



Instruction  
No.

**AC-106**

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AERCO INTERNATIONAL, Inc., Northvale, New Jersey 07647 USA

# ***MODBUS***<sup>®</sup>

## **Communication Manual**

**for**

## **ELECTRONIC CONTROL SYSTEM (ECS)**

**Used to Interface AERCO Equipment  
to Building Automation Systems**

Modbus<sup>®</sup> is a registered trademark of AEG Modicon

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# ELECTRONIC CONTROL SYSTEM COMMUNICATION INTERFACE

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## ELECTRONIC CONTROL SYSTEM COMMUNICATION INTERFACE

### 1. INTRODUCTION

The Electronic Control System (ECS), used on AERCO indirect fired water heaters, can be ordered with a MODBUS® Communication Option, which will permit it to be controlled by an external Energy Management System (EMS), Building Automation System (BAS), or a computer supplied by others.

### 2. COMMUNICATION BOARD

The Communication Board provides the MODBUS interface between any of the possible external control systems and the ECS. The Temperature Controller (Eurotherm 2408) used in the ECS can be optionally equipped with a Communication Board which can be connected to external control systems utilizing either an RS232 or RS485 MODBUS communication interface. The corresponding part numbers for the alternative MODBUS Communication Boards are as follows:

PART NUMBER	DESCRIPTION
64009-1	RS232 COMMUNICATION BOARD
64009-2	RS485 COMMUNICATION BOARD

### 3. MODBUS COMMUNICATION SIGNAL CONNECTIONS

#### CAUTION

DO NOT route MODBUS communication wiring in the same conduit as power wiring. Attempting to do so may result in excessive noise on the signal lines. Also, ensure that the RS232 or RS485 signal cable connections do not exceed the following lengths:

CABLE TYPE	MAXIMUM LENGTH
RS232	50 feet
RS485	4,000 feet

To implement ECS MODBUS control, connect the cable leads from the external controller to the Temperature Controller as instructed in Table 1.

- Refer to the Temperature Controller (Eurotherm 2408) pinouts shown in Figure 1 to locate the required terminals.
- Refer to Table 2 Eurotherm Series 2400 Controller MODBUS Points for a listing of active MODBUS data addresses for the 2408 Controller.
- The Eurotherm documents referenced on page 3 provide additional communication information related to MODBUS.

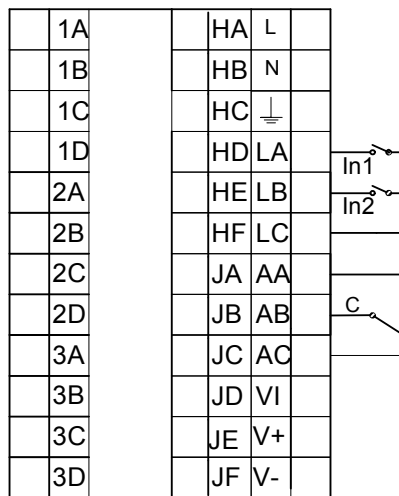
#### **NOTE**

*AERCO recommends that shielded, twisted-pair cable be used for communication wiring. Examples of suitable wiring are: Belden 9841, 8761, 3105A, or equivalent.*

**Table 1. MODBUS Communication Signal Connections**

2408 TEMPERATURE CONTROLLER		COMPUTER CONTROL CABLE			
SIGNAL NAME	PIN NO.	SIGNAL NAME	RS232/9-PIN PIN NO.	RS232/25-PIN PIN NO.	RS485 PIN NO.
GROUND	HD	GROUND	5	7	GROUND
RECEIVE	HE	TRANSMIT	3	2	A+
TRANSMIT	HF	RECEIVE	2	3	B-

**2408 CONTROLLER**



**Figure 1. Temperature Controller (Eurotherm 2408) Terminal Connection Diagram**

#### **4. MODBUS COMMUNICATION INFORMATION**

The Eurotherm 2400 Controller supports the MODBUS RTU mode of transmission. The default settings are as follows:

