (Data from the Eurocard Controller), RS232 RX (Data to the Eurocard Controller) and Signal Ground, as shown in Figure 4.

The signals and electrical loads on the RS232 TX and RS232 RX pins should conform to the electrical specifications of EIA Standard RS232. The maximum cable length specified under the EIA RS232 Standard is 50 feet. Good quality shielded cable should be used for these connections.


Figure 4 — RS232C Connections
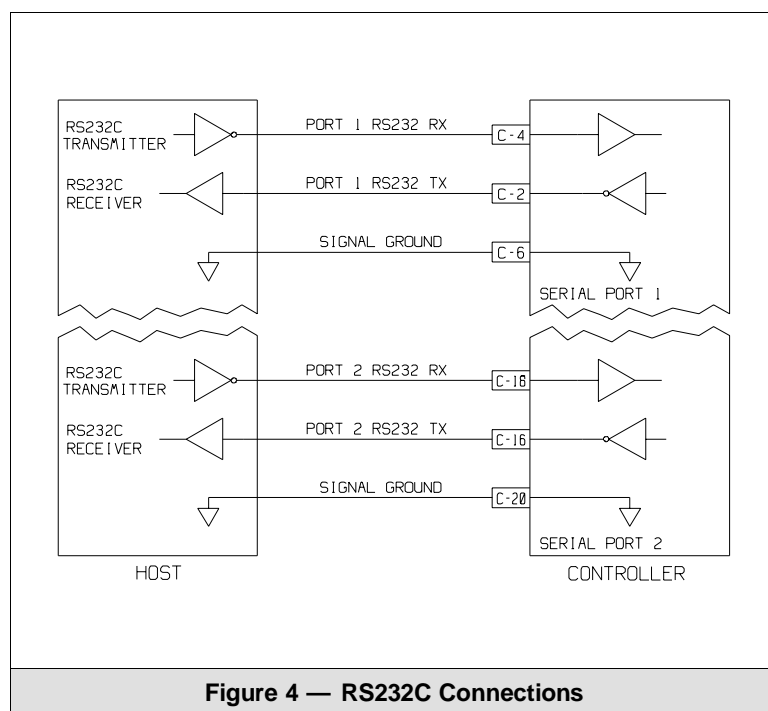
4.8 RS422 Interface

The RS422/485 mode is recommended for electrically noisy environments. The connections are RS422/485 TX+ and RS422/485 TX- (Data from the Eurocard Controller) and RS422/485 RX+ and RS422/485 RX- (Data to the Eurocard Controller), as shown in Figure 5.

For maximum margin at very long line lengths (over 1000 feet), a 1/4 watt, 180 ohm (±5%) terminating resistor should be provided by the user across the RS422/485 RX+ and RS422/485 RX- lines at the Eurocard Controller, and across the RS422/485 TX+ and RS422/485 TX- lines at the host.

The signals and electrical loads on the pins, as well as the characteristics of the shielded twisted pair cable must conform to the electrical specifications of EIA Standard RS422. The maximum recommended length of the RS422 connection is 4000 feet. Good

Figure 5 — RS422 Connections
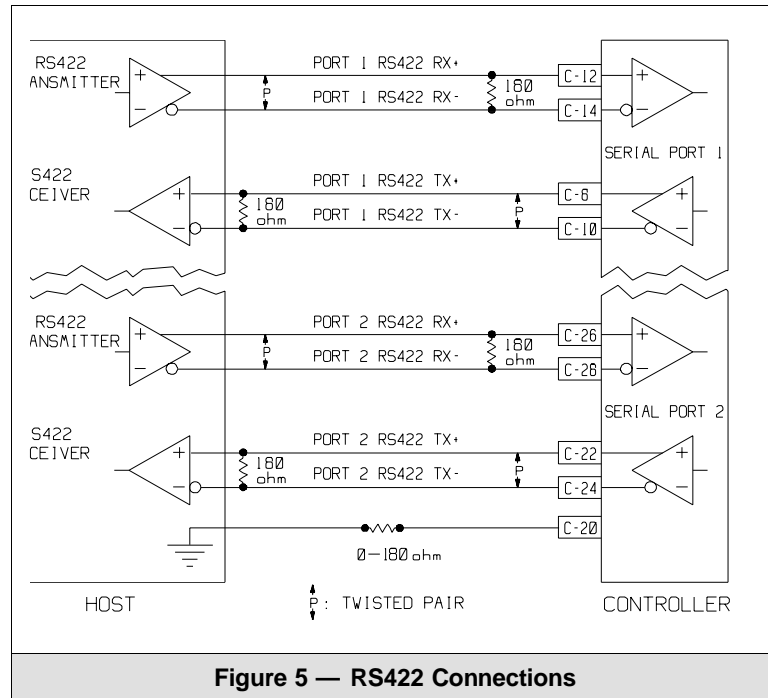
quality shielded cable should be used for these connections.

