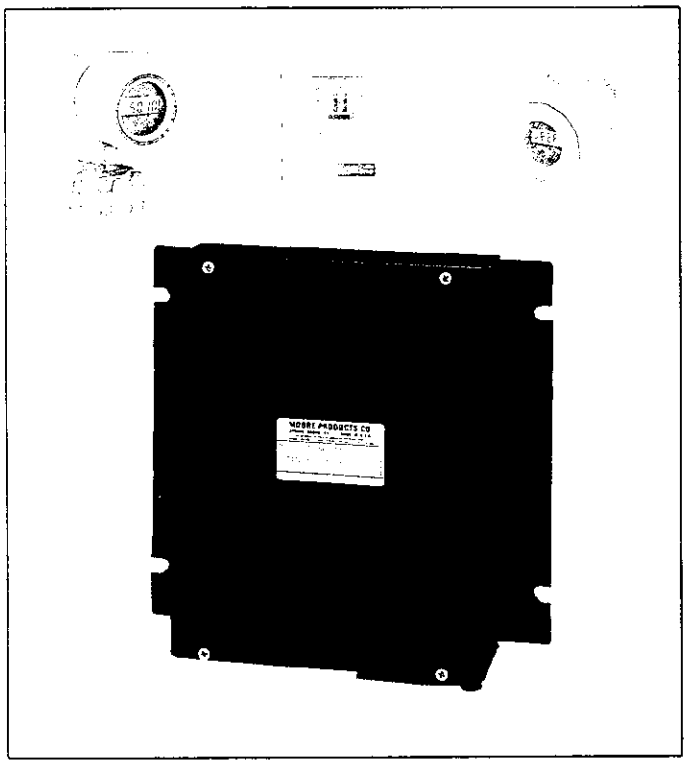
MOORE®

UM325-1
Issue 2
October 1995



Model 325 URICA™

Universal Remote Interface
For
Control & Acquisition
User's Manual

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CHANGES FOR ISSUE 2, OCTOBER 1995

Section 1.3 Product Support added.

In Section 2, installation wiring Figures 2-3, 2-4, and 2-5 have been added.

In Section 3.1.4, Table 3-9 and the related example have been corrected.

1. INTRODUCTION

This User's Manual is for the Model 325 Universal Remote Interface for Control and Acquisition (URICA™). It contains installation, hardware configuration, and maintenance procedures.

IMPORTANT

Save this User's Manual for installing, configuring, operating and servicing a Model 325 URICA.

1.1 SECTION CONTENTS

This User's Manual is divided into six sections as follows:

Section 1, INTRODUCTION, provides an overview of URICA.

Section 2, INSTALLATION, provides general installation considerations, environmental considerations, and mounting and wiring guidelines.

Section 3, COMMUNICATION SETTINGS, describes the communication settings for the available protocols. Information on DIP switch settings is included in this section.

Section 4, MODBUS COMMUNICATIONS, provides a description of the MODBUS mapping and message formats.

Section 5, MAINTENANCE, furnishes preventive maintenance guidelines, troubleshooting, and subassembly replacement procedures.

Section 6, MODEL DESIGNATION AND SPECIFICATIONS, provides information on model designation and specifications.

1.2 PRODUCT DESCRIPTION

The Model 325 Universal Remote Interface for Control and Acquisition (URICA) interfaces remote HART® field devices to a variety of central control systems such as DCS, PLC, MODBUS masters, and general purpose computer. Through URICA, the user can communicate with field devices to send commands to the Model 348 FIELDPAC™ field mounted controller to change setpoints or request process or station data. URICA also provides an interface to the XTC™ line of transmitters to obtain process information, range limits, damping, and loop data from transmitter-controllers.

The front panel faceplate, shown in Figure 2-2, contains LED status lights, all terminal connections, and an RS232 port. Asynchronous communications between URICA and a user's control system can be via either RS232, RS422, or RS485. DIP switches on the circuit board are set to establish communications format.

URICA can be mounted in an industrial enclosure, instrument cabinet, or on a desk.

The Model 325 URICA is designed for ease of installation. Simply connect URICA to multi-drop HART field devices with unique polling addresses, and turn URICA on. The 325 will automatically find the transmitters and start polling information from them.

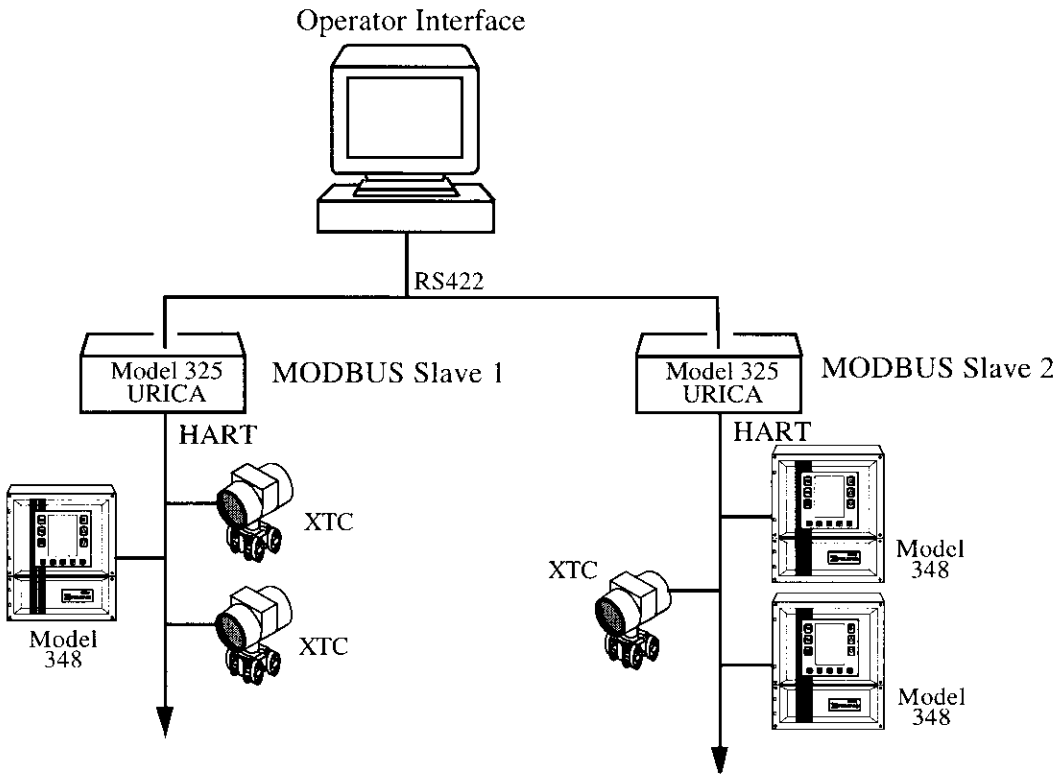


FIGURE 1-1 Typical Application

1.3 PRODUCT SUPPORT

Product support can be obtained from the Moore Products Co. Technical Information Center (TIC). TIC is a customer service center that provides direct phone support on technical issues related to the functionality, application, and integration of all products supplied by Moore Products Co.

To contact TIC for support, either call 215-646-7400, extension 4TIC (4842) or leave a message in the bulletinboard service (BBS) by calling 215-283-4968. The following information should be at hand when contacting TIC for support:

- Caller ID number, or name and company name

  When you call for support for the first time, a personal caller number is assigned. This number is mailed in the form of a caller card. Having the number available when calling for support will allow

the TIC representative taking the call to use the central customer database to quickly identify the caller's location and past support needs.

- Product part number or model number and version

- If there is a problem with product's operation:
  - Is problem intermittent
  - The steps performed before the problem occurred
  - Any error messages displayed
  - Installation environment

2. INSTALLATION

This Section describes installation of a Model 325 Universal Remote Interface for Control & Acquisition (URICA™). Topics include: handling and storage, installation considerations, and mechanical and electrical installation.

IMPORTANT

The installation must conform to the National Electrical Code and all other applicable construction and electrical codes.

2.1 EQUIPMENT DELIVERY AND HANDLING

2.1.1 Factory Shipment

Prior to shipment, URICA is fully tested and inspected to ensure proper operation. It is then packaged for shipment.

2.1.2 Receipt of Shipment

Each carton should be inspected at the time of delivery for possible external damage. Any visible damage should be immediately recorded on the carrier's copy of the delivery slip.

Each carton should be carefully unpacked and its contents checked against the enclosed packing list. At the same time, each item should be inspected for possible previously hidden damage that may or may not have been accompanied by exterior carton damage.

If it is found that some items have been damaged or are missing, notify Moore Products Co. immediately and provide full details. In addition, damages must be reported to the carrier with a request for their on-site inspection of the damaged item and its shipping carton.

2.1.3 Storage

If the unit is to be stored for a period prior to installation, review the environmental specifications in Section 6.3.

2.1.4 Return Shipment

Call the Service Department at (215) 646-7400, ext 4RMA (4762) weekdays between 8:00 a.m. and 4:45 p.m. Eastern Time to obtain an RMA (Return Material Authorization) number. Mark the RMA number prominently on the outside of the return shipment.

When calling for an RMA number, provide the reason for the return. If returning equipment for repair, failure information (e.g. error code, failure symptom, installation environment) will be requested. A purchase order number will be requested.

MATERIAL SAFETY DATA SHEET

A Material Safety Data Sheet (MSDS) must be included with each item being returned that was stored or used anywhere hazardous materials were present.

PACKAGING

Package assembly in original shipping materials. Otherwise, package it for safe shipment or contact the factory for shipping recommendations.

2.2 ENVIRONMENTAL CONSIDERATIONS

Many industrial processes create severe environmental conditions. The conditions at each URICA location must be within the specifications stated in Section 6.3.4.

The Model 325 URICA is designed to perform in industrial environments; however, it is prudent to locate the unit to minimize the effects of heat, vibration, shock, and electrical interference.

CAUTION

Exceeding the specified operating temperature limits can adversely affect performance and may cause damage.

2.3 INSTALLATION

Section 2.3.1 outlines basic considerations to achieve a successful installation. Sections 2.3.2 and 2.3.3 describe the mechanical and electrical installation.

2.3.1 Installation Considerations

The steps necessary to install URICA are summarized below.

- Determine hardware configuration by selecting the MODBUS address, interface standard, baud rate, data format and other communications related characteristics. Set hardware configuration switches. See Section 3.
- URICA communicates with devices on the HART bus and with a user's control system (computer) or modem. Switches within URICA must be set to establish communications and Section 6.2 lists accessories used when RS232C interface standard is selected.
- Select mounting location; observe environmental requirements. See section 2.2.
- Mechanically install URICA. See Section 2.3.2
- Electrically install URICA and selected accessories. See sections 2.3.3.

Typical URICA mounting locations are:

- A vibration-free instrument panel
- A NEMA 4 enclosure
- The desk or cabinet with the user's computer or modem

The location should be indoors or sheltered from the weather. Refer to Section 6.3 for URICA operating temperature limits and operating humidity range. Note that the air surrounding an operating the unit must be kept below 75°C (167°F).

Industrial environments often contain particulate, liquid, and gaseous contaminants. Particulate matter, usually dust and dirt, is abrasive and can cause intermittent contact in connectors associated with circuit subassemblies. A layer of dust on circuit boards can have a corrosive effect on metal, rubber, plastic, and circuit board components. Extended exposure to these contaminants may result in equipment malfunctions.

To reduce contaminant related to equipment malfunctions:

- Identify contaminants and implement methods to reduce their presence.
- When cleaning equipment and surrounding areas, especially the floor, either vacuum away all dust and dirt or use a dampened rag or mop. Sweeping or dry dusting recirculates dust and dirt.
- Clean or replace all air conditioning filters, room air filters, and equipment filters regularly.
- Inform all personnel with access to the equipment of the need for cleanliness.

2.3.2 Mechanical Installation

This section describes mechanical installation of URICA. The unit can be mounted in any orientation, preferably so the faceplate LEDs can be viewed. Allow sufficient clearance for wiring the screw terminals and for cover removal to set the internal communication switches.

2.3.2.1 Mounting

Mount URICA to a flat surface with user-supplied 1/4 inch bolts as described below.

1) Determine mounting hardware. See Figure 2-1 and Figure 6-1.

2) Lay out the mounting hole pattern on the selected surface. Drill four mounting holes in the wall or plate [typically, 0.281 (9/32) inch diameter to accept 1/4 inch bolts].

   Consider the thickness of the mounting surface and the selected mounting hardware (e.g. screw anchors, nuts and washers) in determining mounting bolt length.

3) Place URICA against the surface and align the mounting cutouts in the flanges with the surface mounting holes. Install user-supplied 1/4 inch bolts, washers, and hex nuts.

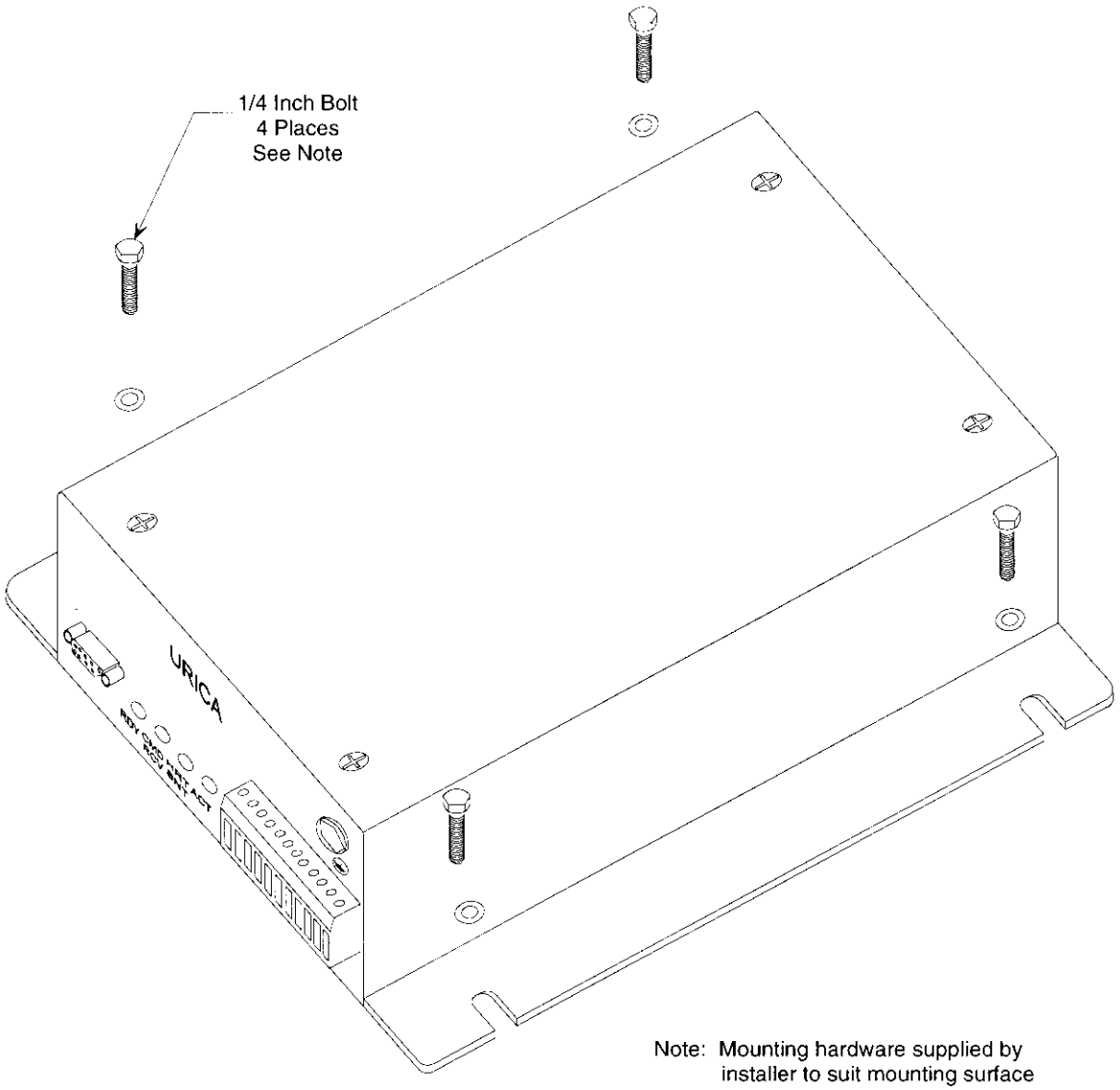


FIGURE 2-1 Mounting Diagram

2.3.3 Electrical Installation

This section describes the electrical connections to URICA. Figure 2-2 shows the unit's faceplate. The removable screw terminals (see Figure 5-1) will accommodate wire sizes up to 14 AWG. Terminal assignments are shown in Table 2-1. There is a DB9 female RS232C connector and a terminal block on the faceplate. Figures 2-3, 2-4, and 2-5 show typical installation wiring.

WARNING

Electrical shock hazard. Remove power from all involved wires and terminals before wiring or servicing.

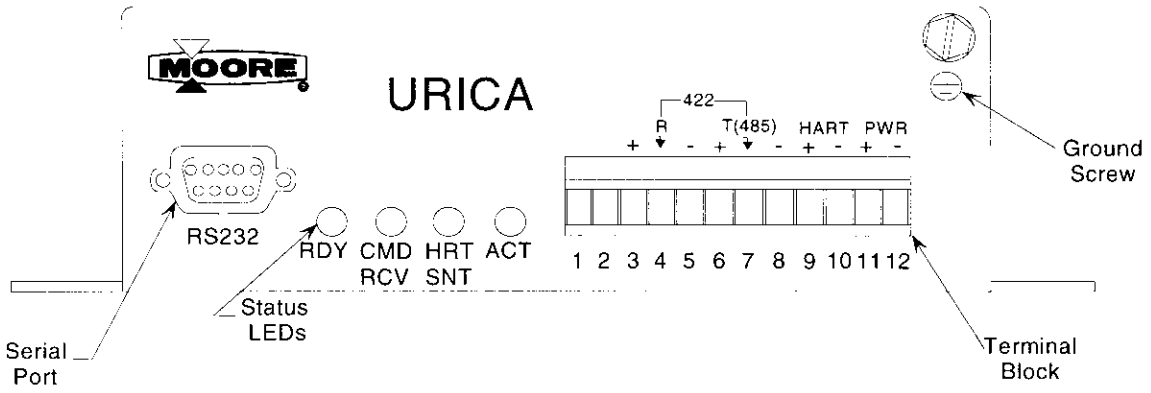


FIGURE 2-2 URICA Faceplate

TABLE 2-1 Terminal Assignments

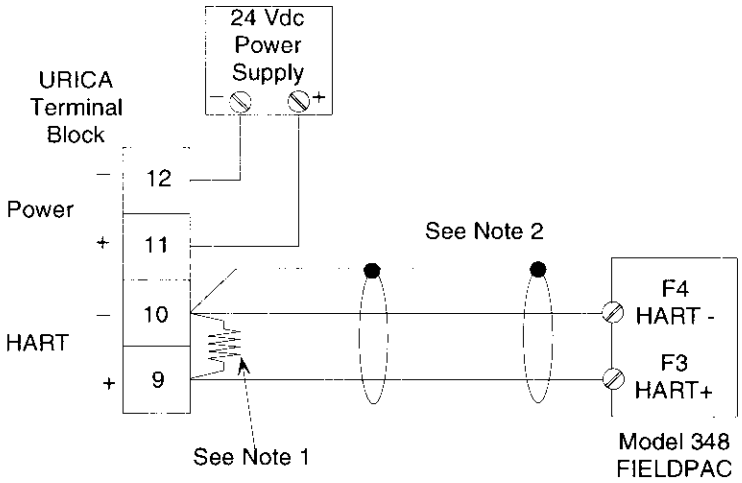
TERMINAL	CONNECTION
1	Not Used
2	Not Used
3	Receive +
4	RS422 Common
5	Receive -
6	Transmit +
7	RS422/485 Common
8	Transmit -
9	Hart +
10	Hart -
11	Power +
12	Power -

2.3.3.1 DC Power Input Connections

Terminal 11 (PWR+) is the +24 Vdc connection for the power supply.

Terminal 12 (PWR-) is the common connection for the power supply.

Refer to Section 6.3 for power supply specifications.



Notes:

1. 250 ohm resistor recommended. Total network resistance must be greater than 230 and less than 1100 ohms to support communication.
2. Cable shield is grounded only at URICA.

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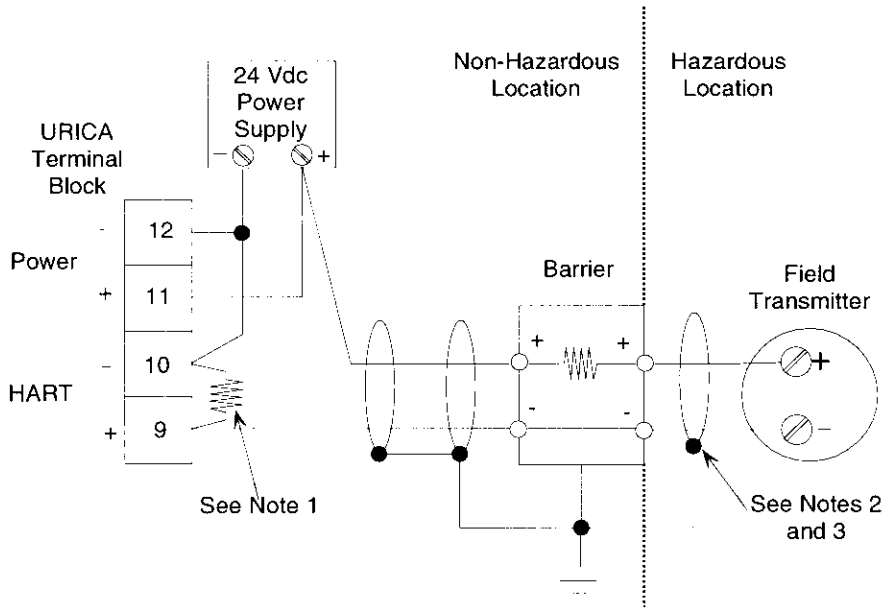
1 of 2

FIGURE 2-3 URICA to Model 348 Connections

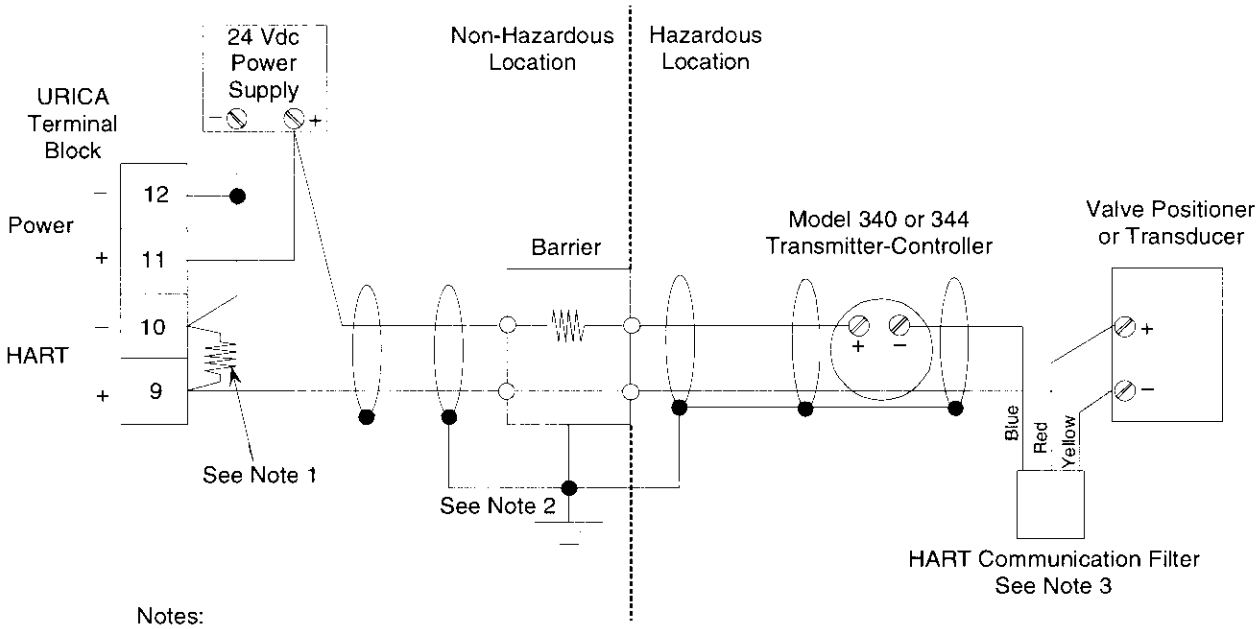


Notes:

X02935S0
2 of 2

1. 250 ohm resistor recommended. Total network resistance must be greater than 230 and less than 1100 ohms to support communication.
2. Cable shield is grounded only at the barrier.
3. All cable shields at a barrier should be connected to earth ground.

FIGURE 2-4 URICA to Field Transmitter Connections, Hazardous Location



Notes:

1. 250 ohm resistor recommended. Total network resistance must be greater than 230 and less than 1100 ohms to support communication.

2. Cable shield is grounded only at the barrier. All cable shields at a barrier should be connected to earth ground.

X02034S0

3. A transducer or valve positioner (e.g. Moore Products Co. Model 77, 771, 750E) with high resistive or inductive input impendence requires a communication filter (PN 16202-3) to allow HART communication between devices in the loop.

   The communication filter increases the loop voltage requirement by 5.2 volts because the filter's 237 ohm series resistor must be included in the loop resistance calculation.

4. URICA can communicate with one Model 340 or 344 Transmitter-Controller on a point-to-point network.

FIGURE 2-5 URICA to Transmitter-Controller Connections, Hazardous Location

2.3.3.2 HART Connections

Installation diagrams are shown in Figures 2-3, 2-4, and 2-5. As shown, URICA communicates with either:

- one HART field device (e.g., XTC transmitter-controller or transmitter only or Model 348) on a point-to-point network or
- up to 15 HART field devices (e.g., XTC transmitter only or Model 348) on a multi-drop network.

At URICA, the HART communication link is connected to terminals 9 (HART +) and 10 (HART -). A current sense resistor should be connected between terminals 9 and 10. When connecting to a Model 348 or XTC this resistor is typically 250Ω. Refer to the field device's installation instructions for more information. See Table 2-2 for recommended HART cable.

TABLE 2-2 HART Two-Wire Cable

Type	Twisted single-pair, shielded, copper
Conductor Size for Network Length: Less than 5000 ft. (1500m) More than 5000 ft (1500m)	 24 AWG minimum 20 AWG minimum, 16 AWG maximum
Cable Capacitance	Refer to Appendix G
Recommendation	Beldon 8641, 24 AWG Beldon 8762, 20 AWG
Length, Maximum	Refer to Appendix G

2.3.3.3 RS232C Serial Port Cable Connections

Table 2-3 shows the pin-out and functions of URICA's RS232 serial port lines. URICA can be set as either a DTE (Data Terminal Equipment) or DCE (Data Circuit-Terminating Equipment) device. Refer to section 3.1.2.5 for information on configuring the communication terminal mode. The factory setting is DCE. In most cases:

- If URICA is communicating with a modem, set it for DTE.
- If URICA is connected directly to a computer, set it to DCE.

The cable between URICA and a master will require a minimum of three lines: TXD, RXD, and SG. Refer to the MODBUS master's documentation to see what connections it requires. A modem typically requires RTS/CTS handshaking. Refer to Section 3.1.3.1 to set the handshaking.

TABLE 2-3 URICA RS232 Serial Port Layout

PIN #	ABBR	DESCRIPTION	DIRECTION DTE	DCE
1	---	---	---	---
2	RXD	Received Data	Input	Output
3	TXD	Transmitted Data	Output	Input
4	---	---	---	---
5	SG	Signal Ground	N/A	N/A
6	---	---	---	---
7	RTS	Request To Send	Output	Input
8	CTS	Clear To Send	Input	Output
9	---	---	---	---

2.3.3.4 RS422 Connections

URICA supports 4-wire RS422 communications. Table 2-4 shows these connections to the terminal block. Shields can be connected to the common terminals. The bus should be terminated with a 120 ohm resistor (Part Number 14700-121G) at both ends.

TABLE 2-4 RS422 Connections

TERMINAL	CONNECTION
3	Receive + (RX+)
4	Common
5	Receive - (RX-)
6	Transmit + (TX+)
7	Common
8	Transmit - (TX-)

2.3.3.5 RS485 Connections

URICA supports 2-wire RS485 communications. Table 2-5 shows these connections to the terminal block. Shields can be connected to the common terminals. The bus should be terminated with a 120 ohm resistor (Part Number 14700-121G) at both ends.

TABLE 2-5 RS485 Connections

TERMINAL	CONNECTION
6	Transmit +
7	Common
8	Transmit -

3. COMMUNICATION SETTINGS

This section describes the communication settings for the Model 325 URICA.

3.1 BIT SWITCH SETTINGS

This section briefly describes and locates the hardware configuration switches in URICA. These switches are set to establish communications compatibility with a computer or modem.

Settings are both hardware and software dependent. The user must set the switches at time of installation. Refer to Figure 3-1 for bit switch locations.

IMPORTANT

URICA reads the bit switch settings only on power up. After changing the bit switch settings, remember to repower URICA. Otherwise, the changes will not take affect.

3.1.1 Switch 1

Switch 1 is not used.

3.1.2 Switch 2

This section describes the bit switch settings for switch number 2.

3.1.2.1 SW2-1, -2, -3 Baud Rate Selection

The baud rate of the computer port is determined by the positions of the baud rate selection switches on SW2. The following baud rates are available:

TABLE 3-1 Baud Rate Selection

SW2-1	SW2-2	SW2-3	BAUD RATE
OFF	OFF	OFF	9600
OFF	OFF	ON	19200
OFF	ON	OFF	38400
OFF	ON	ON	57600
ON	OFF	OFF	115200
ON	OFF	ON	300
ON	ON	OFF	1200
ON	ON	ON	2400

3.1.2.2 SW2-4 Data Bits

The number of data bits can be set to 7 or 8 as follows:

TABLE 3-2 Data Bits

SW2-4	# of Data Bits
OFF	8
ON	7

3.1.2.3 SW2-5, 6 Parity

The parity settings are shown in Table 3-3.

TABLE 3-3 Parity

SW2-5	SW2-6	Parity
OFF	OFF	NONE
OFF	ON	ODD
ON	OFF	EVEN
ON	ON	NONE

3.1.2.4 SW2-7 Computer Port Configuration

The selection of either RS232 or RS422/485 is determined by bit position SW2-7.

TABLE 3-4 Computer Port Configuration

SW2-7	Communications
OFF	RS232
ON	RS422/485

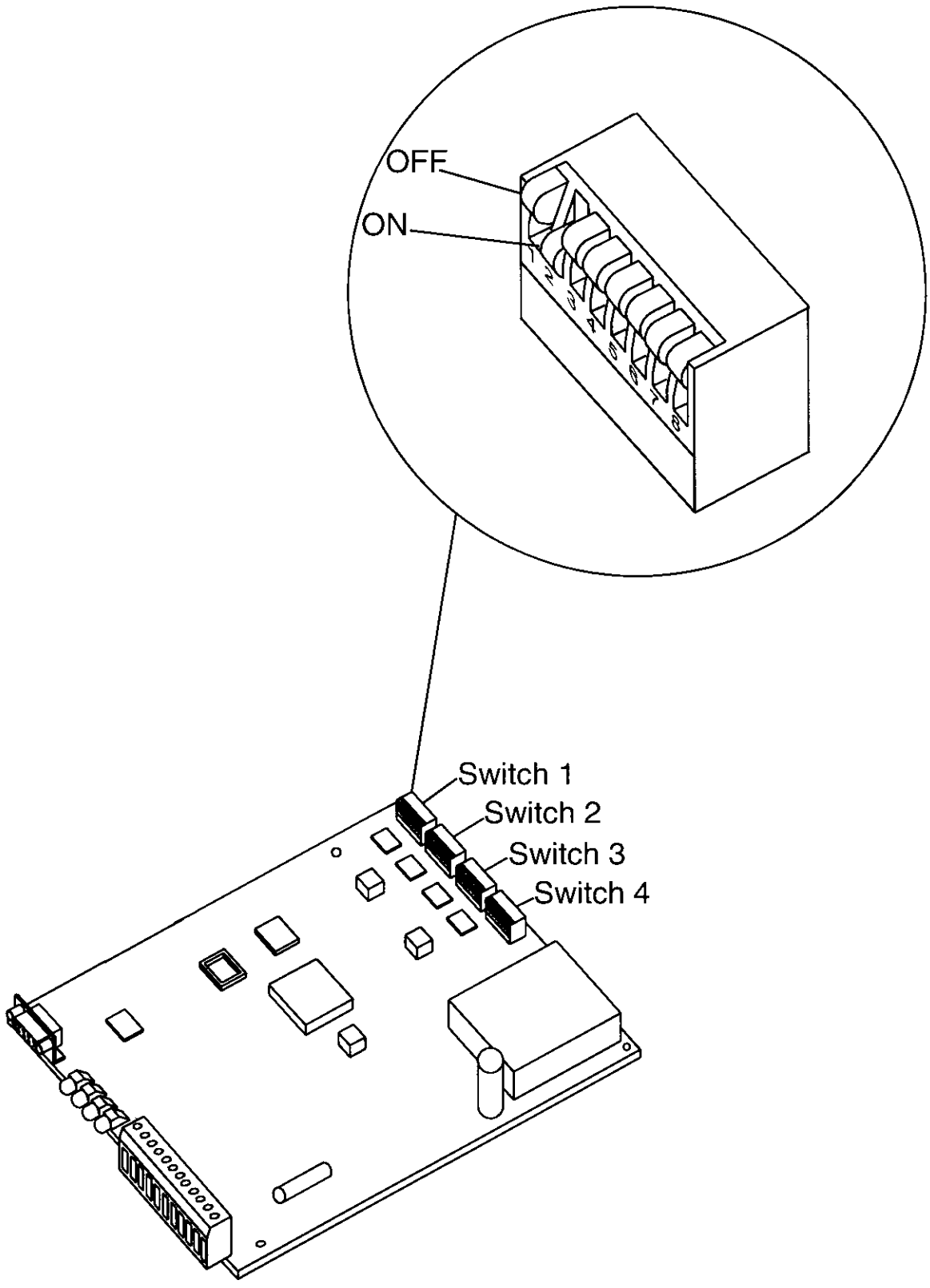


FIGURE 3-1 Model 325 URICA Bit Switches

3.1.2.5 SW2-8 Serial Setup 1

The options for this bit switch are defined by the position of SW2-7.

SW2-7 = OFF: COMMUNICATION TERMINAL MODE
When RS232 communications is selected in bit switch 2-7, then bit switch SW2-8 selects the communication terminal mode of the station.

TABLE 3-5 DTE/DCE Terminal Setting

SW2-8	Communication Terminal
OFF	DCE
ON	DTE

SW2-7 = ON: RS422/485 4 or 2 WIRE MODE
When RS485 communication is selected, SW2-8 is used to specify 2-wire or 4-wire communications.

TABLE 3-6 2-Wire or 4-Wire Mode

SW2-8	# of Wires
OFF	4-wire
ON	2-wire

3.1.3 Switch 3

This section describes the settings for switch number 3.

3.1.3.1 SW3-1 CTS Hardware Handshaking

This bit is used when the device communicating with URICA via RS232 requires CTS hardware handshaking. This most often occurs when URICA is attached to a Hayes® compatible modem.

TABLE 3-7 CTS Hardware Handshaking

SW3-1	CTS HANDSHAKING
OFF	Disabled
ON	Enabled

3.1.3.2 SW3-2 Reserved - Not used.

3.1.3.3 SW3-3 Protocol

This bit is used to select the MODBUS protocol.

TABLE 3-8 Protocol

SW3-3	Protocol
OFF	Reserved
ON	MODBUS

3.1.3.4 SW3-4 Reserved - Not used.

3.1.3.5 SW3-5 32-Bit Word Ordering

When this switch is OFF, URICA will set the byte ordering for 32-bit values (floating point, double integers), similar to Modicon™ PLCs.

That is, a Modicon 32-bit value is sent as two registers and the transmitted byte order is:

Register x = bytes 1 and 0, Register x+1 = bytes 3 and 2

For example, a floating point value in a Modicon PLC-compatible slave device is stored in Registers 40001 and 40002. If the current value is 100.00, it would be transmitted via MODBUS protocol as:

40001	40002
00 00	42 C8

Using standard IEEE single-precision floating point format, this would be interpreted as the value 100.00 REAL.

When this parameter is ON, URICA "word-swaps" the byte order from the Modicon byte order. That is, the value above would be transmitted as:

40001	40002
42 C8	00 00

The word swapping is done only for REAL, DINT, or UINT data.

3.1.3.6 SW3-6,7,8: Reserved - Not Used

3.1.4 SWITCH 4 - MODBUS Address Selection

A MODBUS address can range from 1 to 247. The MODBUS address of URICA is determined by **adding one (1)** to the sum of the switches in the ON position. Table 3-9 shows the value of each switch.

TABLE 3-9 MODBUS Address Selection

Switch	Value
SW4-1	1
SW4-2	2
SW4-3	4
SW4-4	8
SW4-5	16
SW4-6	32
SW4-7	64
SW4-8	128

For example, if SW4-2 and SW4-4 are ON, the address is:

2 + 8 + 1 = 11

An address greater than 247 is not valid.

4. MODBUS COMMUNICATIONS

4.1 DESCRIPTION

The MODBUS protocol is used by AEG Modicon (formerly Gould) programmable logic controllers (PLCs) and by many types of specialty instruments such as analyzers, chromatographs, weigh scales, HMIs, RTUs, and other DCSs. MODBUS is a master/slave protocol in which a single master can address multiple slaves. The slave devices do not initiate communication; they wait for a command from the master, which issues a request to read or write data values.

Many devices in the control industry act as MODBUS masters, such as Human-Machine Interfaces (HMIs), Remote Terminal Units (RTUs), data acquisition systems, and distributed control systems. The slave URICA will respond to commands from the MODBUS master to change (write) values to the attached field devices.

In the MODBUS system, **coils** are addresses from 00001 to 09999 (1 to 9999), **input registers** are 30001 to 39999, and **holding registers** are 40001 to 49999.

Analog values stored in URICA, such as REALs, DINTs, UINTs, STRINGs, and 1 reg WORDs are mapped to input registers (3xxxx) or holding registers (4xxxx). Input registers are read-only and will always represent the actual values retrieved from the field devices. Holding registers are read/write and act in a promissory nature. When a write is sent to a holding register, the holding register will change to reflect the desired value which was written. Because there is a delay between MODBUS communications and HART communications, the holding register is not the actual value received from the HART field device until the HART response, caused by the write command, is received from the field device. The purpose of this is to give the operator immediate feedback when writing to a register. It also eliminates a bouncing effect, if the data is updated after the operator change but just prior to the write command being sent out the HART port.

Discrete values are mapped to coils (0xxxx). These values are not promissory in nature. Therefore, when a change is made, the data stored in URICA will not be changed until a response is received from the field device.

4.2 MAPPING

The MODBUS register mapping is split in sections for each field device and the Model 325 station information. This is shown in the database layout table in Appendix A.

The information for each poll address is separated by data type. By separating by data type, MODBUS masters which cannot mix data types will be able to do multiple register reads. To reduce the number of MODBUS transactions, each field device has the most commonly accessed data in the Quick Access section of the database. For example, when connected to 4 Model 348 FIELDPACs, only 1 MODBUS transaction is required to retrieve the Quick Access information from all 4 devices.

Refer to 325 station, 348, XTC and Generic transmitter database maps located in Appendices A, B C, D, and E.

4.3 MESSAGE FORMATS

The following MODBUS messages are supported by URICA.

4.3.1 Read Coil Status

This command reads the on/off status of Output Coils (addresses 00001 to 09999 decimal) in the addressed slave. The maximum number of coils that can be read by a MODBUS master using Command 01 is 2000.

4.3.2 Read Input Status

This command reads the on/off status of Input Coils (addresses 10001 to 19999 decimal) in the addressed slave. The maximum number of coils that can be read by a MODBUS master using Command 02 is 2000.

4.3.3 Read Holding Registers

This command reads the Holding Registers (addresses 40001 to 49999 decimal) in the addressed slave. The maximum number of registers that can be read by a MODBUS master using Command 03 is 126 registers for values with 2 bytes (i.e. 16-bit WORD, INT, UINT, BOOL) or 63 for values with 4 bytes (i.e. 32-bit REAL, DINT, UINT).

4.3.4 Read Input Registers

This command reads the Input Registers (addresses 30001 to 39999 decimal) in the addressed slave. The maximum number of registers that can be read by a MODBUS master using Command 04 is 126 registers for values with 2 bytes (i.e. 16-bit WORD, INT, UINT, BOOL) or 63 for values with 4 bytes (i.e. 32-bit REAL, DINT, UINT).

4.3.5 Force Single Coil

This command changes the state of a single 0xxxx coil.

4.3.6 Preset Single Register

This command changes the value of a single 4xxxx Holding Register.

4.3.7 Loopback Test

This command causes URICA to re-transmit the received data from the MODBUS master.

NOTE

The implementation of the Loopback Test requires that the first word of data, after the Diagnostic Code portion, indicate the number of words (registers) being transmitted. For example, when the Master sends a Loopback Test command with Diag. Code = 00 00, followed by 6 registers of data, the value in the first data register should be 00 06.

4.3.8 Preset Multiple Registers

This command changes the value of multiple 4xxxx holding registers. When changing the value of a floating point or double integer address that uses two consecutive registers, this command must be used (Function Code 06 will not work).

4.3.9 Report Slave ID

This command will cause URICA to respond with nine bytes of data, similar to a Modicon 984 PLC.

Byte	Contents	
1	09	Slave ID
2	FF	Run Indicator
3	00	not used
4	00	not used
5	00	not used
6	00	not used
7	A0	power on, run (may not reflect actual URICA conditions)
8	00	not used
9	00	not used

4.4 MODBUS ERROR CODES

Table 4-1 shows the exception response codes supported by the Model 325 URICA. Illegal data in a message or difficulty in communicating with URICA will result in exception code responses. When URICA detects one of these errors, it sends a response message to the master consisting of slave address, function code, error code and error check fields. To indicate that the response is a notification of an error, the high order bit of the function code is set to 1.

TABLE 4-1 MODBUS Exception Response Codes

CODE	NAME	MEANING
01	ILLEGAL FUNCTION	The message function received is not an allowable action for the slave. If a poll command was issued, this code indicates that no program function preceded it.
02	ILLEGAL DATA ADDRESS	The address referenced in the data field is not valid for the addressed slave location.
03	ILLEGAL DATA VALUE	The value referenced in the data field is not allowable in the addressed slave location.

5. MAINTENANCE

Model 325 URICA maintenance requirements are minimal. Activities such as cleaning and visual inspection should be performed at regular intervals. The severity of URICA's operating environment will determine the frequency of maintenance. Additional topics in this section include troubleshooting, board replacement, and recommended spare and replacement parts. If technical assistance is needed, refer to Section 1.3 Product Support.

5.1 PREVENTIVE MAINTENANCE

The objective for establishing a preventive maintenance program is to provide maximum operating efficiency by reducing down time.

5.1.1 Cleaning

URICA should be cleaned as often as operating conditions require. Excessive accumulation of dust or dirt on the case prevents efficient heat dissipation and can cause overheating and component breakdown. A damp cloth can be used to clean the case.

Circuit boards should not be cleaned unless accumulated foreign material is causing a problem. The enclosed design should prevent matter from building up. If cleaning becomes necessary, remove debris with either a soft brush or low velocity deionized air.

5.1.2 Visual Inspection

As part of a preventive maintenance program, URICA should be visually inspected. Terminal block connections should be checked periodically. Remove the cover and look for damaged or heat stressed parts on the circuit boards. Check for excessive dirt or dust build-up which may impede air flow and inhibit proper heat dissipation.

5.2 CIRCUIT BOARD HANDLING

Special handling procedures are required whenever a circuit board is removed, adjusted or installed in the case. These procedures are required to prevent component damage from the electrostatic discharge hazard to which most semiconductors are vulnerable. Electrostatic discharge (ESD) can damage semiconductor devices. Handling procedures that prevent the build up of electrostatic potentials are required whenever circuit boards are handled. When handling a circuit board, follow the procedures outlined in the Board Replacement section of this instruction.

5.3 FUSE LOCATION

A power input fuse is located on the circuit board as shown in Figure 5-1. A replacement fuse may be obtained from any local electronics supplier or may be order from the factory. Refer to the Parts List at the back of this instruction for fuse part number and description.

To replace the fuse, refer to section 5.5 for removal and installation of the cover. Visually inspect the circuit board for damaged or overheated components. Insert a new fuse and install the cover. Reconnect the terminal strip and apply power. Operate URICA off-line for several minutes to be sure that a condition does not exist which will cause the replacement fuse to fail.

5.4 TROUBLESHOOTING

Troubleshooting URICA is done by interpreting the status of 4 LEDs on the faceplate. Upon power up, a lamp test is performed to verify that all 4 LEDs light.

TABLE 5-1 LED Maintenance Indicators

LED	MEANING	OPERATION
RDY	Ready	Normally ON continuously following start-up. Any other indication indicates a problem at the station or it's interconnections.
CMD RCV	Command Received	Turned ON whenever this station is addressed by the MODBUS initiator. Remains on until the response is sent, or if no response is sent, until the operation is terminated.
HRT SNT	Hart Command Sent	This light is lit every time a HART command is sent to a field device.
ACT	Active	Flashes steady indicating normal operation

5.4.1 MODBUS Communications

Problem: URICA is not communicating to the MODBUS master.

The CMD RCV LED should light each time a MODBUS command is received. If it does not light, proper communication is not occurring. Check the following:

1. The communication DIP switch settings in Section 3 must match the communication settings of the MODBUS master (or modem if used).

2. Check the cable connections. Verify the pinout of the cable.

3. If communicating to a modem (or other DCE device), check to see that SW2-8 is set to ON. Refer to Section 3.1.2.5 for more information.

Problem: All HART data is 999999.9.

When URICA is powered, the HART data is defaulted to 999999.9.

5.4.2 HART Communications

Following the lamp test, URICA will poll for any devices on the HART bus. This can take up to 30 seconds. After this initial poll cycle, URICA will begin communicating continuously with each HART device. The HRT SNT LED should light approximately twice a second. If the HRT SNT LED is lighting approximately once a second, URICA is not communicating with the HART devices. Recheck

the wiring. Make sure there is a proper current sense resistor across terminals 8 and 9. Refer to the transmitter's installation procedures for more information.

5.5 BOARD REPLACEMENT

As is the case with most circuit boards populated with semiconductor components, precautions must be observed to prevent component damage from ESD (electrostatic discharge). Accordingly, a maintenance kit (P/N 15545-110) containing a wrist strap and a conductive mat must be used whenever a board is removed from or installed in the case.

An uninstalled URICA board must be stored in a static shielding bag.

To replace the circuit board, refer to Figure 5-1 and perform the following procedures:

REMOVAL

1. Unplug the terminal strip from the terminal block.

IMPORTANT

When unplugging the terminal strip, be sure to grip the connector, not the wiring.

2. Ground the wrist strap.
3. Remove 4 screws from the top of the case and place the top aside.
4. Remove 3/4 screws which attach the board to the case.
5. Slide the circuit board to the rear of the case to free the terminal strip and lift the board from the case.

INSTALLATION

1. Ground the wrist strap.
2. Remove circuit board from static shielding bag.
3. Disconnect screw terminals from the terminal block.

IMPORTANT

When unplugging the screw terminals from the terminal block, grip the two halves of the terminal strip.

4. Lower board into case, sliding the terminal strip through the front panel cutout.
5. Connect the board to the case by installing the supplied screws.
6. Plug the screw terminals into the terminal block.
7. Set the DIP switches.
8. Install the cover with the flat-head screws.
9. Make connections to terminal strip

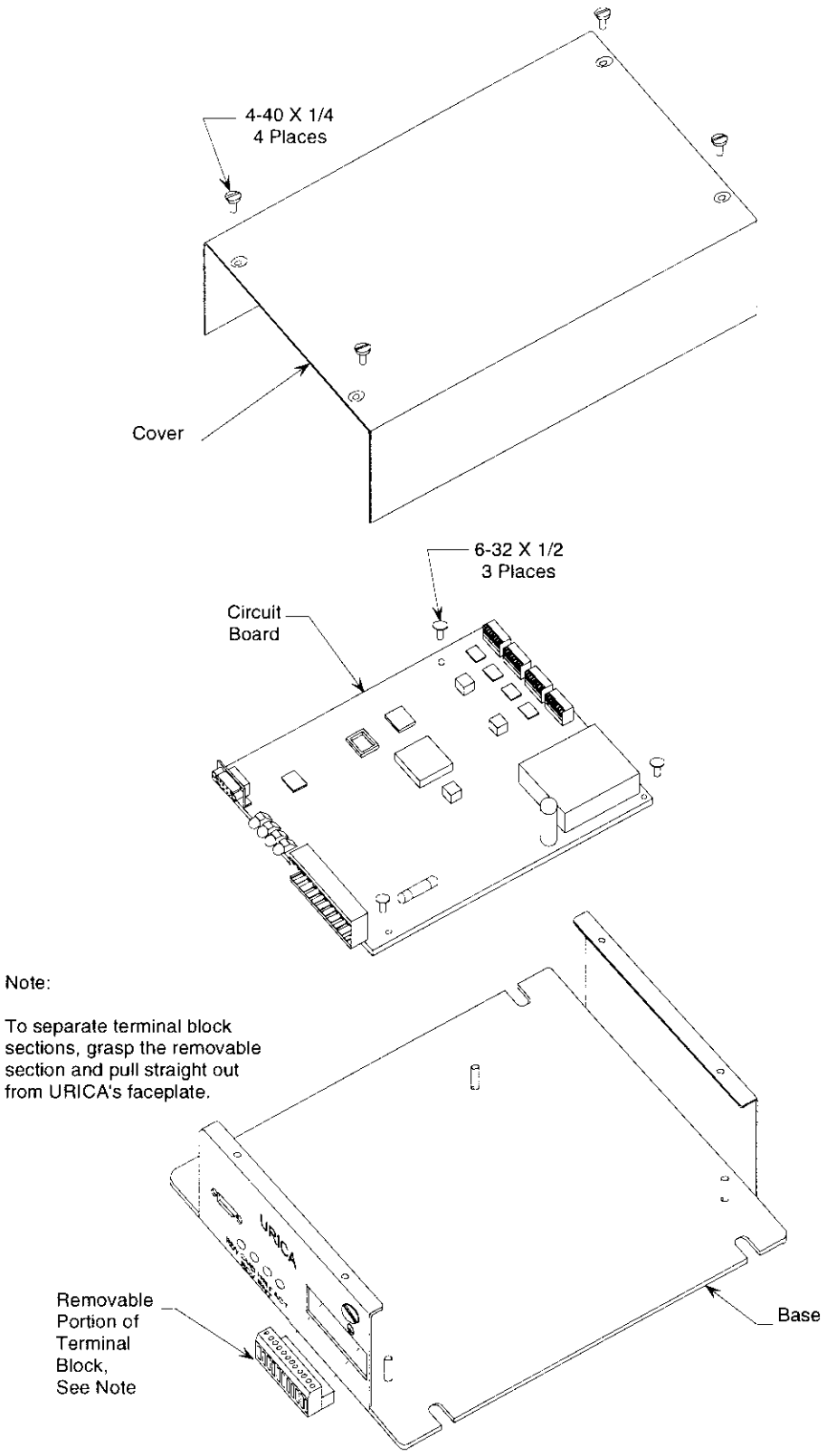


FIGURE 5-1 URICA Exploded View

5.6 RECOMMENDED SPARE AND REPLACEMENT PARTS

It is recommended that one spare of each of the following be stocked for every 1 to 10 units in service: Fuse and circuit board.

Replacement circuit boards and recommended spare parts are available from the factory. Part numbers are provided in the Parts List at the back of this manual.

IMPORTANT

When ordering a replacement or spare circuit board, provide the following data from the board to be replaced or spared.

- part number
- software compatibility code
- serial number

An item being returned to the factory should be packaged in its original shipping container. Otherwise, package for safe shipment and contact the factory as described in Section 2.1.4 Send package to one of the addresses given in the warranty statement.

IMPORTANT

A circuit board must be placed in a static shielding bag before it is packaged for shipment.

5.7 SOFTWARE COMPATIBILITY IDENTIFICATION

When changing a circuit board, consideration must be given to software compatibility. A three letter software compatibility code is used to identify URICA software. This code is stored in MODBUS register $0811 as a string.

5.8 MAINTENANCE RECORD

An accurate record keeping system for maintenance operations should be established and kept up to date. Data extracted from the record can serve as a basis for ordering supplies such as spare parts. In addition, it is useful as a troubleshooting tool by providing historical maintenance data. Scheduled and unscheduled maintenance should be recorded.

6. MODEL DESIGNATION AND SPECIFICATIONS

This section contains the model designation table, accessory list and specifications for the Model 325 URICA.

6.1 MODEL DESIGNATION

Table 6-1 identifies the model designation entry on URICA's nameplate. The nameplate also carries other important information in addition to the model designation.

- Bill of material number (BOM)
- Serial number
- Certifications - Review the certifications before installing or servicing URICA.

TABLE 6-1 Model 325, Model Designation

Basic Model Number
325H Basic Station with HART

Power Supply
D 19-28 Vdc (galvanicly isolated)

Reserved for Factory Use
N Not Used

Reserved for Factory Use
N Not Used

Reserved for Factory Use
N Not Used

Design Level
A Current Design

Hazardous Area Classification
F FM/CSA Approved, Class I, Division 2, Groups A, B, C & D

325H D N N N A F ——— Sample Model Number

6.2 ACCESSORIES

The accessories listed in Table 6-2 are available for use with the Model 325 URICA.

TABLE 6-2 Accessories

DESCRIPTION	PART NUMBER
General Purpose Power Supply, 24 Vdc, 2A	15124-1
DB9M to DB9F, 15 ft. straight-through shielded cable	16260-27
DB9M to DB25F, Adapter	16801-9
120 Ohm RS422/485 Terminating Resistor	14700-121G

6.3 SPECIFICATIONS

The following are specifications for the Model 325 URICA.

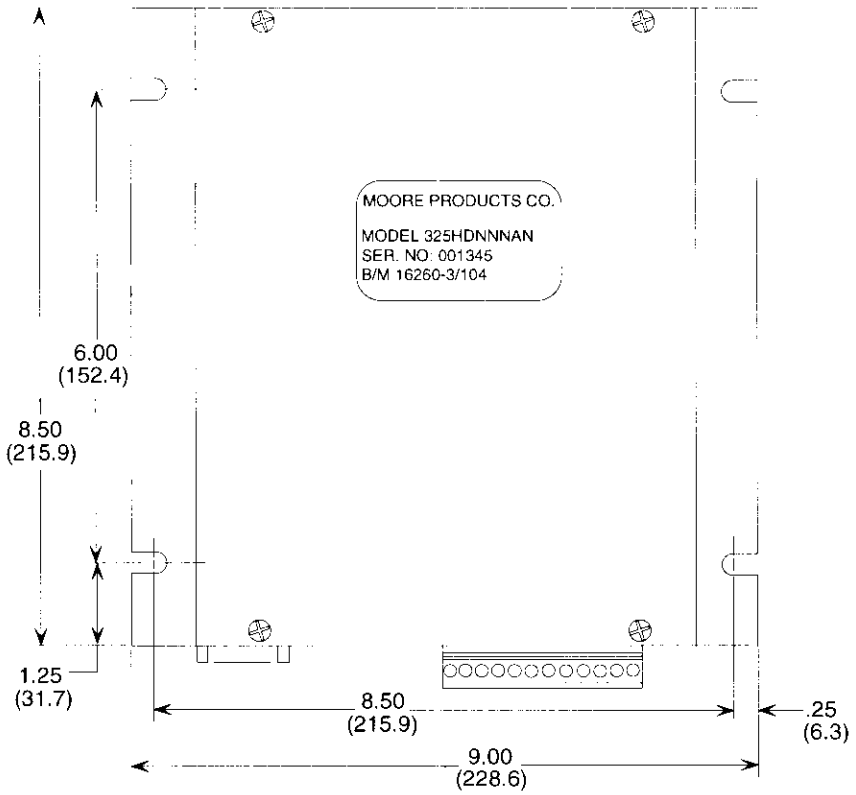
6.3.1 Mechanical

Dimensions ..... See Figure 6-1

Mounting ..... See Figure 2-1

6.3.2 Electrical

Power Requirement:
- Input Voltage..... 19-28 Vdc
- Power Consumption ..... 5 Watts maximum



Dimensions in Inches (Millimeters)

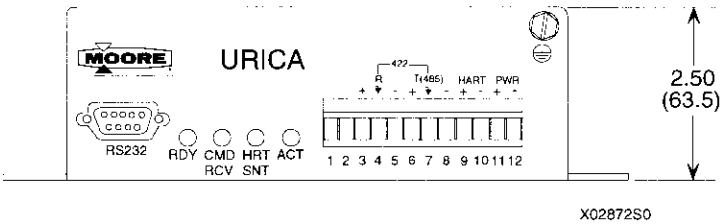


FIGURE 6-1 Dimensions

6.3.3 Communications

Computer Port

Interface Standards..... RS232, RS422, RS485

Baud Rates..... 115,200; 57,600; 38,400; 19,200; 9600; 2400; 1200; 300

RS232 Configuration.... Data Set (DCE) or Data Terminal (DTE) - switch selected

Data Format:
- Start Bits 1
- Data Bits ..... 7 or 8
- Parity ..... Even, Odd, or None
- Stop Bits 1

Connections:
- RS232 ..... DB9 female connector
- RS422, LIL, HART, DC power ..... Plug-in screw terminals

Communication Protocol ..... MODBUS RTU slave

6.3.4 Environmental

Ambient Temperature Range
- Operating Temperature Limits ..... -40° to 75°C (-40° to 167°F)
- Transportation & Storage Temperature ..... -40° to 85°C (-40° to 185°F)

Humidity
- Operating Humidity Range ..... IEC 654-1 Class D_2 (5 to 100%)
- Transportation & Storage Humidity Range ..... 0 to 100% RH non-condensing

ESD Susceptibility
- IEC801-2, HD 481.2 S1 ..... 15 kV/m to case, 5 kVm to terminals

Miswiring Protection ..... ±30 Volts

Circuit Board Protection ..... Conformally coated

Isolation ..... Galvanic isolation between Power, HART, and Communication lines

6.3.5 Electrical Classifications

Hazardous Area Classification
- Agency Approvals ..... FM/CSA Class I; Division 2; Groups A,B,C,D

Appendix A MODEL 325 URICA DATABASE LAYOUT

Model 325 URICA Station Database Layout

	1 Reg. WORD Data	Variable Length String
325 Station Data	0801	0811 to 0812

HART Device Quick Access Database Layout

Poll Address	Quick Access Reals	Quick Access PVs	Quick Access FB98 Inputs	Quick Access Booleans (Coils)
1	0001 to 0030	0501 to 0504	0601 to 0610	001 to 060
2	0031 to 0060	0505 to 0508	0611 to 0620	061 to 120
3	0061 to 0090	0509 to 0512	0621 to 0630	121 to 180
4	0091 to 0120	0513 to 0516	0631 to 0640	181 to 240
5	0121 to 0150	0517 to 0520	0641 to 0650	241 to 300
6	0151 to 0180	0521 to 0524	0651 to 0660	301 to 360
7	0181 to 0210	0525 to 0528	0661 to 0670	361 to 420
8	0211 to 0240	0529 to 0532	0671 to 0680	421 to 480
9	0241 to 0270	0533 to 0536	0681 to 0690	481 to 540
10	0271 to 0300	0537 to 0540	0691 to 0700	541 to 600
11	0301 to 0330	0541 to 0544	0701 to 0710	601 to 660
12	0331 to 0360	0545 to 0548	0711 to 0720	661 to 720
13	0361 to 0390	0549 to 0552	0721 to 0730	721 to 780
14	0391 to 0420	0553 to 0556	0731 to 0740	781 to 840
15	0421 to 0450	0557 to 0560	0741 to 0750	841 to 900

HART Device Parameter Database Layout

Poll Address	REAL Data 32 Bit Floating Point	2 Reg. Double Integer (DINT)	Variable Length STRING Data	1 Register WORD Data	1 Register Unsigned Integer (UINT)	1 Coil Boolean Data (BOOL)
1	1001 to 1150	1151 to 0164	1165 to 1232	1233 to 1258	1259 to 1275	1201 to 1264
2	1301 to 1450	1451 to 1464	1465 to 1532	1533 to 1558	1559 to 1575	1265 to 1328
3	1601 to 1750	1751 to 1764	1765 to 1832	1833 to 1858	1859 to 1875	1329 to 1392
4	1901 to 2050	2051 to 2064	2065 to 2132	2133 to 2158	2159 to 2175	1393 to 1456
5	2201 to 2350	2351 to 2364	2365 to 2432	2433 to 2458	2459 to 2475	1457 to 1520
6	2501 to 2650	2651 to 2664	2665 to 2732	2733 to 2758	2759 to 2775	1521 to 1584
7	2801 to 2950	2951 to 2964	2965 to 3032	3033 to 3058	3059 to 3075	1585 to 1648
8	3101 to 3250	3251 to 3264	3265 to 3332	3333 to 3358	3359 to 3375	1649 to 1712
9	3401 to 3550	3551 to 3564	3565 to 3632	3633 to 3658	3659 to 3675	1713 to 1776
10	3701 to 3850	3851 to 3864	3865 to 3932	3933 to 3958	3959 to 3975	1777 to 1840
11	4001 to 4150	4151 to 4164	4165 to 4232	4233 to 4258	4259 to 4275	1841 to 1904
12	4301 to 4450	4451 to 4464	4465 to 4532	4533 to 4558	4559 to 4575	1905 to 1968
13	4601 to 4750	4751 to 4764	4765 to 4832	4833 to 4858	4859 to 4875	1969 to 2032
14	4901 to 5050	5051 to 5064	5065 to 5132	5133 to 5158	5159 to 5175	2033 to 2096
15	5201 to 5350	5351 to 5364	5365 to 5432	5433 to 5458	5459 to 5475	2097 to 2160

Appendix B MODEL 325 URICA STATION DATA

Model 325 URICA Station REAL Database

Register #	Parameter	Value
0801	Device Type	$000F

Model 325 URICA Station STRING Database

Register #	Parameter
0811-0812	Software Level - MPU

Appendix C MODEL 348 FIELDPAC MODBUS MAPPING

The following tables show the MODBUS register locations of the repective Model 348 data. Each piece of 348 data is associated with function blocks in the 348. For further information on the Model 348 function blocks, refer to UM348-1.

Model 348 FIELDPAC: Quick Access REAL Data

Register #	348 Parameter	Description	Write
(30 * (PA-1)) + 0001	FB98_L1P	Loop 1 Process	
(30 * (PA-1)) + 0003	FB98_L1S	Loop 1 Setpoint	W
(30 * (PA-1)) + 0005	FB98_L1V	Loop 1 Valve	W
(30 * (PA-1)) + 0007	FB98_L2P	Loop 2 Process	
(30 * (PA-1)) + 0009	FB98_L2S	Loop 2 Setpoint	W
(30 * (PA-1)) + 0011	FB98_L2V	Loop 2 Valve	W
(30 * (PA-1)) + 0013	FB15_INX	Variable X	W
(30 * (PA-1)) + 0015	FB15_INY	Variable Y	W
(30 * (PA-1)) + 0017	FB_16 Count	Totalizer Count	
(30 * (PA-1)) + 0019	Spare (2 reg)	Spare Value	
(30 * (PA-1)) + 0021	FB98_IND	FB98 Input D	
(30 * (PA-1)) + 0023	FB98_INE	FB98 Input E	
(30 * (PA-1)) + 0025	FB98_INF	FB98 Input F	
(30 * (PA-1)) + 0027	FB98_ING	FB98 Input G	
(30 * (PA-1)) + 0029	Spare (2 reg)	Spare Value	

Model 348 FIELDPAC: Quick Access Process Variable Data

Register #	348 Parameter	Description	Write
(4 * (PA-1)) + 0501	FB98_L1P	Loop 1 Process	
(4 * (PA-1)) + 0503	FB98_L2P	Loop 2 Process	

Model 348 FIELDPAC: Quick Access FB98 Output Arrows

Register #	348 Paramter	Description	Write
(10 * (PA-1)) + 0601	FB98_70	FB98 Output 70	W
(10 * (PA-1)) + 0603	FB98_70	FB98 Output 71	W
(10 * (PA-1)) + 0605	FB98_70	FB98 Output 72	W
(10 * (PA-1)) + 0607	FB98_70	FB98 Output 73	W
(10 * (PA-1)) + 0609	FB98_70	FB98 Output 74	W

Model 348 FIELDPAC: Quick Access BOOL Data

Coil #	348 Status	Description	Write
(60 * (PA-1)) + 01	Comm. Error	348 Not Communicating	
(60 * (PA-1)) + 02	FDM (Error)	348 Field Device Malfunction	
(60 * (PA-1)) + 03	WCF	Write Command Failed	W
(60 * (PA-1)) + 04	Spare	Spare Coil	
(60 * (PA-1)) + 05	Database Updating	348 Database Updating	
(60 * (PA-1)) + 06	Spare	Spare Coil	
(60 * (PA-1)) + 07	Spare	Spare Coil	
(60 * (PA-1)) + 08	Spare	Spare Coil	
(60 * (PA-1)) + 09	FB14 A/M (Auto=1)	FB14 Auto/Manual (Auto=1)	W
(60 * (PA-1)) + 10	FB98 L/C (Local=1)	FB98 Local/Console (Local=1)	W
(60 * (PA-1)) + 11	FB14 SS	FB14 Standby Sync	
(60 * (PA-1)) + 12	FB11 E/I	FB 11 External/Internal	W
(60 * (PA-1)) + 13	FB17 Ramping SP	FB17 Ramping Setpoint	W
(60 * (PA-1)) + 14	FB10 OR	FB10 Override	
(60 * (PA-1)) + 15	FB14 EM	FB14 Emergency Manual	
(60 * (PA-1)) + 16	Config Hold	348 Configuration Hold	
(60 * (PA-1)) + 17	FB09 HL	FB09 High Limit	
(60 * (PA-1)) + 18	FB09 LL	FB09 Low Limit	
(60 * (PA-1)) + 19	FB12 A1A	FB12 Alarm 1 Active	
(60 * (PA-1)) + 20	FB12 A1NA	FB12 Alarm 1 Not Acknowledged	W
(60 * (PA-1)) + 21	FB12 A2A	FB12 Alarm 2 Active	
(60 * (PA-1)) + 22	FB12 A2NA	FB12 Alarm 2 Not Acknowledged	W
(60 * (PA-1)) + 23	FB12 A3A	FB12 Alarm 3 Active	
(60 * (PA-1)) + 24	FB12 A3NA	FB12 Alarm 3 Not Acknowledged	W
(60 * (PA-1)) + 25	FB12 A4A	FB12 Alarm 4 Active	
(60 * (PA-1)) + 26	FB12 A4NA	FB12 Alarm 4 Not Acknowledged	W
(60 * (PA-1)) + 27	Spare	Spare Coil	
(60 * (PA-1)) + 28	Error	Error	
(60 * (PA-1)) + 29	Spare	Spare Coil	
(60 * (PA-1)) + 30	Spare	Spare Coil	
(60 * (PA-1)) + 31	Spare	Spare Coil	
(60 * (PA-1)) + 32	Spare	Spare Coil	
(60 * (PA-1)) + 33	FB55 A/M (Auto=1)	FB55 Auto/Manual (Auto=1)	W
(60 * (PA-1)) + 34	Local	Local/Console (Local=1)	W
(60 * (PA-1)) + 35	FB55 SS	FB55 Standby Sync	
(60 * (PA-1)) + 36	FB23 E/I	FB 23 External/Internal	W
(60 * (PA-1)) + 37	FB46 Ramping SP	FB46 Ramping Setpoint	W
(60 * (PA-1)) + 38	FB10 OR	FB10 Override	
(60 * (PA-1)) + 39	FB55 EM	FB55 Emergency Manual	
(60 * (PA-1)) + 40	Config Hold	348 Configuration Hold	
(60 * (PA-1)) + 41	FB51 HL	FB51 High Limit	
(60 * (PA-1)) + 42	FB51 LL	FB51 Low Limit	
(60 * (PA-1)) + 43	FB73 A5A	FB73 Alarm 5 Active	
(60 * (PA-1)) + 44	FB73 A5NA	FB73 Alarm 5 Not Acknowledged	W

Coil #	348 Status	Description	Write
(60 * (PA-1)) + 45	FB73 A6A	FB73 Alarm 6 Active	
(60 * (PA-1)) + 46	FB73 A6NA	FB73 Alarm 6 Not Acknowledged	W
(60 * (PA-1)) + 47	FB73 A7A	FB73 Alarm 7 Active	
(60 * (PA-1)) + 48	FB73 A7NA	FB73 Alarm 7 Not Acknowledged	W
(60 * (PA-1)) + 49	FB73 A8A	FB73 Alarm 8 Active	
(60 * (PA-1)) + 50	FB73 A8NA	FB73 Alarm 8 Not Acknowledged	W
(60 * (PA-1)) + 51	Spare	Spare Coil	
(60 * (PA-1)) + 52	Error	Error	
(60 * (PA-1)) + 53	Spare	Spare Coil	
(60 * (PA-1)) + 54	Spare	Spare Coil	
(60 * (PA-1)) + 55	Spare	Spare Coil	
(60 * (PA-1)) + 56	Spare	Spare Coil	

Model 348 FIELDPAC: 2 Register REAL Data

Register #	348 Parameter	Description	Write
(300 * (PA-1)) + 1001	FB98_70	FB98 Output 70	W
(300 * (PA-1)) + 1003	FB98_71	FB98 Output 71	W
(300 * (PA-1)) + 1005	FB98_72	FB98 Output 72	W
(300 * (PA-1)) + 1007	FB98_73	FB98 Output 73	W
(300 * (PA-1)) + 1009	FB98_74	FB98 Output 74	W
(300 * (PA-1)) + 1011	FB15_XL	FB15 X Range Low	W
(300 * (PA-1)) + 1013	FB15_XH	FB15 X Range High	W
(300 * (PA-1)) + 1015	FB15_YL	FB15 Y Range Low	W
(300 * (PA-1)) + 1017	FB15_YH	FB15 Y Range High	W
(300 * (PA-1)) + 1019	FB19_Hold	FB98 Hold Output	W
(300 * (PA-1)) + 1021	FB16_P1	Totalizer Preset 1	W
(300 * (PA-1)) + 1023	FB16_P2	Totalizer Preset 2	W
(300 * (PA-1)) + 1025	FB16_CM	Totalizer Count Multiplier	W
(300 * (PA-1)) + 1027	Spare	Spare Value (2 reg)	
(300 * (PA-1)) + 1029	Spare	Spare Value (2 reg)	
(300 * (PA-1)) + 1031	Spare	Spare Value (2 reg)	
(300 * (PA-1)) + 1033	Spare	Spare Value (2 reg)	
(300 * (PA-1)) + 1035	Spare	Spare Value (2 reg)	
(300 * (PA-1)) + 1037	Spare	Spare Value (2 reg)	
(300 * (PA-1)) + 1039	FB98_PL1	Loop 1 Process Range Low	W
(300 * (PA-1)) + 1041	FB98_PH1	Loop 1 Process Range High	W
(300 * (PA-1)) + 1043	FB17 TSP	FB17 Target Setpoint	W
(300 * (PA-1)) + 1045	FB17 SPRT	FB17 Setpoint Ramp Time	W
(300 * (PA-1)) + 1047	FB17 SPRR	FB17 Setpoint Ramp Rate	W
(300 * (PA-1)) + 1049	FB07_R	FB07 Ratio	W
(300 * (PA-1)) + 1051	FB08_B	FB08 Bias	W
(300 * (PA-1)) + 1053	FB13_PG1	FB13 Proportional Gain	W
(300 * (PA-1)) + 1055	FB13_TI1	FB13 Time Integral	W
(300 * (PA-1)) + 1057	FB13_TD1	FB13 Time Derivative	W
(300 * (PA-1)) + 1059	FB13_DG1	FB13 Derivative Gain	W
(300 * (PA-1)) + 1061	FB13_MR1	FB13 Manual Reset	W
(300 * (PA-1)) + 1063	FB12_SA1	FB12 Setpoint Alarm 1	W
(300 * (PA-1)) + 1065	FB12_SA2	FB12 Setpoint Alarm 2	W
(300 * (PA-1)) + 1067	FB12_SA3	FB12 Setpoint Alarm 3	W
(300 * (PA-1)) + 1069	FB12_SA4	FB12 Setpoint Alarm 4	W
(300 * (PA-1)) + 1071	FB12_PUM	FB12 Power Up Manual	W
(300 * (PA-1)) + 1073	FB09_LL1	FB09 Low Limit 1	W
(300 * (PA-1)) + 1075	FB09_HL1	FB09 High Limit 1	W
(300 * (PA-1)) + 1077	Spare	Spare Value	
(300 * (PA-1)) + 1079	Spare	Spare Value	
(300 * (PA-1)) + 1081	Spare	Spare Value	
(300 * (PA-1)) + 1083	FB98_PL2	Loop 2 Process Range Low	W
(300 * (PA-1)) + 1085	FB98_PH2	Loop 2 Process Range High	W
(300 * (PA-1)) + 1087	FB46 TSP	FB46 Target Setpoint	W

Register #	348 Parameter	Description	Write
(300 * (PA-1)) + 1089	FB46 SPRT	FB46 Setpoint Ramp Time	W
(300 * (PA-1)) + 1091	FB46 SPRR	FB46 Setpoint Ramp Rate	W
(300 * (PA-1)) + 1093	Spare	Spare Value	W
(300 * (PA-1)) + 1095	Spare	Spare Value	W
(300 * (PA-1)) + 1097	FB45_PG1	FB45 Proportional Gain	W
(300 * (PA-1)) + 1099	FB45_TI1	FB45 Time Integral	W
(300 * (PA-1)) + 1101	FB45_TD1	FB45 Time Derivative	W
(300 * (PA-1)) + 1103	FB45_DG1	FB45 Derivative Gain	W
(300 * (PA-1)) + 1105	FB45_MR1	FB45 Manual Reset	W
(300 * (PA-1)) + 1107	FB73_SA1	FB73 Setpoint Alarm 1	W
(300 * (PA-1)) + 1109	FB73_SA2	FB73 Setpoint Alarm 2	W
(300 * (PA-1)) + 1111	FB73_SA3	FB73 Setpoint Alarm 3	W
(300 * (PA-1)) + 1113	FB73_SA4	FB73 Setpoint Alarm 4	W
(300 * (PA-1)) + 1115	FB73_PUM	FB73 Power Up Manual	W
(300 * (PA-1)) + 1117	FB51_LL2	FB51 Low Limit 2	W
(300 * (PA-1)) + 1119	FB51_HL2	FB51 High Limit 2	W

Model 348: FIELDPAC 2 Register DINT Data

Register #	348 Parameter	Description	Write
(300 * (PA-1)) + 1151	FB98_DSN	Device Serial Number	W
(300 * (PA-1)) + 1153	DID	Device ID Number	
(300 * (PA-1)) + 1155	SSN	Sensor Serial Number	
(300 * (PA-1)) + 1157	Command Count	# HART CMDS Sent	
(300 * (PA-1)) + 1159	Fail Response Count	# HART CMDS Failed	
(300 * (PA-1)) + 1161	Spare	Spare Value	
(300 * (PA-1)) + 1163	Spare	Spare Value	

Model 348 FIELDPAC: Variable Length STRING Data

Register #	348 Parameter	Descripition	Length	Write
(300 * (PA-1)) + 1165	FB98_HTN	Hart Tag Name	4 Reg	W
(300 * (PA-1)) + 1169	FB98_DES	Descriptor	8 Reg	W
(300 * (PA-1)) + 1177	FB98_MSG	HART Message	16 Reg	W
(300 * (PA-1)) + 1193	Model #	Moore Model #	8 Reg	
(300 * (PA-1)) + 1201	FB15_EUX	FB15 Var. X Units	2 Reg	W
(300 * (PA-1)) + 1203	FB15_EUY	FB15 Var. Y Units	2 Reg	W
(300 * (PA-1)) + 1205	FB15_TN1	FB15 Tag Name 1	6 Reg	W
(300 * (PA-1)) + 1211	FB15_EU1	FB15 Process 1 Units	2 Reg	W
(300 * (PA-1)) + 1213	FB16_CU	FB16 Totalizer Count Units	2 Reg	W
(300 * (PA-1)) + 1215	FB15_TN2	FB15 Tag Name 2	6 Reg	W
(300 * (PA-1)) + 1221	FB15_EU2	FB15 Process 2 Units	2 Reg	W
(300 * (PA-1)) + 1223	Spare	Spare Values	10 Reg	

Model 348 FIELDPAC 1 Register WORD Data

Register #	348 Parameter	Write
(300 * (PA-1)) + 1233	Device Status	
(300 * (PA-1)) + 1234	Station Status	
(300 * (PA-1)) + 1235	Moore Status	
(300 * (PA-1)) + 1236	Moore Transmitter Status	
(300 * (PA-1)) + 1237	Moore Device Error	
(300 * (PA-1)) + 1238	Device Error Status 1	
(300 * (PA-1)) + 1239	Device Error Status 2	
(300 * (PA-1)) + 1240	Miscellaneous Status	
(300 * (PA-1)) + 1241	Spare Value	
(300 * (PA-1)) + 1242	Spare Value	
(300 * (PA-1)) + 1243	Loop 1 Status Word	
(300 * (PA-1)) + 1244	FB12 Alarm Status Word	
(300 * (PA-1)) + 1245	FB12 Alarm 1 Type	W
(300 * (PA-1)) + 1246	FB12 Alarm 2 Type	W
(300 * (PA-1)) + 1247	FB12 Alarm 3 Type	W
(300 * (PA-1)) + 1248	FB12 Alarm 4 Type	W
(300 * (PA-1)) + 1249	Spare Value	
(300 * (PA-1)) + 1250	Spare Value	
(300 * (PA-1)) + 1251	Loop 2 Status Word	
(300 * (PA-1)) + 1252	FB73 Alarm Status Word	
(300 * (PA-1)) + 1253	FB73 Alarm 5 Type	W
(300 * (PA-1)) + 1254	FB73 Alarm 6 Type	W
(300 * (PA-1)) + 1255	FB73 Alarm 7 Type	W
(300 * (PA-1)) + 1256	FB73 Alarm 8 Type	W
(300 * (PA-1)) + 1257	Spare Value	
(300 * (PA-1)) + 1258	Spare Value	

Model 348: FIELDPAC 1 Register UINT Data

Register #	348 Parameter	Description	Write
(300 * (PA-1)) + 1259	FB98_POL	Poll Address (PA)	
(300 * (PA-1)) + 1260	FB98_DAT _Month	HART Date Month	W
(300 * (PA-1)) + 1291	FB98_DAT _Day	HART Date Day	W
(300 * (PA-1)) + 1262	FB98_DAT _Year	HART Date Year	W
(300 * (PA-1)) + 1263	Spare	Spare Value	
(300 * (PA-1)) + 1264	Transfer Function	HART Transfer Function	
(300 * (PA-1)) + 1265	FB81_IT	FB98 Input Type	
(300 * (PA-1)) + 1266	FB82_BOD	FB98 Burnout Direction	W
(300 * (PA-1)) + 1267	Manufacture ID	HART Manufacture ID Code	
(300 * (PA-1)) + 1268	Device Type	HART Device Type Code	
(300 * (PA-1)) + 1269	SLU	Sensor Limit Units	
(300 * (PA-1)) + 1270	SC	HART Supplier Code	
(300 * (PA-1)) + 1271	DRN	Database Revision Number	
(300 * (PA-1)) + 1272	S_H_Rev Levels	Software/Hardware Revision Levels	

Model 348 FIELDPAC 1 Coil BOOL Data

Coil #	Description	Write
(65 * (PA-1)) + 1201	Write Protect Enabled	W
(65 * (PA-1)) + 1202	Active Alarm (1 = yes)	
(65 * (PA-1)) + 1203	Not Acknowledged (1= yes)	
(65 * (PA-1)) + 1204	Flashing Bargraph (1 = yes)	
(65 * (PA-1)) + 1205	Spare	
(65 * (PA-1)) + 1206	Console =1/Local = 0	
(65 * (PA-1)) + 1207	Spare	
(65 * (PA-1)) + 1208	Configuration Changed Flag	
(65 * (PA-1)) + 1209	FB16 Totalizer Reset (1 = Reset)	
(65 * (PA-1)) + 1210	Spare Coil	
(65 * (PA-1)) + 12...	spare...spare...spare...	
(65 * (PA-1)) + 1226	Spare Coil	
(65 * (PA-1)) + 1227	FB13 Controller Action (Dir = 1/Rev = 0)	W
(65 * (PA-1)) + 1228	FB12 Alarm 1 Enable	W
(65 * (PA-1)) + 1229	FB12 Alarm 2 Enable	W
(65 * (PA-1)) + 1230	FB12 Alarm 3 Enable	W
(65 * (PA-1)) + 1231	FB12 Alarm 4 Enable	W
(65 * (PA-1)) + 1232	Spare Coil	
(65 * (PA-1)) + 12...	spare...spare...spare...	
(65 * (PA-1)) + 1245	Spare Coil	
(65 * (PA-1)) + 1246	FB45 Controller Action (Dir = 1/Rev = 0)	W
(65 * (PA-1)) + 1247	FB73 Alarm 5 Enable	W
(65 * (PA-1)) + 1248	FB73 Alarm 6 Enable	W
(65 * (PA-1)) + 1249	FB73 Alarm 7 Enable	W
(65 * (PA-1)) + 1250	FB73 Alarm 8 Enable	W

Appendix D XTC TRANSMITTER MODBUS MAPPING

XTC Transmitter: Quick Access REAL Data

Register #	XTC Parameter	Write
(30 * (PA-1)) + 0001	Process	
(30 * (PA-1)) + 0003	Setpoint	W
(30 * (PA-1)) + 0005	Valve	W

XTC Transmitter Quick: Access Process Variable REAL Data

Register #	XTC Parameter	Write
(4 * (PA-1)) + 0501	Process Variable	

XTC Transmitter : Quick Access BOOL Data

Coil #	XTC Status	Write
(60 * (PA-1)) + 01	Transmitter Not Communicating	
(60 * (PA-1)) + 02	Field Device Malfunction	
(60 * (PA-1)) + 03	Write Command Failed	W
(60 * (PA-1)) + 04	Configuration Hold	
(60 * (PA-1)) + 05	Database Updating	
(60 * (PA-1)) + 06	Error	
(60 * (PA-1)) + 07	PV Out of Limits	
(60 * (PA-1)) + 08	Non-PV Out of Limits	
(60 * (PA-1)) + 09	Analog Output Saturated	
(60 * (PA-1)) + 10	Output Current Fixed	
(60 * (PA-1)) + 11	Cold Start Has Occurred	
(60 * (PA-1)) + 12	Spare	
(60 * (PA-1)) + 13	Spare	
(60 * (PA-1)) + 14	Write Protect Enabled	W
(60 * (PA-1)) + 15	Push-Button Enabled	W
(60 * (PA-1)) + 16	Auto-Range Enabled	W
(60 * (PA-1)) + 17	Alarm 1 Active	
(60 * (PA-1)) + 18	Alarm 1 Not Acknowledged	W
(60 * (PA-1)) + 19	Alarm 2 Active	
(60 * (PA-1)) + 20	Alarm 2 Not Acknowledged	W
(60 * (PA-1)) + 21	Auto/Manual (Auto=1)	W
(60 * (PA-1)) + 22	Controller On (1=ON)	W
(60 * (PA-1)) + 23	Controller Type (Dir=1/Rev=0)	
(60 * (PA-1)) + 24	2 bit representation??	W
(60 * (PA-1)) + 25	Controller Action	
(60 * (PA-1)) + 26	Manual Reset Tracking	W
(60 * (PA-1)) + 27	Tracking Setpoint	
(60 * (PA-1)) + 28	Power Up Manual	
(60 * (PA-1)) + 29	Auto Mode Only (1=yes)	

XTC Transmitter: 2 Register REAL Data

Register #	XTC Parameter	Write
(300 * (PA-1)) + 1001	PV	
(300 * (PA-1)) + 1003	PV Range Low	W
(300 * (PA-1)) + 1005	PV Range High	W
(300 * (PA-1)) + 1007	Measured Variable	
(300 * (PA-1)) + 1009	MV Range Low	W
(300 * (PA-1)) + 1011	MV Range High	W
(300 * (PA-1)) + 1013	Damping	W
(300 * (PA-1)) + 1015	Current	
(300 * (PA-1)) + 1017	Percent Of Range	
(300 * (PA-1)) + 1019	Lower Sensor Limit	
(300 * (PA-1)) + 1021	Upper Sensor Limit	
(300 * (PA-1)) + 1023	Minimum Span	
(300 * (PA-1)) + 1025	Proportional Gain	W
(300 * (PA-1)) + 1027	Time Integral	W
(300 * (PA-1)) + 1029	Time Derivative	W
(300 * (PA-1)) + 1031	Derivative Gain	W
(300 * (PA-1)) + 1033	Manual Reset	W
(300 * (PA-1)) + 1035	Power Up Setpoint	W
(300 * (PA-1)) + 1037	Power Up Valve	W
(300 * (PA-1)) + 1039	Alarm 1 Limit	W
(300 * (PA-1)) + 1041	Alarm 2 Limit	W
(300 * (PA-1)) + 1043	Secondary Variable	
(300 * (PA-1)) + 1045	Tertiary Variable	
(300 * (PA-1)) + 1047	Fourth Variable	

XTC Transmitter: 2 Register DINT Data

Register #	XTC Parameter	Write
(300 * (PA-1)) + 1151	Device Serial Number	W
(300 * (PA-1)) + 1153	Device ID Number	
(300 * (PA-1)) + 1155	Sensor Serial Number	
(300 * (PA-1)) + 1157	# HART CMDS Sent	
(300 * (PA-1)) + 1159	# HART CMDS Failed	

XTC Transmitter : Variable Length STRING Data

Register #	XTC Parameter	Length	Write
(300 * (PA-1)) + 1165	Hart Tag Name	4 Reg	W
(300 * (PA-1)) + 1169	Descriptor	8 Reg	W
(300 * (PA-1)) + 1177	HART Message Part A	8 Reg	W
(300 * (PA-1)) + 1185	HART Message Part B	8 Reg	W
(300 * (PA-1)) + 1193	Moore Model #	8 Reg	
(300 * (PA-1)) + 1201	Process Variable Units	2 Reg	W

XTC Transmitter : 1 Register WORD Data

Register #	XTC Parameter	Write
(300 * (PA-1)) + 1233	Device Status	
(300 * (PA-1)) + 1234	Spare	
(300 * (PA-1)) + 1235	Moore Status	
(300 * (PA-1)) + 1236	Moore Transmitter Status	
(300 * (PA-1)) + 1237	Moore Device Error	
(300 * (PA-1)) + 1238	Device Error Status 1	
(300 * (PA-1)) + 1239	Device Error Status 2	
(300 * (PA-1)) + 1240	Miscellaneous Status	
(300 * (PA-1)) + 1241	Spare Value	
(300 * (PA-1)) + 1242	Spare Value	
(300 * (PA-1)) + 1243	Loop Status Word	
(300 * (PA-1)) + 1244	Alarm Status Word	
(300 * (PA-1)) + 1245	Alarm 1 Type	W
(300 * (PA-1)) + 1246	Alarm 2 Type	W

XTC Transmitter: 1 Register UINT Data

Register #	XTC Parameter	Write
(300 * (PA-1)) + 1259	Poll Address (PA)	
(300 * (PA-1)) + 1260	HART Date Month	W
(300 * (PA-1)) + 1291	HART Date Day	W
(300 * (PA-1)) + 1262	HART Date Year	W
(300 * (PA-1)) + 1263	Measured Variable Units	W
(300 * (PA-1)) + 1264	HART Transfer Function	W
(300 * (PA-1)) + 1265	Input Type	W
(300 * (PA-1)) + 1266	Burnout Direction	W
(300 * (PA-1)) + 1267	Fail Safe	W
(300 * (PA-1)) + 1268	HART Manufacture ID Code	
(300 * (PA-1)) + 1269	HART Device Type Code	
(300 * (PA-1)) + 1270	Sensor Limit Units	
(300 * (PA-1)) + 1271	HART Supplier Code	
(300 * (PA-1)) + 1272	Database Revision Number	
(300 * (PA-1)) + 1273	Software/Hardware Revision Levels	

Appendix E GENERIC TRANSMITTER MODBUS MAPPING

Generic Transmitter: Quick Access REAL Data

Register #	Parameter	Write
(30 * (PA-1)) + 0001	Primary Variable	
(30 * (PA-1)) + 0003	Secondary Variable	
(30 * (PA-1)) + 0005	Tertiary Variable	
(30 * (PA-1)) + 0007	Fourth Variable	

Generic Transmitter: Quick Access Process Variable REAL Data

Register #	Parameter	Write
(4 * (PA-1)) + 0501	Process Variable	

Generic Transmitter: Quick Access BOOL Data

Coil #	Status	Write
(60 * (PA-1)) + 01	Transmitter Not Communicating	
(60 * (PA-1)) + 02	Field Device Malfunction	
(60 * (PA-1)) + 03	Write Command Failed	W
(60 * (PA-1)) + 04	Configuration Hold	
(60 * (PA-1)) + 05	Database Updating	
(60 * (PA-1)) + 06	Error (1=yes)	
(60 * (PA-1)) + 07	PV Out of Limits	
(60 * (PA-1)) + 08	Non-PV Out of Limits	
(60 * (PA-1)) + 09	Analog Output Saturated	
(60 * (PA-1)) + 10	Output Current Fixed	
(60 * (PA-1)) + 11	Cold Start Has Occurred	
(60 * (PA-1)) + 12	Spare	
(60 * (PA-1)) + 13	Spare	
(60 * (PA-1)) + 14	Write Protect Enabled	

Generic Transmitter: 2 Register REAL Data

Register #	Parameter	Write
(300 * (PA-1)) + 1001	Measured Variable	
(300 * (PA-1)) + 1003	MV Range Low	W
(300 * (PA-1)) + 1005	MV Range High	W
(300 * (PA-1)) + 1007	Damping	
(300 * (PA-1)) + 1009	Current	
(300 * (PA-1)) + 1011	Percent Of Range	
(300 * (PA-1)) + 1013	Lower Sensor Limit	
(300 * (PA-1)) + 1015	Upper Sensor Limit	
(300 * (PA-1)) + 1017	Minimum Span	
(300 * (PA-1)) + 1019	Secondary Variable	
(300 * (PA-1)) + 1021	Tertiary Variable	
(300 * (PA-1)) + 1023	Fourth Variable	

Generic Transmitter: 2 Register DINT Data

Register #	Parameter	Write
(300 * (PA-1)) + 1151	Device Serial Number	W
(300 * (PA-1)) + 1153	Device ID Number	
(300 * (PA-1)) + 1155	Sensor Serial Number	
(300 * (PA-1)) + 1157	# HART CMDS Sent	
(300 * (PA-1)) + 1159	# HART CMDS Failed	

Generic Transmitter: Variable Length STRING Data

Register #	Parameter	Length	Write
(300 * (PA-1)) + 1165	Hart Tag Name	4 Reg	W
(300 * (PA-1)) + 1169	Descriptor	8 Reg	W
(300 * (PA-1)) + 1177	HART Message Part A	8 Reg	W
(300 * (PA-1)) + 1185	HART Message Part B	8 Reg	W

Generic Transmitter: 1 Register WORD Data

Register #	Parameter
(300 * (PA-1)) + 1233	Device Status
(300 * (PA-1)) + 1234	Spare
(300 * (PA-1)) + 1235	Spare
(300 * (PA-1)) + 1236	Spare
(300 * (PA-1)) + 1237	Spare
(300 * (PA-1)) + 1238	Device Error Status 1
(300 * (PA-1)) + 1239	Device Error Status 2
(300 * (PA-1)) + 1240	Miscellaneous Status

Generic Transmitter: 1 Register UINT Data

Register #	Parameter	Write
(300 * (PA-1)) + 1259	Poll Address (PA)	
(300 * (PA-1)) + 1260	HART Date Month	W
(300 * (PA-1)) + 1291	HART Date Day	W
(300 * (PA-1)) + 1262	HART Date Year	W
(300 * (PA-1)) + 1263	Measured Variable Units	W
(300 * (PA-1)) + 1264	HART Transfer Function	W
(300 * (PA-1)) + 1265	Spare	
(300 * (PA-1)) + 1266	Spare	
(300 * (PA-1)) + 1267	Spare	
(300 * (PA-1)) + 1268	Manufacture ID Code	
(300 * (PA-1)) + 1269	Device Type Code	
(300 * (PA-1)) + 1270	Sensor Limit Units	
(300 * (PA-1)) + 1271	HART Supplier Code	
(300 * (PA-1)) + 1272	Database Revision Number	
(300 * (PA-1)) + 1273	Software/Hardware Revision Levels	

Appendix F BIT MAPPED WORDS

This section defines the individual bits in the 1 register WORD data. The status word data is also stored as coils for each device. Refer to the HART device's appropriate MODBUS map for coil definitions.

Device Status

Although the word is read as an integer, each bit in this 16-bit word represents a status condition. The bits that can be written to are marked with an appended asterick below. Note that bits 01 thorugh 08 comprise the HART Field Device Status Word.

Bit 01: Primary Variable Out of Limits
Bit 02: Non-Primary Variable Out of Limits
Bit 03: Analog Output Saturated
Bit 04: Output in Fixed Current Mode
Bit 05: Reserved
Bit 06: Cold Start Occurred
Bit 07: Configuration Change
Bit 08: Error
Bit 09: 1 = Transmitter Not Communicating
Bit 10: Unused
Bit 11: 1 = Square Root Enabled
Bit 12: 1 = Write Command Failed
Bit 13: Unused
Bit 14: 1 = Device Configuration Change
Bit 15: 1 = Device Error NAK
Bit 16: 1 = Device Error

Station Status

This status is valid only for the Model 348 FIELDPAC. Athough the word is read as an integer, each bit in this 16-bit word represents a status condition. The bits that can be written are marked with an appended asterick below.

Bit 01: Active Alarm Exists
Bit 02: Alarm Not Acknowledged
Bit 03: Flashing Bargraph
Bit 04: unused
Bit 05: Configuration Hold *
Bit 06: Unused
Bit 07: Unused
Bit 08: Console = 1, Local - 0 *
Bit 09: Unused
Bit 10: Override Status Output of Function Block 10
Bit 11: Unused
Bit 12: Configuration Changed
Bit 13: Unused
Bit 14: Unused
Bit 15: Error
Bit 16: Unused

Moore Status

Although the word is read as an integer, each bit in this 16-bit word represents a status condition. The bits that can be written to are marked with an appended asterick below.

Bit 01: 1 = Auto Rerange Enabled* - not valid for the Model 348
Bit 02: 1 = Local Pushbuttons Enabled - not valid for the Model 348
Bit 03: 1 = Write Protect Mode*
Bit 04-16: Unused

Moore Transmitter Status

This parameter indicates the state of the HART device. The possible states are: 3 = Off-line, 5 = On-line, and 7 = Configuration Hold. If other states are obtained, call your Moore Products Co. respresentative for assistance.

Moore Device Error

This parameter indicates the Moore Products Co. device errors.

Device Error Status 1

See appropriate transmitter HART manual.

Device Error Status 2

See appropriate transmitter HART manual.

Miscellaneous Status

Bit 06 in this word indicates the the controller is enable for the XTC transmitter.

Loop Status

Although the word is read as an integer, each bit in this 16-bit word represents a status condition. The bits that can be written to are marked with an appended asterick below.

Transmitter Loop Status:

Bit 01: Auto/Manual Status 1 = Auto, 0 = Manual *
Bit 02-16: Unused

Model 348 FIELDPAC Loop Status:

Bit 01: Auto o/Manual Status 1 = Auto, 0 = Manual *
Bit 02: Local Status *
Bit 03: Standby Sync
Bit 04: External/Internal Status, 1 = External *
Bit 05: Unused
Bit 06: Unused
Bit 07: Setpoint Ramp Status *
Bit 08: Unused
Bit 09: Emergency Manual
Bit 10: Configuration Hold
Bit 11: High Setpoint Limit
Bit 12: Low Setpoint Limit
Bit 13: Alarms Out of Service
Bit 14 - 15: Unused
Bit 16: Auto/Manual Transfer Block Configured

Alarm Status

Although this word is read as an integer, each bit in this 16-bit word represents a status condition. In the Model 348, alarms 1,2,3, and 4 are in Loop 1 Function Block 12. When associated with Loop 2 Function Block 73, the alarms are 5,6,7 and 8. For the transmitter controller, only alarms 1 and 2 are valid, so bits 6-12 are unused.

Bit 01: Alarm 1 Active
Bit 02: Alarm 1 Not Acknowledged *
Bit 03: Alarm 1 Enabled *
Bit 04: Alarm 2 Active
Bit 05: Alarm 2 Not Acknowledged *
Bit 06: Alarm 2 Enabled *
Bit 07: Alarm 3 Active (Model 348 FIELDPAC Only)
Bit 08: Alarm 3 Not Acknowledged * (Model 348 FIELDPAC Only
Bit 09: Alarm 3 Enabled * (Model 348 FIELDPAC Only
Bit 10: Alarm 4 Active (Model 348 FIELDPAC Only
Bit 11: Alarm 4 Not Acknowledged * (Model 348 FIELDPAC Only
Bit 12: Alarm 4 Enabled * (Model 348 FIELDPAC Only
Bit 13: Alarms Out of Service * (XTC with Controller Only)
Bit 14 - 16: Unused

Alarm Type

The bits in this status 16-bit word determine the type and settings of the alarms. All bits in this word can be edited.

Bits: 3 2 1

0 0 0 - no alarm action required
0 0 1 - High Alarm
0 1 0 - Low Alarm
0 1 1 - High Deviation Alarm
1 0 0 - Low Deviation Alarm
1 0 1 - Absolute Deviation Alarm
1 1 1 - Out of Range Alarm
1 1 1 - no alarm action required

NOTE

XTC with Controller only has the High or Low alarm options.

Bits: 5 4

0 0 - 0.1% alarm deadband
0 1 - 0.5% alarm deadband
1 0 - 1.0% alarm deadband
1 1 - 5.0% alarm deadband

NOTE

XTC with Controller only has the High or Low alarm options.

Bits: 8 7 6

0 0 0 - 0.0 seconds delay time in
0 0 1 - 0.4 seconds delay time in
0 1 0 - 1.0 seconds delay time in
0 1 1 - 2.0 seconds delay time in
1 0 0 - 5.0 seconds delay time in
1 0 1 - 15.0 seconds delay time in
1 1 1 - 30.0 seconds delay time in
1 1 1 - 60.0 seconds delay time in

Bits: 11 10 9

0 0 0 - 0.0 seconds delay time out
0 0 1 - 0.4 seconds delay time out
0 1 0 - 1.0 seconds delay time out
0 1 1 - 2.0 seconds delay time out
1 0 0 - 5.0 seconds delay time out
1 0 1 - 15.0 seconds delay time out
1 1 0 - 30.0 seconds delay time out
1 1 1 - 60.0 seconds delay time out

Bits: 12
0 - ring back not required
1 - RINGBACK

Bits 13 through 16 - set to 0

Appendix G CABLE CAPACITANCE AND MAXIMUM LENGTH

A cable length calculation is necessary when HART communication is to be employed. Cable capacitance directly affects maximum Network length.

Cable Capacitance

Cable type, conductor size, and recommended cable model numbers are stated in Section 2.3.3.

Cable capacitance is a parameter used in the calculation of the maximum length of cable that can be used to construct the Network. The lower the cable capacitance the longer the Network can be. Manufacturers typically list two capacitance values for an instrumentation cable:

1. Capacitance between the two conductors.
2. Capacitance between one conductor and the other conductor(s) connected to shield. This capacitance is the worst case value and is to be used in the cable length formula.

Maximum Cable Length Calculation

The maximum permissible single-pair cable length is 10,000 feet (3000 meters) or less as determined by the following formula:

$$L = \frac{65{,}000{,}000}{R \times C} - \frac{C_f + 10{,}000}{C}$$

Formula Definitions:

L: The maximum total length of cable permitted to construct the Network. L = Feet when C is in pF/ft. L = meters when C is in pF/meter.

R: The Network Resistance which is the ohmic sum of the Current Sense Resistance, Barrier Resistance (both Return and Supply), if any, in the Network, and the resistance of the wire.

C: Cable capacitance per unit length between one conductor and the other conductor connected to the shield. C may be in pF/ft or pF/meter.

C_f: Total input terminal capacitance of Field Instruments; the Primary Master (URICA) is excluded. C_f is given by the following formula:

C_f = (sum of all C_n values) x (5000)

Where C_n is an integer (e.g. 1, 2, 3) corresponding to the input terminal capacitance of a Field Instrument. C_n values are determined as follows:

FIELD INSTRUMENT CAPACITANCE	C_n VALUE
Less than 5000 pF	1
5000 pF to less than 10000 pF	2
10000 pF to less than 15000 pF	3
15000 pF to less than 20000 pF	4
20000 pF to less than 25000 pF	5

For Field Instruments without C_n values, use $C_n = 1$

Example Calculation:

Assume a Network consists of two Field Instruments (both $C_n = 1$).

Let R = 250 Ω, C = 40 pF/ft., $C_f = (1 + 1) \times 5000 = 10{,}000$

$$\text{Then } L = \frac{65{,}000{,}000}{(250)(40)} - \frac{10{,}000 + 10{,}000}{40} = 6000 \text{ feet (1800 meters)}$$

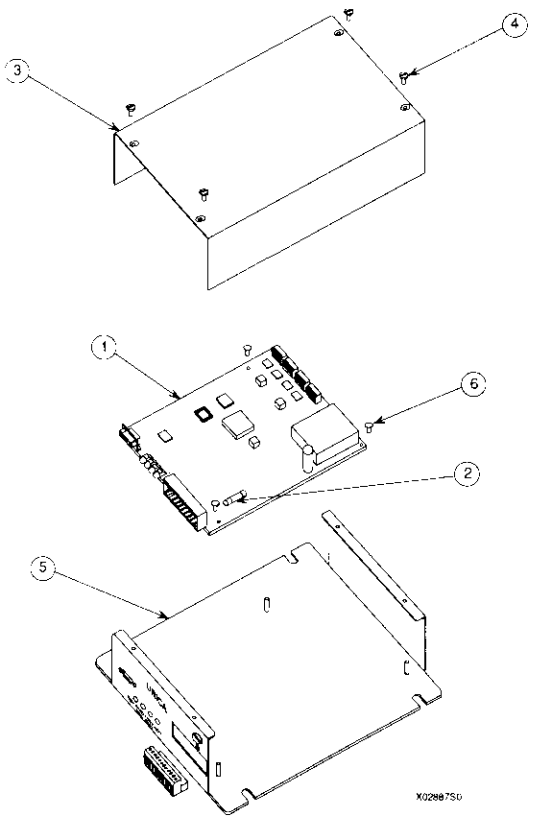
Model 325 URICA™

Drawing No. 325PL

ITEM	PART NUMBER	DESCRIPTION	QTY
1*	16260-41	Main Circuit Board	1
2*	7447-214	Power Supply Fuse 125 Volt, 5 Amp	1
3	16260-14	Case Cover Assembly	1
4	1-1162	6-32 x 0.25 Flat Head Enclosure Mounting Screw	1
5	16260-20	Case Base Assembly	1
6	1-0621	4-40 x 0.25 Phillips Head Circuit Board Mounting Screw	1

Notes:

- Refer to Section 5 of the Model 325 URICA User's Manual before servicing URICA.
- See Figure for disassembly and Item number reference
- An * identifies a recommended on-hand spare part.
- When ordering spare or replacement parts, always provide the complete model number, serial number, and other nameplate information.



WARRANTY

The Company warrants all equipment manufactured by it and bearing its nameplate, and all repairs made by it, to be free from defects in material and workmanship under normal use and service. If any part of the equipment herein described and sold by the Company, proves to be defective in material or workmanship and if such part is within twelve months from date of shipment from the Company's factory, returned to such factory, transportation charges prepaid, and if the same is found by the Company to be defective in material or workmanship, it will be replaced or repaired, free of charfe, f.o.b. Company's factory. The Company assumes no liability for the consequence of its use or misuse by Purchaser, his employees or others. A defect in the meaning of this warranty in any part of said equipment shall not, when such part is capable of being renewed, repaired or replaced, operate to condemn such equipment. This warranty is expressly in lieu of all other warranties, guaranties, obligations, or liabilities, expressed or implied by the Company or its representatives. All statutory or implied warranties other than title are hereby expressly negated and excluded.

Warranty repair or replacement requires the equipment to be returned to one of the following addresses.

Equipment manufactured or sold by MOORE PRODUCT CO.:

MOORE PRODUCTS Co.
Sumneytown Pike
Spring House, PA 19477

Equipment manufactured or sold by MOORE PRODUCTS Co. (CANADA) INC.:

MOORE PRODUCTS Co. (CANADA) INC.:
2KM West of Mississauga Rd. Hwy. 7
Brampton, Ontario, Canada

Equipment manufactured or sold by MOORE PRODUCTS Co. (UK) LTD.:

MOORE PRODUCTS Co. (UK) LTD
Copse Road
Lufton, Yeovil,
Somerset, BA22 8RN, ENGLAND

The warranty will be null and void if repair is attempted without authorization by MOORE PRODUCTS Co.