- 9600 baud rate
- One start bit
- Eight data bits
- One stop bit
- No parity

## AC-106 INSTRUCTIONS - ECS COMMUNICATIONS

**Table 2. Eurotherm Series 2400 Controller MODBUS Points**

MODBUS Data Address	Menu Item	Menu Item Description	Units & Range	Default/Comments	Register Type	Ref. 1 Comm. Guide
5	w.SP	Setpoint	40-205°F	140°F, Address to read value	Read Only	5-4
24	SP 1	Setpoint	40-205°F	140°F, Address to change value	Write	5-11
1	Top Value	Outlet Temp	40-205°F	Same value as front display	Read Only	5-3
133	LoGH	Peak Temp	40-205°F	Resets on Power Loss	Read Only	5-15
135	LoGA	Average Temp	40-205°F	Resets on Power Loss	Read Only	5-15
134	LoGL	Low Temp	40-205°F	Resets on Power Loss	Read Only	5-15
13 (set) 74 (status, 0 = safe 1 = alarm)	AL 1	Over Temp Alarm	40-205°F	20°F above setpoint; Alarm Type 17: Deviation High	Read Only	5-7 5-20
14 (set) 74 (status, 0 = safe 1= alarm)	AL 2 (FSH)	Full Scale High Alarm	205°F	205 ° F Alarm Type 2: Full Scale High	Read Only	5-7 5-20
258	Sbr	Feedback Sensor Break	Status: 0: Good 1: Failed	Denotes Feedback Sensor Failure/Open Circuit	Read Only	5-18
289	Li 1	Feedback Sensor Temp	40-180°F	Sensor input to controller, same as display temp.	Read Only	5-14
290	Li 2	Flow	GPM		Read Only	5-14
3	OP	Control Output Signal	%	Correlates to valve position	Read Only	5-4

### 5. REFERENCE DOCUMENTS

1. Eurotherm 2000 Series Communications Handbook, # HA026230
2. Eurotherm 2404/2408 Control Setpoint Programmer Installation and Operation Handbook, # HA025132

## 6. ALARMS

**Table 3. Process Alarms**

DISPLAY	MEANING
_FSL*	PV Full Scale Low Alarm.
_FSH*	PV Full Scale High Alarm.
_dEu*	PV Deviation Band Alarm
_dHi*	PV Deviation High Alarm
_dLo*	PV Deviation Low Alarm

**Table 4. Diagnostic Alarms**

DISPLAY	MEANING	WHAT TO DO`
<b>EE.Er</b>	<i>Electrically Erasable Memory Error:</i> The value of an operator, or configuration, parameter has been corrupted.	This fault will automatically take you into Configuration level. Check all of the configuration parameters before returning to Operator level. Once in Operator level, check all of the operator parameters before resuming normal operation. If the fault persists, or occurs frequently, contact your supplier
<b>S.br</b>	Sensor Break Input sensor is unreliable or the input signal is out of range.	Check that the sensor is correctly connected
<b>L.br</b>	Loop Break The feedback loop is open circuit	Check that the heating and cooling circuits are working properly
<b>Hw.Er</b>	Hardware Error Indication that a module is of the wrong type, missing, or faulty.	Check to ensure that the correct items are installed. See page A-4 for procedure to clear the Hardware Error.
<b>no.io</b>	No I/O None of the expected I/O items are installed	This error message normally occurs when pre-configuring a controller without installing any of the required I/O modules.
<b>rmt.F</b>	Remote input failure. The remote DC input is open or shorted	Check for open or short circuit wiring on the remote DC input.
<b>LLLL</b>	Out of range low reading	Check the value of the input
<b>HHHH</b>	Out of range high reading	Check the value of the input
<b>Err1</b>	Error 1: ROM self-test fail	Return Controller for repair
<b>Err2</b>	Error 2: RAM self-test fail	Return Controller for repair
<b>Err3</b>	Error 3: Watchdog fail	Return Controller for repair











## AC-106 INSTRUCTIONS - ECS COMMUNICATIONS

<b>Err4</b>	Error 4: Keyboard failure. Stuck button or button was pressed during power-up	Switch power off and then on, without touching any of the controller buttons
<b>Err5</b>	Error 5: Faulty internal communication	Check printed circuit board interconnections. If the fault cannot be cleared, return the controller for repair.
<b>Err6</b>	Digital filter chip faulty or loose board inside controller	Return Controller for repair
<b>Err7</b>	PV ID failure	Return Controller for repair
<b>Err8</b>	Module 1 ID failure	Faulty or loose module, or isolation problem
<b>Err9</b>	Module 2 ID failure	Faulty or loose module, or isolation problem
<b>ErrA</b>	Module 3 ID failure	Faulty or loose module, or isolation problem
<b>dCF</b>	DC output failure	Return Controller for repair

### 7. CLEARING HARDWARE ERROR (HW.ER) DISPLAY

To clear a Hardware Error and reset the Temperature Controller, proceed as follows:

1. Simultaneously press the **Page** (  ) and **Scroll** (  ) buttons on the Temperature Controller.
2. Using the **Up** (  ) arrow button, change the password to “8”.
3. Simultaneously press the **Page** (  ) and **Scroll** (  ) buttons again and observe the Temperature Controller display. The top line will display “8” and the bottom line will display “NO”.
4. Press the **Up** (  ) arrow button to toggle the display from “NO” to “YES”.
5. Simultaneously press the **Page** (  ) and **Scroll** (  ) buttons to “Reset” the Temperature Controller and clear the Hardware Error.