5   ANTENNA INTERFACE

5.1   Connection to EMS Antennas

The Eurocard Controller can control up to four EMS Antennas. The connections to the Antennas are shown in Figure 6. Good quality shielded cable should be used for these connections. Installations with distances of 50' or less may use a 3-pair cable such as Belden 9830 for signal and power. Applications over longer distances may require a 2-pair cable, such as Belden 9829, with a separate power ca-
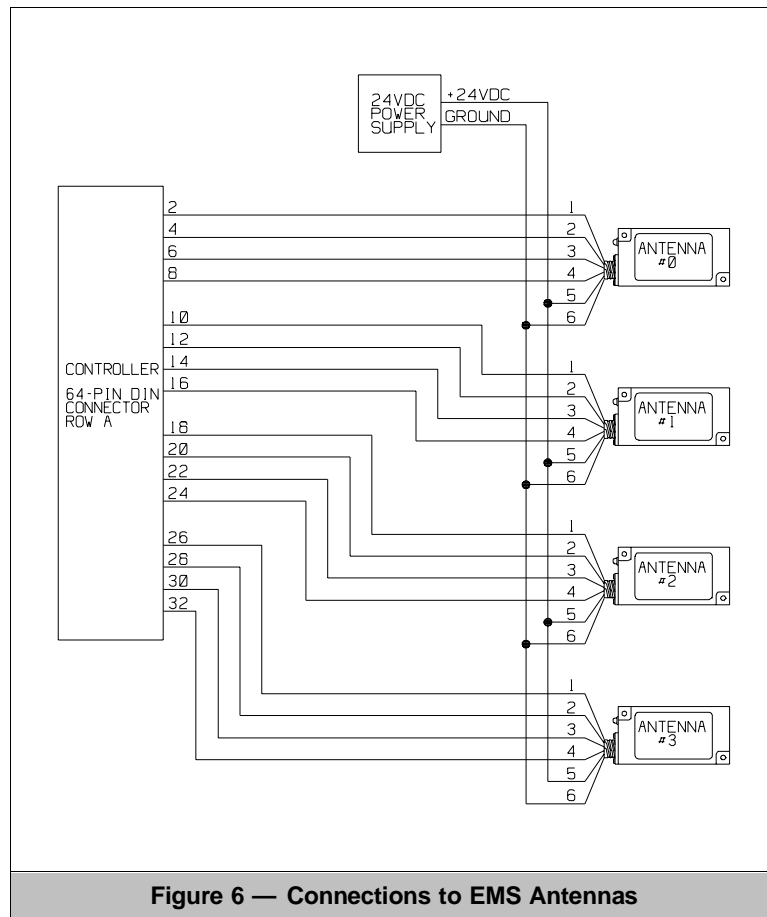

Figure 6 — Connections to EMS Antennas

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A APPENDIX: MODELS & ACCESSORIES

The following table lists the available models and accessories for the HS870-Series RFID controller.

Table 5 — Models and Accessories		
Available Models		
HS870B-4	—	BASIC Programmable Controller, for four Antennas.
HS876B-4	—	C Programmable Controller, for four Antennas.
Accessories		
HS403BH	—	Industrial I/O Board for HS87X, Current-Sourcing.
HS403BL	—	Industrial I/O Board for HS87X, Current-Sinking.
HS640B-870*	—	Single card enclosure for HS87X, provides 32 TTL-level I/O.
HS641B-870*	—	Two card enclosure for HS87XB and HS403, provides 32 industrial-level I/O.
SP1012	—	C Development Package for HS876

*Does not include controller board or I/O board.

NOTES: