



DISCLAIMER:

The information contained in this manual is subject to change without notice from AERCO International, Inc. AERCO makes no warranty of any kind with respect to this material, including, but not limited to, implied warranties of merchantability and fitness for a particular application. AERCO International is not liable for errors appearing in this manual, nor for incidental or consequential damages occurring in connection with the furnishing, performance, or use of these materials



Table of Contents:

CHAPTER 2: E8 CONTROLLER AND BCM DESCRIPTION 7 2.1 E8 Controller Features and Functions. 7 2.2 BCM Features and Functions. 8 CHAPTER 3: E8 CONTROLLER OPERATION. 9 3.1 NORMAL Mode Display Functions. 9 3.1.1 NORMAL Mode Display Functions. 9 3.1.2 HEATING Mode Selection (in NORMAL Mode) 10 3.1.3 JEMENU Mode Operation (Door Open) 11 3.2.2 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Menu/Sub-Menu Navigation and Selection 14 CHAPTER 4: E8 INTIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2.1 Setting Maximu and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 26 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 35 5.4 1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.6 EXPERT HS Menu 44<	CHAPTER 1: INTRODUCTION	5
2.1 EB Controller Features and Functions. 7 2.2 BCM Features and Functions. 8 CHAPTER 3: EB CONTROLLER OPERATION. 9 3.1 NORMAL Mode Operation (Door Closed). 9 3.1.1 NERNU Mode Operation (Door Closed). 9 3.1.2 HEATING Mode Selection (in NORMAL Mode) 10 3.1.3 MENU Mode Operation (Door Open) 11 3.2.1 Basic Menu/Sub-Menu Navigation and Selection 12 3.2.1 Basic Parameter Navigation. Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2 Setting Room Temperature and Outdoor Compensation 19 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Room Temperature and Outdoor Compensation 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 INE PROGRAM Menu and Sun-Menus 30 5.4 I.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.6 SPERT H SMenu 44 5.6 SPERT H SMenu 44 5.6 SPERT H SMenu 45 5.7 1. Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 44 5.6	CHAPTER 2: E8 CONTROLLER AND BCM DESCRIPTION	7
2.2 BCM Features and Functions. 8 CHAPTER 3: E8 CONTROLLER OPERATION	2.1 E8 Controller Features and Functions	7
CHAPTER 3: E8 CONTROLLER OPERATION. 9 3.1 NORMAL Mode Operation (Door Closed). 9 3.1.1 NORMAL Mode Display Functions. 9 3.1.2 HEATING Mode Selection (in NORMAL Mode) 10 3.1.3 MENU Mode Operation (Door Open) 11 3.2.2 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE. 15 4.1 Initiation the Installation Menu 15 4.2.1 Setting Room Temperature and Outdoor Compensation 19 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Room Temperature and Outdoor Compensation 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 LAvailable V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT HS Menu 44 5.6.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.6 SERVICE Menu 44 5.6.2 SERVICE Menu 44 5.6.1 Available Settings for Relay Functions 1 – 4	2.2 BCM Features and Functions	8
3.1 NORMAL Mode Operation (Door Closed)	CHAPTER 3: E8 CONTROLLER OPERATION	9
3.1.1 NORMAL Mode Display Functions 9 3.1.2 HEATING Mode Selection (in NORMAL Mode) 10 3.1.3 MENU Mode Operation (Door Open) 11 3.2 Software Menus 12 3.2.1 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: EB INTIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the EB in the Installation Menu 15 4.2.1 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Room Temperature and Outdoor Compensation 20 CHAPTER 5: EB CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT HS Menu 44 5.6 1 DATE / TIME Menu 44 5.7 1 Available Settings for Relay Functions 1 – 4 53 5.7 1 Available Settings for Relay Functions 1 – 4 53 5.7 1 Available Settings for Rel	3.1 NORMAL Mode Operation (Door Closed)	9
3.1.2 HEATING Mode Selection (in NORMAL Mode) 10 3.1.3 MENU Mode Operation (Door Open) 11 3.2.4 Basic Parameter Navigation and Selection 12 3.2.1 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 30 5.4 EXPERT Menu and Sub-Menus 30 5.4 EXPERT Menu and Sub-Menus 30 5.4 EXPERT Menu and Sub-Menus 35 5.4 EXPERT Menu and Sub-Menus 44 5.6 ENERAL Menu 44 5.6 ENERAL Menu 44 5.6 EXPERT HS Menu and Sub-Menus 55 5.7 2 Available Set Mode 55 6.1 Indoor/Outdoor Reset Mode 55<	3.1.1 NORMAL Mode Display Functions	9
3.1.3 MENU Mode Operation (Door Open) 11 3.2.Software Menus. 12 3.2.1 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE. 15 4.1 Initializing the E6 in the Installation Menu 15 4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 30 5.4 EXPERT Menu and Sub-Menus 30 5.5 EXPERT HS Menu 44 5.6 CENERAL Menu 44 5.6 SERVICE Menu 44 5.6 SERVICE Menu 44 5.6 ZSERVICE Menu 44 5.6 ZSERVICE Menu 44 5.6 ZSERVICE Menu 44 5.6 La Indoor/Outdoor Reset Operation Configuration 55	3.1.2 HEATING Mode Selection (in NORMAL Mode)	10
3.2 Software Menus 12 3.2.1 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 26 5.2 USER Menu 26 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT HS Menu and Sub-Menus 30 5.4 EXPERT HS Menu 44 5.6 Start Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.6 Start A valiable V-Curve Preset Voltage Curves for 0 – 10 Volt Input 44 5.6 1 DATE / TIME Menu 44 5.6.1 DATE / TIME Menu 44 5.6.2 SERVICE Menu 52 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 6.1	3.1.3 MENU Mode Operation (Door Open)	11
3.2.1 Basic Menu/Sub-Menu Navigation and Selection 13 3.2.2 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 26 2.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT HS Menu 44 5.6 C SERVICE Menu 44 5.6.1 DATE / TIME Menu 44 5.6.2 SERVICE Menu 44 5.6.1 Setting Sor Relay Functions 1 – 4. 53 5.7.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.6.1.1 Mitory Coundoor Reset Operation Configuration 52 5.7.2 Available Settings for Relay Functions 1 – 4. 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55	3.2 Software Menus	12
32.2 Basic Parameter Navigation, Selection, and Revision 14 CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu. 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 35 5.4 EXPERT Menu 44 5.6 EXPERT HS Menu 44 5.6 I DATE / TIME Menu 47 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: ES ESTUP AND PROGRAMMING <td< td=""><td>3.2.1 Basic Menu/Sub-Menu Navigation and Selection</td><td>13</td></td<>	3.2.1 Basic Menu/Sub-Menu Navigation and Selection	13
CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE 15 4.1 Initializing the E8 in the Installation Menu 15 4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 2.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT HS Menu 44 5.6 CENERAL Menu 44 5.6.1 STIME PROGRAM Menu and Sun-Menus 44 5.6 SEXPERT HS Menu 44 5.6 SEXPERT HS Menu 44 5.6 CENERAL Menu 44 5.6 1 A DATE / TIME Menu 44 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Moing Connections 57 6.1.2 I	3.2.2 Basic Parameter Navigation, Selection, and Revision	14
4.1 Initializing the E8 in the Installation Menu 15 4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Maximum and Minimum Flow Temperature 18 4.2.3 Setting Meating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 30 5.5 EXPERT HS Menu 44 5.6 CENERAL Menu 44 5.6 CENERAL Menu 44 5.6 1 DATE / TIME Menu 44 5.6.1 DATE / TIME Menu 44 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4. 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Operation Configuration 55 6.1.1 Indoor/Outdoor Reset Operation Configuration 55 6.1.2 Indoor/Outdoor Reset Operation Configuration	CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE	15
4.2 QUICK START INSTRUCTIONS 18 4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 35 5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.6 EXPERT HS Menu 44 5.6 GENERAL Menu 44 5.6.2 SERVICE Menu 44 5.6.2 SERVICE Menu 44 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4. 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections. 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint. 57 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60	4.1 Initializing the E8 in the Installation Menu	15
4.2.1 Setting Maximum and Minimum Flow Temperature 18 4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu. 26 5.3 TIME PROGRAM Menu and Sun-Menus. 30 5.4 EXPERT Menu and Sub-Menus. 30 5.5 EXPERT HS Menu 43 5.6 EXPERT HS Menu 44 5.6 1 DATE / TIME Menu 44 5.6 1 DATE / TIME Menu 44 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 6.1 Indoor/Outdoor Reset Mode 55 6.1 Indoor/Outdoor Reset Operation Configuration 55 6.1.1 Wiring Connections 55 6.1.1 Wiring Connections 57 6.2.2 Viewing the Boiler Setpoint 57 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.3 Setting the Voltage and Set Point Li	4.2 QUICK START INSTRUCTIONS	18
4.2.2 Setting Room Temperature and Outdoor Compensation 19 4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 30 5.4 EXPERT Menu and Sub-Menus 35 5.5 EXPERT HS Menu 43 5.6 EQUERAL Menu 44 5.6 EDRERAL Menu 44 5.6 EXPERT HS Menu 44 5.6 EXPERT HS Menu 44 5.6 LDATE / TIME Menu 44 5.6 LOATE / TIME Menu 44 5.6 SterVICE Menu 47 5.7 Available Settings for Relay Functions 1 – 4 52 5.7 Available Settings for Relay Functions 1 – 4 53 6.1 Indoor/Outdoor Reset Operation Configuration 55 6.1.1 Wiring Connections 55 6.1.2 Indoo	4.2.1 Setting Maximum and Minimum Flow Temperature	18
4.2.3 Setting Heating Programs and Pumps 20 CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 35 5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT HS Menu 44 5.6 GENERAL Menu 44 5.6.2 SERVICE Menu 44 5.6.2 SERVICE Menu 44 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1.1 Miring Connections 55 6.1.2 Indoor/Outdoor Reset Mode 55 6.1.3 Viewing the Boiler Setpoint 57 6.2.2 Viewing Constant Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Viewing Constant Set Point Mode 58 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.2 Configuring MAX T-COLL Parameter 58 6.3.1 Remote Signal Source 61 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/	4.2.2 Setting Room Temperature and Outdoor Compensation	19
CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS 21 5.1 DISPLAY Menu 22 5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus 30 5.4 EXPERT Menu and Sub-Menus 35 5.5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT HS Menu 44 5.6 GENERAL Menu 44 5.6.1 DATE / TIME Menu 44 5.6.2 SERVICE Menu 47 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Operation Configuration 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 57 6.2.2 Constant Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.2 Configuring MAX T-COLL Parameter 59 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wining Connections 61 <tr< td=""><td>4.2.3 Setting Heating Programs and Pumps</td><td>20</td></tr<>	4.2.3 Setting Heating Programs and Pumps	20
5.1 DISPLAY Menu 22 5.2 USER Menu. 26 5.3 TIME PROGRAM Menu and Sun-Menus. 30 5.4 EXPERT Menu and Sub-Menus. 35 5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT HS Menu 44 5.6 GENERAL Menu 44 5.6 ID ATE / TIME Menu 44 5.6.1 DATE / TIME Menu 44 5.6.2 SERVICE Menu 47 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4. 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1.1 Indoor/Outdoor Reset Mode 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.2 Constant Set Point Mode 57 6.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.3.1 Remote Signal Source Wiring Connections 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.3 Setting the Voltage and Set Point Limits for U1/	CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS	21
5.2 USER Menu 26 5.3 TIME PROGRAM Menu and Sun-Menus. 30 5.4 EXPERT Menu and Sub-Menus. 35 5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input 43 5.5 EXPERT MS Menu 44 5.6 GENERAL Menu 44 5.6 J DATE / TIME Menu 44 5.6.2 SERVICE Menu 44 5.6.2 SERVICE Menu 47 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 56 6.1.1 Moor/Outdoor Reset Mode 55 6.1.1 Moor/Outdoor Reset Operation Configuration 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Constant Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 5	5.1 DISPLAY Menu	22
5.3 TIME PROGRAM Menu and Sun-Menus	5.2 USER Menu	26
5.4 EXPERT Menu and Sub-Menus	5.3 TIME PROGRAM Menu and Sun-Menus	30
5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input. 43 5.5 EXPERT HS Menu 44 5.6 GENERAL Menu 44 5.6.1 DATE / TIME Menu. 44 5.6.2 SERVICE Menu 44 5.6.1 DATE / TIME Menu. 44 5.6.2 SERVICE Menu 47 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 56.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.1 Wiring Connections 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Vo	5.4 EXPERT Menu and Sub-Menus	35
5.5 EXPERT HS Menu 44 5.6 GENERAL Menu 44 5.6.1 DATE / TIME Menu 44 5.6.2 SERVICE Menu 47 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 6.1.1 Wiring Connections. 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Constant Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.2 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring MAX T-COLL Parameter 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Volta	5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input	43
5.6 GENERAL Menu 44 5.6.1 DATE / TIME Menu 47 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 56 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3.0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring MAX T-COLL Parameter 61 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 <td></td> <td>44</td>		44
5.0.1 DEP / INPL Mend 44 5.6.2 SERVICE Menu 47 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 6.1 Indoor/Outdoor Reset Mode 6.1 Indoor/Outdoor Reset Mode 55 6.1 Indoor/Outdoor Reset Operation Configuration 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.3.1 Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 64 </td <td>5.6 1 DATE / TIME Monu</td> <td>44 11</td>	5.6 1 DATE / TIME Monu	44 11
5.7 Installation Menu & E8 Controller Initial Startup 51 5.7 Installation Menu & E8 Controller Initial Startup 51 5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.1.2 Constant Set Point Mode 58 6.2.2 Viewing Constant Set Point 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring MAX T-COLL Parameter 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65 <td>5.6.2 SERVICE Menu</td> <td>44 17</td>	5.6.2 SERVICE Menu	44 17
5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner) 52 5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.2 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 64	5.7 Installation Menu & F8 Controller Initial Startun	51
5.7.2 Available Settings for Relay Functions 1 – 4 53 CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 57 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Wiring Connections 58 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3.0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	5.7 1 CAP/MODULE Function (Maximum Kilowatts per Burner)	52
CHAPTER 6: E8 SETUP AND PROGRAMMING 55 6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 57 6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	5.72 Available Settings for Relay Functions $1 - 4$	53
6.1 Indoor/Outdoor Reset Mode 55 6.1.1 Wiring Connections 55 6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 57 6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 64		55
6.1.1 Wiring Connections	61 Indoor/Outdoor Reset Mode	55
6.1.2 Indoor/Outdoor Reset Operation Configuration 55 6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 57 6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.1.1 Wiring Connections	55
6.1.3 Viewing the Boiler Setpoint 57 6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 57 6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 64	6.1.2 Indoor/Outdoor Reset Operation Configuration	55
6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor 57 6.2 Constant Set Point Mode 57 6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 64	6.1.3 Viewing the Boiler Setpoint	57
6.2 Constant Set Point Mode	6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor	57
6.2.1 Wiring Connections 58 6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 64	6.2 Constant Set Point Mode	57
6.2.2 Viewing Constant Set Point 58 6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.2.1 Wiring Connections	58
6.2.2.1 Configuring HEATSLOPE Parameter 59 6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.2.2 Viewing Constant Set Point	58
6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters 60 6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.2.2.1 Configuring HEATSLOPE Parameter	59
6.2.2.3 Configuring MAX T-COLL Parameter 61 6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.2.2.2 Configuring MAX T-FLOW and MIN T-FLOW Parameters	60
6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6 2 2 3 Configuring MAX T-COLL Parameter	61
6.3 0 to 10 Volt Remote Set Point Mode 61 6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65		
6.3.1 Remote Signal Source Wiring Connections 61 6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.3 0 to 10 Volt Remote Set Point Mode	61
6.3.2 Configuring Remote Signal Source 62 6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2 63 6.3.4 Setting the Curve 11-UO Voltage 64 6.3.5 Viewing the Set Point 65	6.3.1 Remote Signal Source Wiring Connections	61
6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and 11/12	6.3.2 Configuring Remote Signal Source	62
6.3.5 Viewing the Set Point	6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and 11/12	ნ კ
0.3.3 VIEWING THE SET FUNT	0.3.4 Setting the Curve TT-UC Voltage	04 65
6.4 Domestic Hot Water Operation Using A Tank Sensor	6.4 Domestic Hot Water Operation Using & Tank Sensor	65
64 1 Sensor Wiring Connections	6.4.1 Sensor Wiring Connections	65
6.4.2 Configuring the Controller for DHW With a Tank Sensor	6.4.2 Configuring the Controller for DHW With a Tank Sensor	66



 6.4.3 Setting the DHW Set Point 6.4.4 Displaying Temperatures Associated With DHW 6.4.4.1 Viewing DHW Set Point and Actual DHW Temperature 	67 68 68
6.4.4.2 Viewing DHW Set Point With T-BOILER DHW Function	68
6.5 DHW Operation Using an Aquastat	69
6.5.1 Sensor Wiring Connections	69
6.5.2 Configuring the Controller for DHW With an Aquastat	69
6.5.3 Setting the DHW Set Point	69
6.6 Boiler & Pump Epoble/Disoble	60
CLADTED 7, EQ CONNECTOD TEDMINAL ASSIGNMENTS	03
7 1 SENSOR Terminal Assignments	71
7 1 1 Connector 7	72
7.1.2 Connector 1	72
7.1.3 Connector 5	72
7.1.4 Connector 8 => PT 1000 Sensor	72
7.1.5 Connector 3	72
7.1.6 Connector 9	72
7.2 MAINS Power Terminal Assignments	73
	73
7.2.2 Connector 6	73
	/ 4
CHAPTER 8: BUILER COMMUNICATIONS MODULE (BCM)	/3
8.2 BCM Fault Relay	75
8.2.1 BCM Fault Relay Wiring	77
8.2.2 Clearing Faults	78
8.3 BCM Configured as Back-Up Controller	78
8.3.1 BCM Back-Up Controller Wiring	78
8.4 BCM Configured as Primary Controller Utilizing Modbus	80
8.4.1 Operating Scenario	80
8.4.2 Physical Modbus RS485 Wiring	81
8.4.3 Disconnecting the E8 from the E-Bus on the BCM Board	81
8.4.4 AERCO BMS II/ACS Master to BCM Slave Wiring Connections.	82
8.4.5 EMS of BAS Master to BCM Slave Wiring Connections	82
8.5 1 Pump Control Wiring	02 82
8.5.2 Pump Control Operation	02
8.6 RS485 Loop Termination Resistors and Bias	83
8.6.1 Master BMS II/ACS or EMS/BAS Terminating Resistor and Bias	83
8.6.2 BCM Controller Terminating Resistor and Bias	83
8.7 Modbus Network Wiring Diagram	85
8.8 Modbus Software Set-Up	87
8.8.1 BCM Set-Up For Modbus Operation	87
8.8.2 Monitoring and Configuration Only	87
8.8.3 AERCO BMS II/ACS Modbus Control and Monitoring	88
8.8.5 EMS or BAS Set-Up As Master to BCM Controller Slaves	00
8.9 Multiple Modulex Boiler Heating Mode – Using A RMS II or ACS	88
8.9.1 Sequence of Operation (Example: Four-Modulex boiler installation)	89
CHAPTER 9: BCM MODBUS AND ADDRESS ASSIGNMENTS	91
9.1 BCM Modbus Comm. & Support Requirements	
9.1.1 Function Codes	91
9.1.2 Modbus Support Requirements	91
9.2 BCM Controller Standard Holding Register Assignments	92
9.2.1 BCM Controller Standard Input Register Assignments	92



9.2.2 BCM Controller Standard Holding Register Assignments	
CHAPTER 10: E8, BCM, AND BMM FAULT CODES	
10.1 Processing and Clearing Fault Codes	
10.2 Fault Codes and Descriptions	
10.2.1 E8 Controller Fault Code Table	
10.2.2 BCM and BMM Fault Code Conversion Table	
10.2.3 BCM Fault Code Table	
10.2.4 BMM Fault Code Table	



CHAPTER 1: INTRODUCTION

CHAPTER 1: INTRODUCTION

The information in this manual provides a guide to the operation of the Modulex Boiler using the E8 Controller and the Boiler Communications Module (BCM) mounted on the front of the unit.

It is imperative that the initial startup procedures be performed by factory trained personnel. Operation by untrained personnel, prior to the initial startup, will void the equipment warranty. In addition, CAUTIONS and WARNINGS in this manual must be observed at all times.

CAUTION!

It is of utmost importance to observe all **CAUTIONS** and **WARNINGS** presented in this manual to avoid injury, death, and damage to the equipment. Failure to properly heed safety warnings and cautions may result in the voiding of applicable warranties.

CHAPTER 1: INTRODUCTION



(This page intentionally blank)



CHAPTER 2: E8 CONTROLLER AND BCM DESCRIPTION

CHAPTER 2: E8 CONTROLLER AND BCM DESCRIPTION

Modulex boilers contain advanced and reliable electronic controls, which includes the E8 Controller and the BCM (Boiler Communications Module), providing comprehensive programming and monitoring of the Modulex boiler and its functions. Features and functions of the E8 Controller are described in the following sections.

2.1 E8 Controller Features and Functions

A standard component included in Modulex units, the E8 Controller is responsible for the staging and modulation of individual thermal heating modules in a Modulex boiler and also monitors supply and return water temperatures and domestic hot water zones.

The E8 Controller is housed in a compact enclosure measuring 5.7" (145 mm) x 3.9" (100 mm). The Controller is mounted on the front of the Modulex Boiler and contains all of the controls, indicators and displays necessary to adjust, operate and troubleshoot the Modulex Boiler. The E8 features the following functions for Modulex boilers:

- Shares the heating load among as many of the boiler's thermal heating modules as possible, maximizing the overall operating efficiency of the boiler.
- Provides access to all testing/programming parameters of each individual heating module: operation test, operation time, boiler freeze protection and the pump's anti seize program.
- Drives lead-lag burner operation based on operating hours. The boiler module with the least burner operating hours is the first to start and the burner with the most operating hours is the first to stop.
- Supports DHW (Domestic Hot Water) production using a dedicated sensor to control a dedicated pump or 3-way diverting valve for storage tank temperature control.
- Supports a manual operation service mode to control individual modules during troubleshooting or combustion calibration procedures.
- Drives diagnostics such as relay and senor testing.
- Supports Modbus integration with AERCO BMS II and AERCO Control System (ACS) or Building Automation Systems. AERCO also offers a Communication Gateway to support BACnet, Lonworks and N2 system integration.



Figure 2-1: Modulex E8 Controller Front Panel

CHAPTER 2: E8 CONTROLLER AND BCM DESCRIPTION



2.2 BCM Features and Functions

The BCM (Boiler Communications Module) is an electronic module in Modulex boilers (one per burner), which supports full interoperability to BAS (Building Automation Systems) via Modbus protocol to make remote communications and control possible. In addition, it provides customers with a remote alarm contact to notify customers of faults detected within any of the boiler's multiple thermal modules. Finally, in the event the boiler's master controller stops working, the BCM also takes over operations of the boiler.

As a back-up controller, the BCM further increases the reliability of a product line already known for its uniquely redundant design. Each Modulex boiler combines between two and seven independent, pre-assembled thermal modules housed in a common enclosure. Each module has its own dedicated controller with a combustion safeguard, variable-speed fan, modulating gas valve, electronic ignition, modulating burner, flow temperature sensor, thermostat and heat exchanger. The independent operation of these thermal modules increases each boiler's overall reliability. If a single module requires maintenance or repair, the other module(s) in the boiler can maintain the system load requirements -- thereby providing a level of redundancy that was previously only realized in multi-boiler installations.

A photo of the module is shown in Figure 2-2 below. Additional information for the BCM component can be found in Chapter 7, 9, and 10.



Figure 2-2: BCM (Boiler Control Module)

NOTE:

Before operating any menus and functions in the E8, one MUST perform a one-time entry of items into the initial INSTALLATION menu. See Section 4.1 for more information about initial setup and configuration of the E8 Controller.

CHAPTER 3: E8 CONTROLLER OPERATION

The E8 Controller operates in NORMAL Mode when the controller door is closed, which allows for monitoring the boiler status through the display window and setting the HEATING Mode. When the door is opened, the unit enters MENU Mode, and in this mode the boiler may be initialized, configured, and adjusted. The controls and display for the E8 controller are described in the following sections.

3.1 NORMAL Mode Operation (Door Closed)

When the hinged door is closed on the E8, the unit is in NORMAL Mode.

3.1.1 NORMAL Mode Display Functions

Figure 3-1 describes the types of information provided on the LCD display when in NORMAL Mode (door closed). Note that the display in the illustration is only an example, and that an E8 Controller in service will show information appropriate for its configuration.





3.1.2 HEATING Mode Selection (in NORMAL Mode)

Heating modes may be selected using the Rotary Knob on the controller when the hinged door is in the *closed* position (NORMAL Mode). As the Rotary Knob is turned, each appropriate heating mode symbol is displayed, in turn, along the lower edge of the display.

Mode changes take effect when the setting is not changed for 5 seconds. The symbols and description for the available heating modes are shown in Figure 3-2.





CHAPTER 3: E8 CONTROLLER OPERATION

3.1.3 MENU Mode Operation (Door Open)

Opening the E8 controller hinged door reveals the E8 controls (below) and initiates MENU Mode, which enables access to an extensive set of software menus.



3.2 Software Menus

Software menus are divided into five main menus, each with a set of sub-menus (Table 3-1). The rotary knob on the front of the E8 Controller is used to sequentially cycle through the menus and the sub-menus. Two small arrows at the bottom of the display point to the selected menu and sub-menu name, respectively. Note that some menus and sub-menus are read-only or not available, according to the boiler used and the initial startup configuration.

NOTE:

Before operating any menus and functions in the E8, one MUST perform a one-time entry of items into the initial INSTALLATION menu. See Section 4.1, E8 Controller Initial Startup for more information about initial setup and configuration of the E8 Controller.

Note that whenever the unit is powered down and then powered up again, the INSTALLATION menu will reappear. When this occurs, the INSTALLATION menu items DO NOT need to be reentered. Normally, after entry of the required initial INSTALLATION menu entries, turning the Rotary Knob clockwise will automatically advance the Controller to the DISPLAY menu group. All items in this group are "Read Only" and cannot be changed.

TABLE 3-1: Main Menus and Sub-Menus		
MAIN MENUS SUB-MENUS		
	INSTALLATION	
	HOT WATER	
DISPLAY	HEAT CIRCUIT I	
	HEAT CIRCUIT II	
	SOLAR/MF	
	INSTALLATION	
	HOT WATER	
USER	HEAT CIRCUIT I	
	HEAT CIRCUIT II	
	SOLAR/MF	
	CIRCL TIME	
	HOTW-PROG	
	HTG-PROG 1	
	HTG-PROG 2	
	INSTALLATION	
	HOT WATER	
EXPERT	HEAT CIRCUIT I	
	HEAT CIRCUIT II	
	SOLAR/MF	
EXPERT HS	INSTALLATION	
	SERVICE	
	DATE/TIME	
GENERAL	HOLIDAY	
	CLOCK CHANGE	







Figure 3-4: E8 Display in MENU Mode

3.2.1 Basic Menu/Sub-Menu Navigation and Selection

Selected Menu and Sub-menu are indicated by two black arrows at display bottom pointing to the Menu and Sub-menu names silk-screened below the display (see Figure 3-4).

Following initial startup and one-time entry of the required INSTALLATION menu items (see E8 Controller Initial Startup, Section 4.1), to access, view and/or change menu items follow these instructions:

Menu/Sub-Menu Navigation and Selection

- 1. When the ON/OFF switch on the front of the boiler is turned ON and the swing-down hinged panel is opened, the controller will enter MENU Mode and INSTALLATION will be displayed (Figure 3-4) in the LCD. This is the initial INSTALLATION menu and it is assumed that all entries have already been made. See Section 4.1 for INSTALLATION menu initial entry information.
- Turn the Rotary Knob clockwise until the display advances to the DISPLAY menu. The dial on the clock face will rotate one revolution counterclockwise and then go off. The display will then show INSTALLATION, which is the first sub-menu in the DISPLAY menu group (Figure 3-4). The two small black arrows at bottom of the display will point down to the menu and submenu names, in this case DISPLAY and INSTALLATION, respectively.
- 3. To view functions included in the INSTALLATION sub-menu, press the Program Key (Item E, Figure 3-3). If desired, turn the Rotary Knob to scroll through the functions in the INSTALLATION sub-menu. As previously mentioned, these display functions are read-only and cannot be changed. Once you reach the end of the sub-menu, RETURN will appear in the display.
- 4. To exit this sub-menu and advance to the next sub-menu in the DISPLAY menu, press the Program Key. INSTALLATION will again be displayed. Turn the Rotary Knob clockwise until the next sub-menu is displayed.
- 5. Repeat steps 2, 3 and 4 to view the remaining main menus and their associated sub-menus. The remaining main menus are: USER, TIME PROGRAM, EXPERT, EXPERT HS, and GENERAL.



3.2.2 Basic Parameter Navigation, Selection, and Revision

When in the **USER**, **TIME PROGRAM**, **EXPERT**, or **GENERAL** Main Menu, virtually all submenu items can be changed if the desired. Perform the following steps to access, view, and/or change menu item parameters:

PARAMETER CHANGE PROCEDURE			
DESCRIPTION	EXAMPLES		
Use Rotary Knob to navigate to desired Menu/Sub- menu. Menu and sub-menu are indicated by two small black arrows at bottom of LCD display pointing down to menu/sub-menu names below display (see Figure 3-4).	Example: User Menu & Hot Water Sub-menu HOT-WATER Display Detail		
Press Program Key to access parameters in the selected (displayed) sub-menu.	HOT-WATER displayed sub-menu		
Turn the Rotary Knob to sequence through the available parameters.	Cycle thru parameters		
To change a parameter value, press the Program Key when the desired parameter is displayed. The Change LED will light up indicating the displayed parameter may now be changed.	T-DHW displayed parameter		
To change the displayed parameter value, turn the Rotary Knob; clockwise to increase value and counter- clockwise to decrease the value.	cycle thru values		
To save the displayed parameter value to the controller memory, press the Program Key. The Change LED will turn off indicating the new value has been saved.	142.0displayed valuevalueuluepush!142.0Displayed ValueValue		



CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE

CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE

4.1 Initializing the E8 in the Installation Menu

When power is first applied to the boiler and then the E8 controller cover is opened, the **INSTALLATION** Menu is displayed once (only). See Figure 4-1 for a diagram of this menu. These values MUST be entered in order to initialize the boiler for operation. Once the **LANGUAGE**, **TIME** and **DATE** values grouped here have been entered and accepted, the controller is initiated and operatable and may be configured for your boiler installation. To reenter the **INSTALLATION** menu, cycle the boiler power and open the cover again.

To initialize the E8 Controller, follow the instructions below and refer to Figure 4-1 and Table 4-1 on the following pages:

Initial Startup INSTALLATION Entry

- 1. Set the POWER rocker switch, located to the left of the Controller, to the ON (I) position.
- 2. Open the panel cover on the Controller. The LCD display will read **INSTALLATION**. All values in this level must be entered, in sequence, without interruption.
- 3. The first function that appears is **LANGUAGE**. By default, the display should show **ENGLISH**. If **ENGLISH** is not displayed, turn the Rotary Knob until **ENGLISH** appears.
- 4. Press the Program Key to store this setting.
- 5. Next, **TIME** will be displayed. Enter the current time (minutes, hours) using the Rotary Knob. Press the Program Key to store each value.
- 6. The next items displayed are the **YEAR**, **MONTH** and **DAY**. Enter each item using the Rotary Knob and press the Program Key as previously described to store the entry.
- 7. Following entry of all LANGUAGE, TIME and DATE entries, continue entering the remaining items shown in Figure 4-1 and Table 4-1 until all required items have been entered. Use the Program Key and Rotary Knob to select, adjust and store all entries as previously described.

NOTE:

Leave the **BUS – ID HS** parameter blank. Remaining parameters are already set and do not require any entry.

- 8. Continue step 7 until **RETURN** appears in the display, indicating that you are at the end of the **INSTALLATION** menu.
- 9. Press the Program Key to exit the **INSTALLATION** menu.



CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE

INSTALLATION			
Language - ENGLISH Set new value	BUS-ID HS =	MODULEX EXT DV E8 master	MODULEX EXT DV E8 slave 01 ÷ 08
	HEATSOURCE 1 =	06	06
Press to	HS 1 BUS =	02	02
enter Level	HEATSOURCE 2 =	00	00
Current Time -> TIME -> 1	STORAGE Hs2 =	00	00
	BUFFER =	00	00
Press to	HC FUNCTION 1 =	00	00
enter Level	HC FUNCTION 2 =	00	00
	CAP/MODULE =	"SCAN"	"SCAN"
	RELAY FUNC 1 =	00	00
Press to	T-MF 1 SETP =	86	86
enter Level	MF1HYST =	9	9
	RELAY FUNC 2 =	00	00
	T-MF 2 SETP =	86	86
Press to	MF 2 HYST =	9	9
enter Level	RELAY FUNC 3 =	01	01
Current Day ->	T-MF 3 SETP =	86	86
	MF 3 HYST =	9	9
Press to	RELAY FUNC 4 =	02	02
	T-MF 4 SETP =	86	86
Menu selections shown	MF 4 HYST =	9	9
are the factory default	BUS 1 ID =	01	
settings.	BUS 2 ID =		
enter Level	5 K SENSOR =	00	00

Figure 4-1: INSTALLATION Menu

CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE



TABLE 4-1: INSTALLATION Menu Listing			
PARAMETERS	DESCRIPTION	ENTRY RANGE	DEFAULT
INSTALLATION	Sub-Menu		
LANGUAGE	Set Language		ENGLISH
TIME	Set current time (min., hrs)	00:00 - 24:00	
YEAR	Set current year	XXXX (4 digits)	
MONTH	Set current month	00-12	
DAY	Set current day of month	00-31	
CONF DEVICE	Confirm Device	, 01 – 06	
HEATSOURCE 1	Heat Source 1, Must be set to 06	00 – 06	06
HS1 BUS	Heat Source 1 Bus	00 - 04	02
HEATSOURCE 2	Heat Source 2	00 – 05	00
STORAGE HS2	Storage Heat Source 2	00 - 03	00
BUFFER	Buffer	00, 01, 02	00
HC FUNCTION 1	Heating Circuit Function 1, control mode (outdoor reset, constant setpoint, etc)	00, 01, 03	00
HC FUNCTION 2	Heating Circuit Function 2	00 - 04	00
CAP/MODULE	See Section 5.7.1 for instructions.	00 – 1000 Kw	MLX EXT up to 1100 = 47 kW MLX EXT 1500 to 3060 = 112 kW
RELAY FUNC 1	Relay Function 1 (See Section 5.7.2)	00 – 26	00
T-MF1 SETP	Temperature – Multifunction Relay 1 Setpoint	86°F – 194°F	86°F
MF1 HYST	Multifunction Relay 1 Hysteresis	4°F – 18°F	9°F
RELAY FUNC 2	Relay Function 2 (See Section 5.7.2)	00 – 26	00
T-MF2 SETP	Temperature – Multifunction Relay 2 Setpoint	86°F – 194°F	86°F
MF2 HYST	Multifunction Relay 2 Hysteresis	4°Ra – 18°Ra	9°F
RELAY FUNC 3	Relay Function 3	00 – 26	01
T-MF3 SETP	Temperature – Multifunction Relay 3 Setpoint	86°F – 194°F	86°F
MF3 HYST	Multifunction Relay 3 Hysteresis	4°F – 18°F	9°F
RELAY FUNC 4	Relay Function 4	00 – 26	02
T-MF4 SETP	Temperature – Multifunction Relay 4 Setpoint	86°F – 194°F	86°F
MF4 HYST	Multifunction Relay 4 Hysteresis	4°F – 18°F	9°F
BUS ID 1	Bus Identification No. 1	00 – 15	01
BUS ID 2	Bus Identification 2	00 – 15	02
5K SENSOR	5,000 Ohm Sensor	00=5K, 01=1K	00 = 5 K



CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE

4.2 QUICK START INSTRUCTIONS

Below are instructions for setting the most basic settings in the E8 controller, including maximum and minimum flow temperature, room temperature settings, heat slope, and initiation of heating programs.

IMPORTANT NOTE:

Before the boiler may be used, the E8 controller **MUST** be first intitialized by entering language, year, month, day, and hour in the Installation Menu as described in Section 4.1.



Figure 4-2: E8 Quick Start, Max. & Min. Flow Temperature Settings



CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE

4.2.2 Setting Room Temperature and Outdoor Compensation



Figure 4-3: E8 Quick Start, Room Temperature and Outdoor Compensation Settings with Outdoor Temperature (Slope) Chart

CHAPTER 4: E8 INITIALIZATION AND QUICK START GUIDE



4.2.3 Setting Heating Programs and Pumps



Figure 4-4: E8 Quick Start, Heating and Pump Program Settings



CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

This chapter provides flow-chart illustrations and tabular listings of all Menu and Sub-Menu functions. Overall menu hierarchy is shown below:

MAIN MENUS	SUB-MENUS	
	INSTALLATION	
	HOT WATER	
DISPLAY	HEAT CIRCUIT I	
	HEAT CIRCUIT II	
	SOLAR/MF	
	INSTALLATION	
	HOT WATER	
USER	HEAT CIRCUIT I	
	HEAT CIRCUIT II	
	SOLAR/MF	
	CIRCL TIME	
	HOTW-PROG	
	HTG-PROG 1	
	HTG-PROG 2	
	INSTALLATION	
	HOT WATER	
EXPERT	HEAT CIRCUIT I	
	HEAT CIRCUIT II	
	SOLAR/MF	
EXPERT HS	INSTALLATION	
	SERVICE	
	DATE/TIME	
GENERAL	HOLIDAY	
	CLOCK CHANGE	

IMPORTANT NOTE:

In the following flow-chart illustrations and tabular listings, descriptions, entry ranges, and default values are provided for only the commonly used functions which are referenced in Chapter 6, titled E8 Set-Up & Programming. These commonly used functions are shown in **Bold** *Italics* in the illustrations and tables which follow.



CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

5.1 DISPLAY Menu

The DISPLAY Menu contains the INSTALLATION, HOT WATER, HEATING (HTG) CIRCUIT 1 & 2 and a SOLAR M/F Sub-Menu as shown in Figures 5-1 & 5.2, and in Table 5-1.



Figure 5-1: DISPLAY Menu Flow Chart

CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS



Figure 5-2: DISPLAY Menu

NOTE:

Some menus are visible only if the relevant sensor is wired (e.g. HOT WATER is displayed only if the DHW storage sensor is wired).

NOTE:

All DISPLAY Menu and Sub-Menu functions are READ ONLY and cannot be changed. Temperature readings shown are in °F.







TABLE 5-1: DISPLAY Menu Listing46				
FUNCTION	DESCRIPTION	REMARKS		
INSTALLATIO	DN Sub-Menu			
T-EXT DES	Boiler Set Point setting in 0 to 10 volt input mode	A 0 to 10 volt external input signal can be used to change the Boiler set point.		
T-COLL DES	Boiler Set Point temperature in Indoor/ Outdoor Reset and Constant Set Point modes.			
T-COLLECTOR	Header temperature			
T-BOIL	Press Program Key to display temperature and ON/OFF status of individual Heat Modules (HS) which range from 2 (EXT 321) to 8 (EXT 3060). Turn Rotary Knob to sequence between Heat Modules.	The Burner symbol (I) is displayed when the respective Heat Module is ON.		
T-SOLID FUEL	Not Applicable			
T-RETURN 1	Return water temperature			
T-RETURN 2	Not Applicable			
T-BUFFER T	Not Applicable			
T-BUFFER M	Not Applicable			
T-BUFFER L	Not Applicable			
T-STORAGE 3	Not Applicable			
MODGRAD	Press Prog Key to display Modulation % for individual Heat Modules (HS). Turn Rotary Knob to sequence between Heat Modules.			
RETURN	Press Program Key to exit INSTALLATION Sub-Menu.			
HOT WATER Sub-Menu				
T-DHW RATED	DHW set point temperature	Based on heating prog and operating mode. Actual DHW set point as set in USER/HOT WATER menu.		
T-DHW	Actual hot water temperature	Only if tank sensor is installed		
T-DHW L	Not Applicable			
T-CIRCL	Not Applicable			
RETURN	Press Program Key to exit the HOT WATER Sub-Menu.			



CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

TABLE 5-1: DISPLAY Menu Listing (Continued)					
FUNCTION	DESCRIPTION	REMARKS			
HTG CIRCUIT 1	HTG CIRCUIT 1 Sub-Menu				
T-ROOM DES A	Not Applicable				
T-ROOM	Current room air temperature.	Only if indoor sensor is connected			
HUMIDITY	Room humidity (%).	Only if humidity sensor is installed and parameters set for heating circuit.			
T-DHW RATED	Hot water set point temperature	Appears only if heating circuit is programmed as hot water circuit			
T-DHW	Current hot water temperature	Same as above			
T-FLOW RATED	Current flow set point temperature				
FLOW	Current flow temperature				
N-OPT-TIME	Not Applicable	Not applicable			
RETURN	Press Program Key to exit HTG CIRCUIT 1 Sub-Menu.				
HTG CIRCUIT 2 Functions for HTG (I	Sub-Menu Heating) Circuit 2 are identical to HTG C	ircuit 1 Functions above.			
SOLAR M/F Sub-	Menu				
T-MF1	Not Applicable	Currently not used			
T-MF2	Not Applicable	Currently not used			
T-MF3	Programmed to run the primary pump 24/7				
T-MF4	Not Applicable	Currently not used			
T-COLLECTOR 1	Not Applicable	Currently not used			
T-DHW	Not Applicable	Currently not used			
T-DHW L	Not Applicable	Currently not used			
RETURN	Press Program Key to exit SOLAR M/F Sub-Menu.				



CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

5.2 USER Menu

The USER Menu (Figures 5-3 & 5-4) contains the same Sub-Menus as the DISPLAY Menu. However, the USER Menu items are not "Read Only" and therefore can be changed. The Sub-Menu functions in the USER Menu also differ from those contained in the DISPLAY Menu. Tabular listings for the USER Menu items are provided in Table 5-2.



Figure 5-3: USER Menu Flow Chart







Figure 5-4: USER Menu Diagram

CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

TABLE 5-2: USER Menu Listing				
FUNCTION	DES	SCRIPTION	ENTRY RANGE	DEFAULT
INSTALLATIO	ON Sub-Menu			
LANGUAGE	Selects display lang	uage.	12 languages are available.	ENGLISH
CONTRAST	Adjusts display conti	rast	-20 to 20	00
	Sets the day of the w temperature (°F) to a the swing-down pan	veek or the sensor appear in the display when el is closed.		
	Day:	SUN – SAT		
	T-OUTSIDE:	Outside Temperature		
DISPLAY SEL	FLOW TEMP (1/2):	Flow Temp. For Heating Circuit 1 or 2 supply water temperature. (Only if sensor is installed)	See DESCRIPTION Column	
	T-DHW:	Domestic Hot Water Temperature.		
	T-BOILER;	Boiler Outlet Temperature.		
	T-ROOM (1 / 2):	Room Temp, Heating Circuit 1 or 2 (ONLY if Remote Control is connected).		
RETURN	Press Program Key Sub-Menu.	to exit INSTALLATION		
HOT WATER Sub-Menu				
1X DHW	Not Applicable			
T-DHW 1	Hot Water set point		50°F - 158°F	140°F
T-DHW 2	Not Applicable			
T-DHW 3	Not Applicable			
BOB-VALUE	Not Applicable			
CIRCL-P- DHW	Not Applicable			
RETURN	Press Program Key Menu.	exit HOT WATER Sub-		



CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

TABLE 5-2: USER Menu Listing (Continued)				
FUNCTION	DESCRIPTION	ENTRY RANGE	DEFAULT	
HTG CIRCUIT 1 Sub-Menu				
MODE	Displays Timer Mode for Boiler	, Standby, Auto 1, Auto 2, Day, Night		
T-ROOM DES 1	Not Applicable			
T-ROOM DES 2	Not Applicable			
T-ROOM DES 3	Not Applicable			
T-REDUCED	Not Applicable			
T-ABSENCE	Not Applicable			
T-LIMIT DAY	If PUMP MODE = 01 only. During <i>daytime</i> heating period, if outside temp exceeds this limit, heating is disabled. "" disables this limit.	, -23.0°F–104.0°F	66.0°F	
T-LIMIT N	If PUMP MODE = 01 only. During nightime heating period, if outside temp exceeds this limit, heating is disabled. "" disables this limit.	, -23.0°F–104.0°F	50.0°F	
HEATSLOPE	Reset curve slope. Indicate number of degrees that the flow temperature changes if the outside temperature increases or decreases by 1°F.	0.00 – 3.00	1.20	
OPTIM HEAT	Not Applicable			
MAX OPT-TIME	Not Applicable			
ECONO OPTI	Not Applicable			
PC-ENABLE	Not Applicable			
RETURN	Press Program Key to exit HTG CIRCUIT 1 (or 2) sub-menu.			
HTG CIRCUIT 2 Sub-Menu Functions for HTG Circuit 2 are identical to HTG Circuit 1 Functions listed above.				
SOLAR M / F Sub-Menu (No Functions Currently In This Sub-Menu)				
RETURN	Pressing the Program Key with SOLAR M/F displayed will change display to RETURN. Press Program Key again to redisplay SOLAR M/F. Turning the Rotary Knob clockwise will advance thd			

display to the TIME PROGRAM Menu.





CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

5.3 TIME PROGRAM Menu and Sun-Menus

Day and Time-related functions can be set using the TIME PROGRAM Menu and its associated Sub-Menus. However, at the present time, none of the Sub-Menus and functions in the TIME PROGRAM Menu are being utilized. This menu is shown in Figures 5-5 & 5-6.

Refer to Chapter 9 for additional information on these Menu and Sub-Menu functions.







CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS



Figure 5-6: TIME PROGRAM Menu Diagram

CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS



TABLE 5-3: TIME PROGRAM Menu Sub-Menus and Parameters						
FUNCTION	DESCRIPTION	ENTRY RANGE	DEFAULT			
CIRCL TIME Sub-Menu						
The CIRCL (Circulation) Time Sub-Menu is used to set the ON-OFF times for Circulation Pump. Press the Program Key to enter this Sub-Menu and view or change ON-OFF times. The times can be set individually for each day of the week or they can be set in groups as listed in the options which follows:						
MONDAY	View or change the pump ON – OFF times for Monday. Press the Program Key to view current settings. Turn Rotary Knob to change displayed ON or OFF time if required. Press Program Key to store displayed ON or OFF time and sequence the display to the next function.	All ON and OFF times can be set in 15 minute increments from 00:00 – 24:00	ON: 5:00h OFF: 21:00h			
TUESDAY	Same as previous except for Tuesday.	See prev.	See prev.			
WEDNESDAY	Same as previous for Wednesday	See prev.	See prev.			
THURSDAY	Same as previous for Thursday	See prev.	See prev.			
FRIDAY	Same as previous for Friday	See prev.	See prev.			
SATURDAY	Same as previous for Saturday	See prev.	See prev.			
SUNDAY	Same as previous for Sunday	See prev.	See prev.			
MO – FRI	Same as above for Monday – Friday	See prev.	See prev.			
SA – SU	Same as previous for Saturday and Sunday	See prev.	ON: 6:00h OFF: 22:00h			
MO – SU	Same as previous for Monday – Sunday	See prev.	ON: 6:00h OFF: 22:00h			
RETURN	Press Program Key to exit CIRCL sub-menu					
HOTW - PROG Sub-Menu						
	The HOTW – PROG (Hot Water Program) Sub-Menu is used to set the ON-OFF times for the Hot Water Charging Pump. The procedures for viewing/changing ON- OFF times are identical to those previously described for the CIRCL TIME Sub-Menu, <u>except</u> they apply to the <u>Hot Water</u> <u>Charging Pump.</u> The days/day groups are also identical to the those shown in the CIRCL TIME Sub- Menu.					





TABLE 5-3: TIME PROGRAM Menu Sub-Menus and Parameters (Continued)						
FUNCTION	DESCRIPTION	ENTRY RANGE	DEFAULT			
MONDAY	View or change the pump ON – OFF times for Monday. Press the Program Key to view current settings. Turn Rotary Knob to change displayed ON or OFF time if required. Press Program Key to store displayed ON or OFF time and sequence the display to the next function.	All ON and OFF times can be set in 15 minute increments from 00:00 – 24:00	ON: 5:00h OFF: 21:00h			
TUESDAY	Same as previous except for Tuesday.	See prev.	See prev.			
WEDNESDAY	Same as previous for Wednesday	See prev.	See prev.			
THURSDAY	Same as previous for Thursday	See prev.	See prev.			
FRIDAY	Same as previous for Friday	See prev.	See prev.			
SATURDAY	Same as previous for Saturday	See prev.	See prev.			
SUNDAY	Same as previous for Sunday	See prev.	See prev.			
MO – FRI	Same as above for Monday – Friday	See prev.	See prev.			
SA – SU	Same as previous for Saturday and Sunday	See prev.	ON: 6:00h OFF: 22:00h			
MO – SU	Same as previous for Monday – Sunday	See prev.	ON: 6:00h OFF: 22:00h			
RETURN	Press Program Key to exit HOTW – PROG sub-menu.					
HTG - PROG 1 Sub-Menu						
	The HTG-PROG 1 (Heating Program 1) So Menu is used to set the ON-OFF times for Heating Circuit 1 The procedures for viewing/changing ON- times are identical to those previously described for the CIRCL TIME Sub-Menu, <u>except</u> they apply to the <u>HTG PROGRAM</u> The days/day groups are also identical to the those shown in the CIRCL TIME Sub-Men The associated ON / OFF times are as sho In the DEFAULT column	ub- OFF <u>1.</u> the u. own				





TABLE 5-3: TIME PROGRAM Menu Sub-Menus and Parameters (Continued)					
FUNCTION	DESCRIPTION	ENTRY RANGE	DEFAULT		
MONDAY	View or change the pump ON – OFF times for Monday. Press the Program Key to view current settings. Turn Rotary Knob to change displayed ON or OFF time if required. Press Program Key to store displayed ON or OFF time and sequence the display to the next function.	All ON and OFF times can be set in 15 minute increments from 00:00 – 24:00	ON: 6:00h OFF: 22:00h		
TUESDAY	Same as previous except for Tuesday.	See prev.	See prev.		
WEDNESDAY	Same as previous for Wednesday	See prev.	See prev.		
THURSDAY	Same as previous for Thursday	See prev.	See prev.		
FRIDAY	Same as previous for Friday	See prev.	See prev.		
SATURDAY	Same as previous for Saturday	See prev.	See prev.		
SUNDAY	Same as previous for Sunday	See prev.	See prev.		
MO – FRI	Same as above for Monday – Friday	See prev.	See prev.		
SA – SU	Same as previous for Saturday and Sunday	See prev.	See prev.		
MO – SU	Same as previous for Monday – Sunday	See prev.	See prev.		
RETURN	Press Program Key to exit HTG – PROG 1 sub-menu.				
HTG - PROG 2 Sub-Menu					
	Sub-Menu Functions, processing procedures, ranges and defaults are same as HTG PROG 1 above.				
RETURN	Press Program Key to exit HTG – PROG 2 sub-menu.				



CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS

5.4 EXPERT Menu and Sub-Menus

The EXPERT Menu contains the following Sub-Menus: INSTALLATION, HOT WATER, HEAT CIRCUIT 1, HEAT CIRCUIT 2 and SOLAR M/F as shown in Figures 5-7 & 5-8. As this figure shows, the EXPERT Menu includes an extensive list of Sub-Menu functions, particularly in the INSTALLATION Sub-Menu. Tabular listings for the EXPERT Menu and Sub-Menu items are provided in Table 5-4.



CONTINUED ON SHEET 2

Figure 5-7: EXPERT Menu Flow Chart (Sheet 1 of 2)





Figure 5-7: EXPERT Menu Flow Chart (Sheet 2 of 2)




Figure 5-8: EXPERT Menu – 1 of 2





CHAPTER 5: E8 CONTROLLER MENUS AND SUB-MENUS



Figure 5-8: EXPERT Menu – 2 of 2

NOTE:

The shaded items in the following table indicate those parameters that change according to the boiler type and whether used singly or in a cascaded configuration.

NOTE:

Whenever "**CODE NO.**" is displayed, it indicates that the valid password must be entered. This is accomplished by entering code **0000** (four zeros) by pressing the Program Key four (4) times.



TABLE 5-4: EXPERT Menu Listing			
FUNCTION	DESCRIPTION	ENTRY RANGE DEFAULT	
INSTALLATIC	N Sub-Menu		
CODE-NO	Permits entry of valid Code No.(0000)	0000 - 9999	0000
BUS ID HS	BUS ID HS MUST be set to to operate the boiler	01 - 08	DO NOT CHANGE
BUS ID 1	The heating circuits are sequentially numbered starting with "01", heating circuit numbers must not be assigned twice.	01 – 15	01
BUS ID 2	Heating circuits are sequentially numbered starting with "01", heating circuit numbers must not be assigned twice.	01 – 15	
AF SUPPLY	Outdoor sensor power supply	00, 01 (OFF/ON)	01 (ON)
BUS TERM	Bus terminating resistor (Must be set to 01)	00, 01 (OFF/ON)	01 (ON)
EBUS SUPPLY	Switches the Ebus supply ON/OFF	00, 01 (OFF/ON)	01 (ON)
TIME MASTER	Not Applicable		
MAX T-COLL	Sets the maximum header water temperature alarm value.	86.0°F – 230.0°F	185.0°F
MIN T-COLL	Sets the minimum header water temperature alarm value.	50.0°F – 176.0°F	50.0°F
MAX T-HS2	Not Applicable		
MIN T-HS2	Sets minimum allowable HS2 set point temperature.	50.0°F – 176.0°F	104.0F°
V-CURVE	0 to 10 Volt input Voltage curves. Choose from preset curves (see Section 5.4.1) or customize a curve.	00 – 11	11
CURVE 11-U1	Low voltage setting	0.00V - 10.00V	0.000
CURVE 11-U2	High voltage setting	0.00V - 10.00V	10.00
CURVE 11-T1	Minimum set point temperature	32.0°F – 248.0°F	59.0°F
CURVE 11-T2	Maximum set point temperature	32.0°F – 248.0°F	185.0°F
CURVE 11-UO	Stop/Start voltage level. Going below/above this setting will stop/start the Boiler.	0.00V – 10.00V	1.00



TABLE 5-4: EXPERT Menu Listing (Continued)			
FUNCTION	DESCRIPTION	ENTRY RANGE	DEFAULT
INSTALLATIO	DN Sub-Menu (Continued)		
HYSTERESIS	Not Applicable		
FOUND MODULS	Displays the number of heat modules available for service.	Display	
CAP/MODULE	Displays the maximum Kw output of each heat module.	00 – 1000 Kw	MLX EXT up to 1100 = 47 kW MLX EXT 1500 to 3060 = 112 kW
NEW CONFIG	Automatically search for new eBus. Not Applicable		
MIN MOD CASC	Not Applicable	01 – 08	01
HW-BOILER	Not Applicable	00 - 08	00
CONTR DEVIAT	Control Deviation indicates the temperature difference between the Boiler set point and the actual water temperature.	Display	
DES OUPUT	Required system output [in %]	0 – 100%	00
SWITCH TIME	Not Applicable	(N/A)	(N/A)
BLOCK TIME	Not Applicable	(N/A)	(N/A)
MAX T- MODUL	Maximum temperature of Heat Module	122.0°F to 230.0°F	194.0°F
DYN UPWARD	Not Applicable	(N/A)	(N/A)
DYN DOWNWARD	Not Applicable	(N/A)	(N/A)
RESET TIME	Not Applicable	5 - 500	50
MODULAT MAX	Start Level. If this modulation percentage is exceeded, the next heat module is connected after the delay time elapses.	50% - 100%	30%
MODULAT MIN	Stop Level. If value drops below this modulation percentage, the last heat generator (module) of the current sequence is switched off	10% - 60%	35%
MIN MOD HS	Not Applicable	0% - 60%	35%
MOD LEVEL HW	Not Applicable		
SEQUENCE 1	Boiler sequence 1	12345678	
SEQUENCE 2	Boiler sequence 2	87654321	



TABLE 5-4: EXPERT Menu Listing (Continued)			
FUNCTION	DESCRIPTION	ENTRY RANGE	DEFAULT
INSTALLATION	Sub-Menu (Continued)		
SEQU CHANGE	Sequence change mode	01 – 06	06
SEQ SW TIME	Time to sequence change (hours)	10 – 800	200
LOCK TIME	Not Applicable	00 min – 30 min	00
HYST BURNER2	Not Applicable		
HS COOL-FCT	Not Applicable		
T-HS COOL	Not Applicable		
HEATSOURCE 1	Identification of Boiler Type being used: 00 = No Boiler 01 = Single-Stage, switching 02 = Single-Stage, modulating 03 = 2-Stage, switching 04 = 2 individual, switching 05 = Multi-Stage, switching 06 = Multi-Stage, modulating (cascade via BUS)	See DESCRIPTION	06 (Multi-Stage Modulating)
HS 1 BUS	Communication connection between Controller and Heat Source	00 – 04	02
HEATSOURCE 2	Not Applicable	N/A	N/A
STORAGE HS2	Not Applicable	N/A	N/A
BUFFER	Not Applicable	N/A	N/A
SCREED	Not Applicable	N/A	N/A
SCREED PROGR	Not Applicable	N/A	N/A
RETURN	Press Program Key to exit INSTALLATION Sub-Menu.		
HOT WATER Su	ib-Menu		
DHW RELIEF	Not Applicable	N/A	N/A
PARALLEL	Parallel pump operation. 00 = Hot Water Priority 01 = Hot Water Partial Priority 02 = Pump Parallel Running	00, 01, 02	01
T-BOILER DHW	Boiler temperature increase during Hot Water operation. Boiler Temp = (DHW Temp Setting) + (T-BOILER DHW)	32°F – 194°F	97°F
HYST DHW	Hot Water Hysteresis	48°F – 129°F	48°F
DHW FOLLOWUP	Pump Run-Down Time	00 min. – 30 min.	00 min.
THERM INPUT	Storage Tank With Sensor = 00 Storage Tank With Thermostat = 01	00, 01	00 (Off)
WALL HUNG	Not Applicable		00 (Off)
LOAD THROUGH	Not Applicable		00 (Off)
RETURN	Press Program Key to exit HOT WATER Sub-Menu.		



TABLE 5-4: EXPERT Menu Listing (Continued)			
FUNCTION	FUNCTION DESCRIPTION		DEFAULT
HEAT CIRCUIT 1 & 2 Sub-Menus The Sub-Menu Functions for HEAT CIRCUIT 1 & HEAT CIRCUIT 2 are identical, except for the MIXER OPEN & MIXER CLOSE Functions which apply only to HEAT CIRCUIT 1. The Function values in this Sub-Menu level will change, depending on the Heat Circuit Function (HC FUNCTION) selected.			
HC FUNCTION	Heat Circuit Function defines type of circuit: 00 = Standard Heat Circuit (indoor / outdoor reset) 01 = Control to fixed flow temperature (constant setpoint) 02 = Swimming pool control (HC 2 ONLY) 03 = Hot Water Circuit 04 = Return flow temp. Increase via mixing valve.	00 – 04	00 (Standard Heat Circuit)
PUMP MODE	Circulation pump mode control for ON/OFF switching of pumps. 00 = Pump switching per room temperature 01 = Pump switching per outdoor air temperature 02 = Pump switching per timed heating program 03 = Continuous pump operation (24 hrs.)	00 – 03	00
MIXER OPEN	Not Applicable		
MIXER CLOSE	Not Applicable		
MAX T-FLOW	Maximum allowable water temperature set point for the heating circuit.	68°F – 230°F	176°F
MIN T-FLOW	Minimum allowable water temperature set point for the heat circuit.	50°F – 230°F	50°F
T-FROST PROT	Specifies the minimum allowable outside air temperature setting for the Frost Protection Mode. If temperature drops below this value, the system switches to the Frost Protect Mode and the pumps are switched ON. (This Function should be set to 0°F in the INSTALLATION Mode)	-5°F – 41°F	32°F
OUT-TEMP- DEL	Not Applicable	N/A	N/A
SLOPE OFFSET	Not Applicable	N/A	N/A
B-HEAT SINK	Not Applicable	N/A	N/A
RETURN	Press Program Key to exit HEAT CIRCUIT 1 (or 2) Sub-Menu.		





5.4.1 Available V-Curve Preset Voltage Curves for 0 – 10 Volt Input

The following listing (Table 5-4) shows the available preset V-Curve settings for operation in the 0 to 10 Volt Mode:

TABLE 5-5: V-Curve Preset Voltage Curves for 0 – 10 Volt Input					
CURVE NO.	U1	U2	T1	T2	UO
0	2.0 V	10.0 V	32°F	194°F	2.0 V
1	2.5 V	0.3 V	100°F	176°F	5.0 V
2	2.5 V	0.3 V	100°F	167°F	5.0 V
3	2.5 V	0.3 V	100°F	113°F	5.0 V
4	4.0 V	0.1 V	68°F	185°F	5.0 V
5	4.0 V	0.1 V	68°F	167°F	5.0 V
6	4.0 V	0.1 V	68°F	131°F	5.0 V
7	4.0 V	0.1 V	68°F	189°F	5.0 V
8	4.0 V	0.1 V	68°F	189°F	5.0 V
9	4.0 V	0.1 V	68°F	163°F	5.0 V
10	4.0 V	0.1 V	68°F	127°F	5.0 V
11	4.0 V	0.1 V	68°F	194°F	5.0 V





5.5 EXPERT HS Menu

The EXPERT HS menu is a submenu of the EXPERT menu and is used for initialization of the E8 controller. See Section 4.1 for how to use this menu to initialize the E8 controller.

5.6 GENERAL Menu

The GENERAL Menu contains a DATE/TIME Menu and a SERVICE Menu.

5.6.1 DATE / TIME Menu

This Sub-Menu is used to set the time, date, holiday (vacation) schedule and, where necessary, enter clock change settings (daylight savings time, etc.). The DATE/TIME menu functions are illustrated and described in Figures 5-9 & 5-10 and Table 5-6.



Figure 5-9: DATE/TIME Menu Flow Chart



NOTE:

All items in the following DATE/TIME Menu must be entered in sequence. Press the Program Key to step through the menu functions. Use the Rotary Knob to adjust/change entries. Press the Program Key to store entries and sequence to the next function.





|--|

TABLE 5-6: DATE / TIME Menu Listing			
FUNCTION	DESCRIPTION	ENTRY RANGE	
TIME – DATE	Sub-Menu		
This Sub-Menu clock change se	is used to set the time, date, holiday schedule and, wher ettings (daylight savings time, etc).	e necessary, enter	
TIME	Set current time (min., hours)	00:00 - 24:00	
YEAR	Set current year	XXXX	
MONTH	Set current month	01 – 12	
DAY	Set currrent day	01 – 31	
HOLIDAY Sub-Menu This Sub-Menu sets the start and end dates for Holiday (Vacation) periods where no heat or hot water is required.			
YEAR	Set current holiday start year	XXXX	
MONTH START	Set current holiday start month	01 – 12	
DAY START	Set current holiday start day	01 – 31	
YEAR STOP	Set current holiday end year	XXXX	
MONTH STOP	Set current holiday end month	01 – 12	
DAY STOP	Set current holiday end day	01 – 31	
CLOCK CHA	NGE Sub-Menu		
This Sub-Menu is used in areas where seasonal time changes are required for "Daylight Savings", etc.			
MONTH START	Set clock change start month	01 -12	
DAY START	Set clock change start day	01 – 31	
MONTH END	Set clock change end month	01 – 12	
DAY END	Set clock change end day	01 – 31	
RETURN	When CLOCK CHANGE reappears, press Program Key.		



5.6.2 SERVICE Menu

The SERVICE Menu contains all the test and diagnostic functions/values required for Customer Service Engineers to troubleshoot the equipment in a timely manner. The SERVICE Menu items are illustrated and described in Figures 5-11 & 5-12 and Table 5-7 respectively.

Some of the functions in this Sub-Menu require a valid Code No. (password) to be entered, prior to accessing/changing Function values. When prompted by a "**CODE NO.**" display, enter **0000** (four zeros) by pressing the Program Key four (4) times. This will allow function access.



Figure 5-11: SERVICE Menu Flow Chart





Figure 5-12: SERVICE Menu



TABLE 5-7: SERVICE Menu Listing			
FUNCTION	DESCRIPTION REMARKS		
RELAY TEST SU	ub-Menu		
This Sub-Menu is u	used to check the status of the relays contained in	the	
Controller. These	relays are numbered 00 through 11 and are define	ed as shown	
Delow. CODE NO.	Entry is required to access these relays.		
RELAY NO.			
00	No relay		
01	A1: Pump, Heating Circuit 1		
02	A2: Pump, Heating Circuit 2		
03	A3: Hot Water Charging Pump		
04	A4: Mixer OPEN, Heating Circuit 2		
05	A5: Mixer CLOSED, Heating Circuit 2		
06	A6: HS 1 ON		
07	A7: HS2 ON [2-stage:HS 1+2 (after 10s) ON]		
08	A8: Mixer OPEN Heating Circuit 1 / Multifunction 1		
09	A9: Mixer CLOSED Heating Circuit 1 / Multifunction 2		
10	A10: Multifunction 3		
11	A11: Collector Pump / Multifunction 4		
SENSOR TEST	SENSOR TEST Sub-Menu		
This Sub-Menu is used to check and display the temperature readings of the sensors connected to the Controller.			
SENSOR			
F1	Lower buffer storage temperature		
F2	Middle buffer storage temperature or room temperature heating circuit 1		
F3	Upper buffer storage temperature		
F5	Flow temperature, heating circuit 2		
F5	Flow temperature, heating circuit 2		
F6	Upper hot water temperature		
F8	Heat generator /header temperature		
F9	Outside temperature		



TABLE 5-7: SERVICE Menu Listing (Continued)			
FUNCTION	DESCRIPTION	REMARKS	
SENSOR TEST S	ub-Menu	I	
F11	Flow temperature heating circuit 1 or temperature multifunction 1		
F12	Hot water temperature lower or temperature multifunction 2		
F13	Solid fuel boiler temperature or collector 2 or temperature multifunction 3		
F14	Collector 1 temperature or temperature multifunction 4		
F15; Light; 0-10V I	Room temperature heating circuit 2 or measured value of the light sensor or voltage value 0-10V input		
OTHER ENTRIES			
Additional items and	functions in the SERVICE Sub-Menu include the follow	wing:	
SW NO XXX-XX	Specifies the Software Version and Index number currently installed in the Controller		
CASCADE MANU (1-8)	Starting different burner stages of the cascade See GF-136, Section 3.31 for additional calibration instructions using these sub-menu functions.		
BURNER TIME (1- 8)	Program Key – Burner time for all stages		
BURNER START (1-8)	Program Key – Burner start for all stages		
LIMITER TEST (1-8)	Safety temperature limiter test with heat generator temperature display Start with Program Key (hold down)!		
SERVICE	Input of date or operating hours for service messages		
WARNING: <u>NEVER</u> ATTEMPT TO USE THE FOLLOWING RESET FUNCTIONS.			
RESET USER 00	DO NOT USE		
RESET EXPERT 00	DO NOT USE		

00		
RESET T-PRG 00	DO NOT USE	
RETURN	Exit level using Program Key	



5.7 Installation Menu & E8 Controller Initial Startup

See Section 4.1 for instructions for initial startup of the E8 Controller, which requires a number of one-time entries to be made in the initial INSTALLATION Menu that appear in the E8 display when the controller door is first opened. Table 5-8 lists the description, entry range, and default entry for all INSTALLATION MENU parameters.

TABLE 5-8: INSTALLATION Menu Listing					
PARAMETERS	DESCRIPTION	ENTRY RANGE	DEFAULT		
INSTALLATION	INSTALLATION Sub-Menu				
LANGUAGE	Set Language		ENGLISH		
TIME	Set current time (min., hrs)	00:00 - 24:00			
YEAR	Set current year	XXXX (4 digits)			
MONTH	Set current month	00-12			
DAY	Set current day of month	00-31			
CONF DEVICE	Confirm Device	, 01 – 06			
HEATSOURCE 1	Heat Source 1	00 - 06	06		
HS1 BUS	Heat Source 1 Bus	00 - 04	02		
HEATSOURCE 2	Heat Source 2	00 – 05	00		
STORAGE HS2	Storage Heat Source 2	00 – 03	00		
BUFFER	Buffer	00, 01, 02	00		
HC FUNCTION 1	Heating Circuit Function 1	00, 01, 03	00		
HC FUNCTION 2	Heating Circuit Function 2	00 - 04	00		
CAP/MODULE	See Section 5.7.1 for instructions.	00 – 1000 Kw	MLX EXT up to 1100 = 47 kW MLX EXT 1500 to 3060 = 112 kW		
RELAY FUNC 1	Relay Function 1 (See Section 5.7.2)	00 – 26	00		
T-MF1 SETP	Temperature – Multifunction Relay 1 Setpoint	86°F – 194°F	86°F		
MF1 HYST	Multifunction Relay 1 Hysteresis	4°F – 18°F	9°F		
RELAY FUNC 2	Relay Function 2 (See Section 5.7.2)	00 – 26	00		
T-MF2 SETP	Temperature – Multifunction Relay 2 Setpoint	86°F – 194°F	86°F		
MF2 HYST	Multifunction Relay 2 Hysteresis	4°Ra – 18°Ra	9°F		
RELAY FUNC 3	Relay Function 3	00 – 26	01		
T-MF3 SETP	Temperature – Multifunction Relay 3 Setpoint	86°F – 194°F	86°F		
MF3 HYST	Multifunction Relay 3 Hysteresis	4°F – 18°F	9°F		
RELAY FUNC 4	Relay Function 4	00 – 26	02		
T-MF4 SETP	Temperature – Multifunction Relay 4 Setpoint	86°F – 194°F	86°F		
MF4 HYST	Multifunction Relay 4 Hysteresis	4°F – 18°F	9°F		
BUS ID 1	Bus Identification No. 1	00 – 15	01		
BUS ID 2	Bus Identification 2	00 – 15	02		
5K SENSOR	5,000 Ohm Sensor	00=5K, 01=1K	00 = 5 K		



5.7.1 CAP/MODULE Function (Maximum Kilowatts per Burner)

When the Program Key is pressed with CAP/MODULE displayed, the display may show "SCAN", indicating that the Controller is searching for related MODULE (BOILER) functions. Once the scan is complete, follow instructions below.

CAP/MODULE Function (Setting Max. Kw per Burner)

- 1. Press the Program Key. The display will show CODE NO., requesting the valid code to be entered.
- 2. Enter code **0000** (four zeros) by pressing the Program Key four times. The red LED will remain lit while the four code digits are entered.
- 3. Press the Program Key
- 4. The display will show BOILER 1 (meaning Heat Module 1), along with kilowatt (Kw) setting for the first Module. The default setting for each Boiler Module is:
 - MLX EXT up to 1100 = 47 kW
 - MLX EXT 1500 to 3060 = 112 kW

NOTE:

The 47 Kw or 112 Kw setting, depending on model size, is only a control parameter. It does not represent the maximum input of each module.

- 5. If the desired Kw setting is not displayed, press the Program Key and change the setting using the Rotary Knob. Once the desired setting is displayed, press the Program Key to store the value.
- 6. Continue scrolling through each **BOILER** (Heat Module) and observe the Kw setting for each one. Change as needed by repeating step 5.
- 7. Once all **BOILER** modules have been set, **RETURN** will be displayed.
- 8. Press the Program Key to continue with the next menu function (**RELAY FUNC 1**) in the **INSTALLATION** Menu.



5.7.2 Available Settings for Relay Functions 1 – 4

Table 5-9 lists the available Function selections for Multi-Function (MF) Relays 1 thru 4:

TABLE 5-9: Relay 1-4 Functions		
FUNCTION	DESCRIPTION	
00	No MF Relay Function	
01	Header Pump	
02	Circulation (Time)	
03	Booster Pump	
05	Pump HS1	
06	Pump HS2	
20	Temperature-Controlled Circulation Pump	
21	Pulsed Circulation Pump	
22	Solid Fuel Boiler Integration (Not Applicable)	
23	Solar Integration	
24	Return Flow Temperature Increase HS1	
25	Return Flow Temperature Increase HS2	
26	Return Flow Temperature Increase Via Buffer Storage	



(This Page Is Intentionally Blank)



CHAPTER 6: E8 SETUP AND PROGRAMMING

The following sections provide the detailed set-up and programming procedures necessary to configure the Modulex Boiler for service operation.

NOTE:

When performing the following operating mode set-up procedures, refer to Chapter 3 of this document for illustrations and descriptions of the Controller operating controls and displays. Refer to Chapter 6 for Controller wiring connections.

6.1 Indoor/Outdoor Reset Mode

This mode is used to adjust the boiler set point based on the outdoor air temperature and a programmed heating curve. The heating curve can be customized using functions provided in the USER menu. The outdoor air sensor provided with the Modulex boiler <u>must</u> be installed to enable this mode of operation. The following sections provide the procedures necessary to wire and configure the controller for operation in the Indoor/Outdoor Reset mode.

6.1.1 Wiring Connections

The outdoor air sensor provided with the boiler should be mounted on the outer North or North-East side of the building away from windows, doors and vents. Never mount the outdoor air sensor in a location where it is exposed to direct sunlight.

Wire the sensor using shielded 2-conductor, 18 AWG wire (Belden #8760, or equiv.). Connect the outdoor air sensor wire leads to terminals 9 (F9) and 10 (GND) of Connector 1 on the rear of the Controller. There is no polarity to observe when connecting the wire leads. Refer to the wiring diagrams in Chapter 7 for the locations of sensor connections. This sensor must be connected (Section 7.1.2) prior to configuring the Controller.

6.1.2 Indoor/Outdoor Reset Operation Configuration

The Indoor/Outdoor Reset Mode is configured using the USER menu as shown in instructions on the next page.

IMPORTANT!

The outdoor air sensor MUST be connected as described in Section 5.1.1 above, prior to configuring the Controller for Indoor/Outdoor Reset Mode operation.



CHAPTER 6: E8 SETUP & PROGRAMMING

Indoor/Outdoor Reset Configuration in USER Menu

- 1. Ensure ON/OFF switch on front of Modulex boiler is in the ON position.
- 2. Open controller front panel.
- 3. Turn the Rotary Knob clockwise to the **USER** menu. The first sub-menu displayed will be **INSTALLATION**.

NOTE:

Before continuing, check to ensure that HC FUNCTION in the EXPERT>HEATING CIRCUIT 1 menu is set to the default "00".

- 4. Continue scrolling clockwise through the **USER** menu until the **HTG CIRCUIT 1** sub-menu is displayed.
- 5. With **HTG CIRCUIT 1** displayed, press Program Key to enter sub-menu.
- 6. Use Rotary Knob to scroll to the **HEATSLOPE** sub-menu item. The display will show "**HEATSLOPE**" and the current value stored in memory (0.00 to 3.00).
- 7. To change the **HEATSLOPE** value, press the Program Key. The red LED will light.
- 8. Refer to Heat Slope Diagram (Figure 6-1) to determine the required value for the **HEATSLOPE** function based on the boiler installation design set point. The value entered must be between 0 and 3.00.
- 9. Turn Rotary Knob until the desired **HEATSLOPE** value is displayed.
- 10. Press the Program Key to store the **HEATSLOPE** value.
- 11. Continue scrolling through the **HTG CIRCUIT 1** sub-menu until **RETURN** is displayed. Press the Program Key to exit the **HTG CIRCUIT 1** sub-menu.



CHAPTER 6: E8 SETUP & PROGRAMMING



6.1.3 Viewing the Boiler Setpoint

The setpoint temperature setting is viewed in the E8 controller display as shown below.

Viewing the Boiler Setpoint

- 1. Turn the Rotary Knob to the **DISPLAY** menu. The first sub-menu displayed will be **INSTALLATION**.
- 2. Press the Program Key to enter the **INSTALLATION** sub-menu.
- 3. Turn Rotary Knob clockwise until **T-COLL DES** is displayed along with corresponding temperature reading. This **T-COLL DES** reading equals the boiler set point.

6.1.4 Configuring Set Point High and Low Limits Per Outside Temperature Sensor

It is often desirable to control the maximum and minimum outlet water temperature based on outside air temperature. For instance it might be desirable to set the outlet water temperature to be 180° F whenever the outside temperature is 15° F or below, and 120° F whenever the outside temperature is 60° F or higher. Four parameters must be set in the E8 Controller to accomplish this. They are: HEATSLOPE, MAX T-FLOW, MIN T-FLOW, and MAX T-COLL. Descriptions are provided in Table 6-1.

TABLE 6-1: E8 Controller Outside Temperature Sensor Parameters			
Parameter	Description		
HEATSLOPE	A curve that relates a boiler's outflow temperature with the outside air temperature monitored with a temperature sensor		
MAX T-FLOW	The maximum allowable outlet water (set point) temperature		
MIN T-FLOW	The minimum outlet water (set point) temperature		
MAX T-COLL	The maximum allowable outflow water collection manifold surface temperature. When this temperature is reached, it triggers the limiter and the boiler will shut down.		
PUMP MODE	Must be set to "01" to enable/disable pump per outdoor temperature		
T-LIMIT DAY	During daytime heating, if outdoor temp > T-Limit Day, heating is disabled		
T-LIMIT NIGHT	During nighttime heating, if outdoor temp > T-Limit Night, heating is disabled		

To select the best HEATSLOPE value to enter into the E8 Controller, consider the set of heat slope curves shown in Figure 6-1. Locate the two points given by the coordinate pairs (Outside Temperature, Flow Temperature); One for the low temperature range and one for the high temperature range. Now find the curve that best fits these two points. Do not expect any single curve to go through either point, let alone *both* points. Simply pick the best fit.

6.2 Constant Set Point Mode

When a fixed header temperature is desired, configure the Constant Set Point Mode as shown in the instructions below.



Constant Setpoint Mode Configuration

- 1. Set the ON/OFF switch on the front of the Modulex boiler to the ON position.
- 2. Open the Controller front panel.
- 3. Turn the Rotary Knob clockwise to the **EXPERT** menu. The first item (sub-menu) displayed will be **INSTALLATION**.
- 4. Continue turning the Rotary Knob clockwise until **HEAT CIRCUIT 1** is displayed.
- 5. Press the Program Key to enter the **HEAT CIRCUIT 1** sub-menu.
- Scroll to HC FUNCTION. The currently stored setting will be displayed. Normally, 00 will be displayed since this is the Factory Default. However, for the Constant Set Point Mode, the HC FUNCTION setting must be changed to 01. If the HC FUNCTION is currently set to 00, proceed to step 7. However, if it is set to 01, skip to step 11.
- 7. If the **HC FUNCTION** is set to 00, press the Program Key. **CODE NO.** will be displayed requesting the valid code to be entered.
- 8. Enter code **0000** (four zeros) by pressing the Program Key four times. The red LED will remain lit while the digits are entered.
- 9. With **HC FUNCTION** again displayed, press the Program Key. The red LED will light. Turn the Rotary Knob to change the **HC FUNCTION** to 01.
- Press the Program Key to store the 01 setting for the HC FUNCTION. Red LED will go off. RESET will be momentarily displayed, followed by display of the current Controller software version (e.g. SW 259-04). Following RESET, the Controller display will then switch to the initial INSTALLATION menu.
- 11. Use Rotary Knob to scroll to the **USER** menu and access **HTG CIRCUIT 1** sub-menu. Press Program Key to enter the sub-menu.
- 12. Using Rotary Knob, scroll to **T FLOW DAY**. The currently stored value for **T FLOW DAY** will be displayed. This represents the current Constant Set Point temperature in °F.
- 13. To change Constant Set Point value, press the Program Key and turn the Rotary Knob to select the desired Constant Set Point. Press the Program Key again to store the Set Point.

6.2.1 Wiring Connections

There are NO wiring connections required for this mode.

6.2.2 Viewing Constant Set Point

The set point is viewed in the DISPLAY menu as shown below.

Viewing the Constant Setpoint

- 1. Use Rotary Knob to navigate to the **DISPLAY** menu. First sub-menu displayed will be **INSTALLATION**.
- 2. Press the Program Key to enter the **INSTALLATION** sub-menu.
- **3.** Turn Rotary Knob clockwise until **T-COLL DES** is displayed along with corresponding temperature reading. This **T-COLL DES** reading equals the boiler set point in °F.





<u>6.2.2.1</u> Configuring HEATSLOPE Parameter

The **HEATSLOPE** value is configured as shown in the instructions below.

Configuring HEATSLOPE Parameter

- 1. Ensure ON/OFF switch on front of Modulex boiler is in the ON position.
- 2. Open controller front panel.
- 3. Turn the Rotary Knob clockwise to the USER menu.
- 4. Press Program Key to select the User submenu. The first item (sub-menu) displayed will be **INSTALLATION**.
- 5. Continue scrolling clockwise through the **USER** menu until the **HTG CIRCUIT 1** sub-menu is displayed.
- 6. With **HTG CIRCUIT 1** displayed, press the Program Key to enter this sub-menu.
- 7. Using the Rotary Knob, scroll to the **HEATSLOPE** variable. The display will show "**HEATSLOPE**" and the current value stored in memory (0.00 to 3.00).
- 8. If the desired value for **HEATSLOPE** is not displayed, press the Program Key once. The red LED will light.
- 9. Determine the required value for the **HEATSLOPE** function as explained above. The value to be entered must be between 0 and 3.00 inclusively.
- 10. Turn the Rotary Knob until the desired **HEATSLOPE** value is displayed.
- 11. Press the Program Key to store the **HEATSLOPE** value. The value will flash indicating it was entered.
- 12. Continue scrolling through the **HTG CIRCUIT 1** sub-menu until **RETURN** is displayed. Press the Program Key to exit the **HTG CIRCUIT 1** sub-menu.



<u>6.2.2.2</u> Configuring MAX T-FLOW and MIN T-FLOW Parameters

To enter the MAX T-FLOW and MIN T-FLOW values, see instructions below.

Configuring MAX T-FLOW and MIN T-FLOW Parameters

- 1. Ensure ON/OFF switch on front of Modulex boiler is in the ON position.
- 2. Open controller front panel.
- 3. Turn the Rotary Knob clockwise to the **EXPERT** menu. The first item (sub-menu) displayed will be **INSTALLATION**.
- 4. Continue scrolling clockwise through the **EXPERT** menu until the **HTG CIRCUIT 1** submenu is displayed.
- 5. With **HTG CIRCUIT 1** displayed, press the Program key to enter the sub-menu.
- 6. Use Rotary Knob to scroll to **MAX T-FLOW** sub-menu. The display will show "**MAX T-FLOW**" and the current value stored in memory (68 to 230).
- 7. To change **MAX T-FLOW** value, press the Program Key 6 times to sequence through the 4 digits and back to the current value for **MAX T-FLOW**.
- 8. Press the Program Key one more time. The red LED will light.
- 9. Rotate the Rotary Knob until the desired value for **MAX T-FLOW** is displayed. It is typically set to the same or lower value than **MAX T-COLL** (the shut-down trigger temperature).
- 10. Press the Program Key once. The new value for **MAX T-FLOW** will flash indicating it was entered.
- 11. Turn the Rotary Knob to the next parameter displayed, **MIN T-FLOW**.
- 12. Press the Program Key once. The red LED will light.
- 13. Now turn Rotary Knob until desired **MIN T-FLOW** (50 230) value is displayed.
- 14. Press the Program Key once. The new value for **MIN T-FLOW** will flash indicating it was entered.
- 15. Continue scrolling through the **HTG CIRCUIT 1** sub-menu until **RETURN** is displayed. Press the Program Key to exit the **HTG CIRCUIT 1** sub-menu.





<u>6.2.2.3</u> Configuring MAX T-COLL Parameter

To enter the MAX T-COLL value, see instructions below.

Configuring MAX T-COLL Parameter

- 1. Set the ON/OFF switch on the front of the Modulex boiler to the ON position.
- 2. Open the swing-down hinged panel of the Controller.
- 3. Turn the Rotary Knob clockwise to the **EXPERT** menu. The first item (sub-menu) displayed will be **INSTALLATION**.
- 4. The first sub-menu to be displayed will be **INSTALLATION**.
- 5. Press the Program key once to enter this sub-menu.
- 6. Using the Rotary Knob, scroll to **MAX T-COLL**. The display will show "**MAX T-COLL**" and the current value stored in memory (86 to 230).
- 7. If the desired value for **MAX T-COLL** is not displayed, press the Program Key 6 times to go through the digit sequence.
- 8. Now press the Program key one more time. The red LED will light.
- 9. Rotate the Rotary Knob until the desired value for **MAX T-COLL** is displayed. It is typically set to the same or higher value than **MAX T-FLOW**.
- 10. Press the Program Key once. The new value for **MAX T-COLL** will flash indicating it was entered.
- 11. Continue scrolling through the **INSTALLATION** sub-menu until **RETURN** is displayed. Press the Program Key to exit the **INSTALLATION** sub-menu.

6.3 0 to 10 Volt Remote Set Point Mode

This mode allows the boiler set point to be controlled by an external control signal. The following sections provide the procedures necessary to wire, configure and set the required functions necessary to operate in the 0 to 10 volt remote set point mode.

After setting all of these functions, make sure to close the E8 cover and turn the knob to Standby to enable the 0-10V operation.

6.3.1 Remote Signal Source Wiring Connections

When setting up to operate in the 0 to 10 volt remote set-point mode, the remote signal source must be wired to terminals 1 (F-15) and 2 (GND) of connector number 3 (III) on the rear of the Controller. See Chapter 7 for illustrations and pin-outs of the connectors located on the rear of the Controller.





6.3.2 Configuring Remote Signal Source

Configure the Remote Signal Source as shown in the instructions below.

Configuring Remote Signal Source

- 1. Ensure ON/OFF switch on front of Modulex boiler is in the ON position.
- 2. Open Controller front panel.
- 3. Turn Rotary Knob clockwise to **EXPERT** menu. The first sub-menu displayed will be **INSTALLATION** (sub-menu items scroll in this sequence: **INSTALLATION**, **HOT WATER**, **HEAT CIRCUIT 1**, **HEAT CIRCUIT 2**, **SOLAR / MF**). Continue scrolling (clockwise) through the **EXPERT** menu until **SOLAR / MF** is displayed.
- 4. With **SOLAR / MF** displayed, press the Program Key to enter the **SOLAR / MF** sub-menu.
- 5. Scroll through the **SOLAR / MF** sub-menu by turning Rotary Knob clockwise until the **F-15 FUNCTION** is displayed along with it's presently stored value (default is 00).
- 6. Press Program Key to change the F-15 **FUNCTION**. Display will show **CODE NO.**, requesting valid code to be entered.
- 7. Enter code **0000** (four zeros) by pressing the Program Key four times. The red LED will remain lit while the four code digits are entered.
- 8. With **F-15 FUNCTION** displayed again and red LED lit, turn Rotary Knob to change the **F-15 FUNCTION** to 01.
- 9. Press the Program Key to store the 01 setting for the **F-15 FUNCTION**. The red LED will go off.
- 10. Continue scrolling through the sub-menu until **RETURN** is displayed.
- 11. Press the Program Key to exit the **SOLAR / MF** sub-menu.
- 12. With SOLAR / MF displayed, turn Rotary Knob <u>counter-clockwise</u> until the **INSTALLATION** sub-menu is displayed in the LCD.
- 13. With **INSTALLATION** displayed in the LCD, proceed directly to Section 6.3.3.

NOTE:

When navigating the menus during configuration and you scroll past the SOLAR / MF item, the EXPERT HS menu will be displayed. If this occurs, <u>slowly</u> turn the Rotary Knob counterclockwise until SOLAR / MF is again displayed.



6.3.3 Setting the Voltage and Set Point Limits for U1/U2 and T1/T2

NOTE:

Ensure that all steps in Section 6.3.2 were completed prior to performing the following steps.

NOTE:

When scrolling through sub-menus and functions, enter required Code 0000 only when prompted to do so. Normally, Code 0000 only needs to be entered once, unless you exit and reenter EXPERT menu.

U1 and U2 settings: To set the voltage limits corresponding to the minimum and maximum allowable set point limits, follow the instructions below.

Voltage & Set Point Limits: U1 & U2

- 1. Press the Program Key to enter the **EXPERT** menu **INSTALLATION** sub-menu. The display will show **CODE NO.** requesting the valid code to be entered.
- 2. Enter code **0000** (4 zeros) by pressing the Program Key four times. The red LED will remain lit while the four code digits are entered. A dashed line will appear in the display following code entry.
- 3. Next, turn the Rotary Knob clockwise until **CURVE 11-U1** is displayed.
- 4. Press the Program Key. The red LED will light.
- 5. Enter the desired low voltage limit for U1 by turning the Rotary Knob. The voltage will increment in 0.10 volt increments.
- 6. With the desired low voltage limit displayed, press the Program Key to set the U1 voltage. The red LED will go off.
- 7. Turn the Rotary Knob clockwise and scroll to **CURVE 11-U2**.
- 8. Press the Program Key. The red LED will light.
- 9. Enter the desired high voltage limit for U2 by turning the Rotary Knob.
- 10. With the desired high voltage limit displayed, press the Program Key to set the U2 voltage. The red LED will go off.



T1 and T2 Settings: The previous steps set the U1 and U2 voltages which will be used to scale the minimum and maximum set point levels. To set the minimum (T1) and maximum (T2) set point temperatures which correspond to the U1 and U2 voltage levels, follow instructions below.

Voltage & Set Point Limits: T1 & T2

- 1. Turn the Rotary Knob clockwise and scroll to **CURVE 11-T1**. This will be the minimum set point temperature.
- 2. Press the Program Key. The red LED will light.
- 3. Enter the desired low set point temperature limit for T1 by turning the Rotary Knob. The selected T1 value will correspond to U1.
- 4. With the desired low set point temperature limit displayed, press the Program Key to set the T1 temperature (low set point limit). The red LED will go off.
- 5. Finally, turn the Rotary Knob clockwise and scroll to **CURVE 11-T2**. This will be the maximum set point temperature.
- 6. Press the Program Key. The red LED will light.
- 7. Enter the desired high set point temperature limit for T2 by turning the Rotary Knob. The selected T2 value will correspond to U2.
- 8. With the desired high set point temperature limit displayed, press the Program Key to set the T2 temperature (high set point limit). The red LED will go off.

This completes the required steps for setting the low and high limits corresponding to the set point voltage and temperature functions. Proceed immediately to Section 6.3.4 to set the **CURVE 11-UO** voltage.

6.3.4 Setting the Curve 11-UO Voltage

UO is a voltage level that will turn off the boiler. Therefore, the UO voltage level must be set <u>below</u> the limit set for the U1 voltage. For example; if U1 is set for 1 Volt, UO should be set to 0.9 Volt (or lower). After setting the low and high set point limits as described in Section 6.3.3, set the UO voltage per instructions below.

Setting Curve 11-UO Voltage

- 1. Turn the Rotary Knob clockwise and scroll to **CURVE 11-UO**.
- 2. Press the Program Key. The red LED will light.
- 3. Using the Rotary Knob, adjust the UO voltage to <u>below</u> the voltage set for U1.
- 4. With UO set to the desired value, press the Program Key to store the setting. The red LED will go off.
- 5. This completes all of the required entries for operation in the 0 to 10 Volt Remote Set Point Mode.
- 6. To exit the **EXPERT** menu **INSTALLATION** sub-menu, continue scrolling using the Rotary Knob until **RETURN** is displayed.
- 7. Press the Program Key to return to exit the **INSTALLATION** sub-menu.

To view the remote set point temperature, proceed to Section 6.3.5.

CHAPTER 6: E8 SETUP & PROGRAMMING



6.3.5 Viewing the Set Point

The set point is displayed as shown in instructions below.

NOTE:

When viewing the set point temperature using the steps in Section 6.3.5, you will note that the when the voltage source is equal to 0.9 Volt, the set point temperature will drop to $41^{\circ}F$ (9°C), thereby shutting down the boiler.

Example:

U1 = 1 Volt and the set point = $80^{\circ}F$

U2 = 8 Volts and the set point = $180^{\circ}F$

UO should be set to 0.9 Volt

Viewing the Setpoint

- 1. Turn the Rotary Knob to the DISPLAY menu **INSTALLATION** sub-menu.
- 2. Press the Program Key to enter the **INSTALLATION** sub-menu.
- 3. Using the Rotary Knob, scroll to **T-EXT DES** to view the set point temperature.

6.4 Domestic Hot Water Operation Using A Tank Sensor

With the controller hinged panel closed, turn the Rotary Knob until the Faucet symbol (\mathbf{H}) appears in the lower part of the display window. When there is a demand for domestic hot water (DHW), a second Faucet symbol will be displayed. This second Faucet symbol indicates that the boiler is currently in the DHW mode and is raising the temperature of the domestic water to the DHW set point. Once the DHW demand has been satisfied, the boiler will switch back to the space heating mode. The second Faucet symbol will change to a heating circuit symbol, indicating that the boiler is back in the space heating mode.

The following procedures describe the wiring connection and Controller configuration setting needed to provide domestic hot water (DHW) using a tank sensor installed in a thermowell.

6.4.1 Sensor Wiring Connections

To monitor the DHW temperature, connect the tank sensor wire leads to Connector 1, Terminals 6 (F6) and 7 (GND) on the rear of the Controller. After the sensor is connected, turn the ON/OFF switch to the OFF position, then back to the ON position. This is necessary to ensure that the Controller recognizes the added sensor.



6.4.2 Configuring the Controller for DHW With a Tank Sensor

Both EXPERT and USER Menus will be used to configure the Controller for DHW production. The DISPLAY Menu will be used to display the set point. Follow instructions below to configure the controller for DHW with a tank sensor.

IMPORTANT!

The tank sensor MUST be connected (Section 6.4.1), prior to configuring the Controller for DHW operation. If the sensor is not connected, many required functions will not display.

Configure the Controller for DHW with a Tank Sensor

- 1. With Controller front cover **closed**, turn Rotary Knob until Faucet symbol (^h) appears in the lower part of the display window.
- 2. Next, open Controller front panel.
- 3. Turn Rotary Knob clockwise to **EXPERT**, **HOT WATER** sub-menu.
- 4. With **HOT WATER** displayed, press the Program Key to enter sub-menu.
- 5. Scroll through **HOT WATER** sub-menu turning Rotary Knob clockwise until **THERM INPUT** is displayed with the current setting (00 or 01). If 00 is displayed (sensor), skip to step 6.
- 6. If the **THERM INPUT** is currently set to 01 (Aquastat), press Program Key to change the **THERM INPUT**. The display will show "CODE NO.", requesting entry of a valid code.
- 7. Enter code **0000** (four zeros) by pressing the Program Key four times. The red LED will remain lit while the four code digits are entered.
- 8. With **THERM INPUT** again displayed and the red LED lit, turn Rotary Knob to change to 00 for sensor operation.
- 9. Press Program Key to store 00 setting for **THERM INPUT**. Red LED is off.



6.4.3 Setting the DHW Set Point

The set point temperature is set in the USER menu as shown in instructions below.

NOTE:

Typically, a higher water temp is needed to heat domestic hot water to its setpoint. do this by using EXPERT / HOT WATER / T-BOILER DHW. degrees entered are added to DHW setpoint in USER Menu. See Section 6.2.3.

Setting the DHW Set Point

- 1. Use Rotary Knob to scroll to **USER** menu and **INSTALLATION** sub-menu.
- 2. Continue scrolling clockwise until the **HOT WATER** sub-menu is displayed.
- 3. Press the Program Key to enter the **HOT WATER** sub-menu.
- 4. Scroll to **T-DHW 1**, displayed along with the current **DHW** set point temperature.
- 5. To change **DHW** set point, press the Program Key. Red LED will light.
- 6. Using the Rotary Knob, enter the desired set point temperature.
- 7. With desired DHW set point displayed, press Program Key to save. The red LED will go off.
- 8. Continue scrolling until **RETURN** is displayed. Press Program Key to exit.
- 9. Scroll clockwise to the **EXPERT** menu, **HOT WATER** sub-menu.
- 10. Press Program Key and scroll to the **T BOILER DHW** in **HOT WATER** sub-menu. Current value is displayed in °F.
- 11. To change temp, press Program Key to enter value that will be added to the **DHW** set point. Red LED lights.
- 12. Adjust the **T BOILER DHW** temperature to desired value using the Rotary Knob.
- 13. Press Program Key to store the temp setting. The red LED will go off.
- 14. Continue scrolling through the **HOT WATER** sub-menu until **RETURN** is displayed. Press the Program Key to exit the sub-menu.



6.4.4 Displaying Temperatures Associated With DHW

Functions in the **DISPLAY** menu are used to display the actual DHW temperature measured by the tank sensor. The swing-down hinged panel must be open to access and display these functions.

<u>6.4.4.1</u> Viewing DHW Set Point and Actual DHW Temperature

The DHW set point and the actual DHW temperature measured by the tank sensor are displayed as shown in the instructions below.

Viewing DHW Setpoint and Actual DHW Temperature

- 1. Turn the Rotary Knob to the **DISPLAY** menu. The first sub-menu displayed will be **INSTALLATION**.
- 2. Continue turning the Rotary Knob clockwise until the **HOT WATER** sub-menu is displayed.
- 3. Press the Program Key to enter the **HOT WATER** sub-menu.
- 4. Turn Rotary Knob to display **T-DHW RATED**. The temperature value shown is the DHW set point temperature.
- 5. Next, scroll to **T-DHW**. The temperature value shown is the actual DHW temperature measured by the tank sensor.
- 6. Continue scrolling until RETURN is displayed. Press the Program Key to exit the **HOT WATER** sub-menu.

6.4.4.2 Viewing DHW Set Point With T-BOILER DHW Function

The setting for T-BOILER DHW, in the EXPERT/HOT WATER Menu, adds to the Domestic Hot Water setpoint (T-DHW RATED), becoming the final supply water temperature to the domestic hot water tank. The T-COLL DES reading equals the DHW setpoint plus the value of the T-BOILER DHW function or T-DHW RATED + T-BOILER DHW = T-COLL DES.

EXAMPLE: If T-DHW RATED is set at 140° and T-BOILER DHW is set at 45°, then the T-COLL DES (Boiler Outlet Temperature) will be 185°.

To view DHW set point with the T-BOILER DHW setting already added to it, refer to the instruction below.

Viewing DHW Setpoint with T-BOILER DHW Function

- 1. Turn the Rotary Knob to the **DISPLAY** menu. The first sub-menu displayed will be **INSTALLATION**.
- 2. Press the Program Key to enter the **INSTALLATION** sub-menu.
- 3. Turn the Rotary Knob clockwise until **T-COLL DES** is displayed along with corresponding temperature reading.



6.5 DHW Operation Using an Aquastat

Operation, wiring connections and Controller configuration settings for DHW heating using an aquastat are virtually identical to the procedures previously described in Section 6.4 for the tank sensor. Therefore, the following sections describe only the differences between these two types of applications.

6.5.1 Sensor Wiring Connections

To monitor the DHW temperature, connect the aquastat wire leads to Connector KF/SPF, Terminals 6 (F6) and 7 (GND). After the sensor is connected, turn the ON/OFF switch to the OFF position, then back to the ON position. This is necessary to ensure that the Controller recognizes the added sensor.

IMPORTANT

The aquastat MUST be connected as described above, prior to configuring the Controller for DHW operation. Also, the aquastat must be closed (shorted) for the Controller to display the required sub-menu functions.

6.5.2 Configuring the Controller for DHW With an Aquastat

The procedures for configuring the Controller for DHW with an Aquastat are virtually identical to those specified in Section 6.4.2. The only difference is that the THERM INPUT in the EXPERT menu/HOT WATER sub-menu must be set to 01 (Aquastat) instead of 00 (Sensor).

6.5.3 Setting the DHW Set Point

Same as Section 6.4.3.

6.5.4 Displaying Temperatures Associated With DHW

Same as Section 6.4.4 through 6.4.4.2.

6.6 Boiler & Pump Enable/Disable

The Enable/Disable feature found between terminals 3 and 4 of connector "I" can be used to start/stop the boiler only in Indoor/Outdoor Reset and Constant Set Point modes of operation. The Enable/Disable does not start/stop the boiler in 0 to 10 Volt Remote Set Point mode. To start/stop the boiler in 0 to 10 Volt Remote Set Point mode, see Section 6.3.4.

To use the Enable/Disable feature, wire a dry set of contacts between terminals 3 and 4 of Connector "I" and then set the boiler to Standby mode (\bigcirc). To set the boiler to Standby mode, close the swing-down front panel door of the E8 and turn the wheel counterclockwise until the Standby symbol (\bigcirc) is displayed. With terminals 3 and 4 closed, the Standby symbol, and others in the display, will be blinking. This indicates that the boiler is enabled. When the connection is broken between terminals 3 and 4, the Standby symbol, and others in the display, will stop blinking that the boiler is disabled.

The Enable/Disable feature not only start/stops the boiler but also start/stops the pumps.



(This Page Is Intentionally Blank)



CHAPTER 7: E8 CONNECTOR TERMINAL ASSIGNMENTS

CHAPTER 7: E8 CONNECTOR TERMINAL ASSIGNMENTS



Figure 7-1: E8 Controller Rear Panel Terminals

7.1 SENSOR Terminal Assignments

TABLE 7-1: Sensor Terminal Assignments			
Term	Pin#	Function	
7	(1+2)	Ebus (FA) or 0-10V output	
1	(1,2,3+M)	F1/F2/F3 = buffer storage tank low/middle/top	
1	(2+3+M)	FBR2 (FBR1) for heating circuit 1	
1	(2+M)	F2 = Room sensor for heating circuit 1	
1	(4+5)	F5 = Flow sensor heating circuit 2	
1	(6+7)	F6 = Storage tank sensor	
1	(7+8)	F8 = Boiler sensor/header sensor	
1	(9+10)	F9 = Outdoor sensor	
5	(1+M)	F11 = Flow sensor heating circuit 1/Multifunction relay sensor $\sqrt{1}$	
5	(2+M)	F12 = Hot-water tank low/Multifunction relay sensor 12	
8	(1+M)	F13 = PT1000 => HS2/collector 2/Multifunction relay sensor ^۱ 3	
8	(2+M)	F14 = PT1000 => Collector 1/Multifunction relay sensor \ ¹ 4	
3	(1-3)	FBR2 (FBR1) for heating circuit 2	
3	(1+2)	F15 = 0-10V input/light sensor/Room sensor for heating circuit 2	
3	(2+3)	F17 = Pulse counter for output measurement	
9	(1+2)	Data line CAN bus	
9	(3+4)	Power supply CAN bus	



CHAPTER 7: E8 CONNECTOR TERMINAL ASSIGNMENTS

Sensor Terminal Assignments (Continued)

7.1.1 Connector 7



7.1.3 Connector 5



Pin 1: Flow sensor heating circuit 1 / sensor multifunction 1 Pin 2: Service water low sensor / sensor multifunction 2

7.1.4 Connector 8 => PT 1000 Sensor



Pin 1: Sensor HS2 / Solar 2 / Multifunction relay 3 Pin 2: Sensor Solar 1 / Sensor multifunction relay 4

7.1.5 Connector 3



Pin 1: FBR heating circuit 2 (room sensor) / 0-10V IN / Light

Pin 2: FBR heating circuit 2 (ground)

Pin 3: FBR heating circuit 2 (set value) / Pulse counter for output measurement

7.1.6 Connector 9



CAN Bus Pin 1 = H (Data) CAN Bus Pin 2 = L (Data) CAN Bus Pin 3 = - (ground, Gnd) CAN Bus Pin 4 = + (12V supply)


CHAPTER 7: E8 CONNECTOR TERMINAL ASSIGNMENTS

7.2 MAINS Power Terminal Assignments

TABLE 7-2: Mains Power Terminal Assignments				
Term	Pin#	Function		
II	(1)	Neutral conductor, mains		
II	(2)	Power supply, unit		
I	(3)	Power supply, relay		
II	(4)	A1 = Secondary Pump, heating circuit 1		
II	(5)	A2 = Secondary Pump, heating circuit 2		
I	(6)	A3 = Cylinder charging pump		
II	(7)	A4 = Mixer motor heating circuit 2 on		
II	(8)	A5 = Mixer motor heating circuit 2 to		
I	(9+10)	A6 = Burner stage 1/HS 1		
VI	(1+2)	A7 = Burner stage 2/HS 2/Solid fuel		
IV	(1)	A8 = Mixer motor heating circuit 1 on/Multifunction relay $\frac{1}{1}$		
IV	(2)	A9 = Mixer motor heating circuit 1 to/Multifunction relay $\frac{1}{2}$		
IV	(3)	A10 = Primary Pump, Collector pump 2/Switching value to solar tank 2/Multifunction relay $\frac{1}{3}$		
IV	(4)	A11 = Collector pump 1 (speed controlled) multifunction relay $\frac{1}{4}$ 4		

7.2.1 Connector 2



N: Neutral conductor, mains L1: Power supply, unit L1': Power supply to relay 'IIII 1: heating circuit pump HC 1 'IIII 2: heating circuit pump HC 2 IIII 2: heating circuit pum

7.2.2 Connector 6



⇒: Burner stage 2/HS2⇒: Burner stage 2/HS2

IMPORTANT THE PRIMARY PUMP (COLLECTOR PUMP 2) MUST BE WIRED TO RELAY A10.



CHAPTER 7: E8 CONNECTOR TERMINAL ASSIGNMENTS

7.2.3 Connector 4



명: Mixer heating circuit 1 open / Multifunction relay $\frac{1}{3}$ 명: Mixer heating circuit 1 close / Multifunction relay $\frac{1}{2}$

Collector pump 2/Switching value / Multifunction relay 1 3 Collector pump 1(rpm)/Multifunction relay 1 4



CHAPTER 8: BOILER COMMUNICATIONS MODULE (BCM)

When installed and enabled, the BCM enhances the range of control functions offered by the Modulex Boilers. These additional control functions include the following:

- BCM provides a fault relay which energizes when any fault condition occurs in the Modulex Boiler.
- BCM serves as a Back-up Controller in the event that the primary E8 Controller fails.
- BCM can be selected as the Primary Controller instead of the E8.
- BCM provides a 0-10V output for controlling a VFD primary pump.
- BCM can function as a "Slave" to a "Master" Energy Management System (EMS), Building Automation System (BAS) or AERCO's Boiler Management System II (BMS II/AERCO Control System (ACS) on a Modbus Network.

Following are detailed descriptions of the BCM and each of the additional control functions listed above.

8.1 BCM Description

The BCM shown in Figure 8-1 is housed in a compact enclosure measuring 4.13" (105 mm) x 3.50" (89 mm). The BCM is installed on the front of the Modulex Boiler, behind the lift-up front panel.



Figure 8-1: Boiler Communications Module (BCM)

Input/Output (I/O) connections to the BCM are made via four connectors mounted on the Printed Circuit Board (PCB) of the BCM. Three Control Switches are mounted on the clear plastic cover on the front of the BCM. Three LED Status Indicators are mounted directly on the BCM PCB and can be viewed through the clear plastic cover. In addition, the PCB contains an on-board, screwdriver-adjustable 10-position address switch. The control and indicator functions are illustrated and described in Figure 8-2.



CHAPTER 8: BOILER COMMUNICATION MODULE (BCM)

			DL1DL2 (RED)DL3 (GREEN)EFG
Input Communications Connector (Modbus/Ebus)		00000	
	A Change-Over 3-Pos. Switch		
	B Enable/Disable 2-Pos. Switch		C
Output Communications Connector (Ebus)			Reset Switch
	Item Feature Function		
Item	reature		Function
A	Change-Over Series/Parallel, 3-Position Switch	Three-positic control.	n rocker switch for setting internal/external boiler
A B	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch	Three-position control. Two-position Up Controlle for description	rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch.
A B C	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch	Three-position control. Two-position Up Controlle for description Momentary t and LED who	rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated.
A B C D	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switch	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch b Boiler on the	rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. h labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network.
A B C D	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switch	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch Boiler on the Communicat	rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. n labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network. on Status Indicator functions as follows:
A B C D	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switch	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch Boiler on the Communicat Status	Function n rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. n labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network. on Status Indicator functions as follows: Description No devices detected by either
A B C D	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switch	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch Boiler on the Communicat Status OFF	Function n rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. n labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network. on Status Indicator functions as follows: Description No devices detected by either communication interface.
A B C D	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switcl DL1 LED: (YELLOW)	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch Boiler on the Communicat Status OFF BLINKING	Function n rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. n labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network. on Status Indicator functions as follows: Description No devices detected by either communication interface. Only one communication device detected at one communication interface (input or output).
A B C D	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switch DL1 LED: (YELLOW)	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch Boiler on the Communicat Status OFF BLINKING	Function n rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. n labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network. on Status Indicator functions as follows: Description No devices detected by either communication interface. Only one communication device detected at one communication interface (input or output). Both communication interfaces (input & output) are active.
A B C D F	Change-Over Series/Parallel, 3-Position Switch Enable/Disable (I/0), 2-Position Switch Reset Switch SW1, 10-Position Rotary Switcl DL1 LED: (YELLOW) DL2 LED: (RED)	Three-position control. Two-position Up Controlle for description Momentary t and LED who Rotary switch Boiler on the Communicat Status OFF BLINKING Alarm Status Activating the	Function n rocker switch for setting internal/external boiler rocker switch enables the BCM to act as a Back- when placed in the ON (I) position. See Table 8-1 n of settings related to Item B switch. wo-position rocker switch resets (clears) fault relay en activated. n labeled 0 – 9. Sets the corresponding address of input Modbus or EBUS Network. on Status Indicator functions as follows: Description No devices detected by either communication interface. Only one communication device detected at one communication interface (input or output). Both communication interfaces (input & output) are active. LED lights when a fault is detected by the BCM. e Reset Switch will clear the faults.

The BCM Change-Over Series/Parallel 3-Position Switch and the Enable/Disable (I/0) 2-Position Switch function as described in Table 8-1.

CHAPTER 8: BOILER COMMUNICATION MODULE (BCM)



TABLE 8-1: Two and	d Three Position Switch functions			
2-POSITION SWITCH (BCM Backup)		3-POSITION SWITCH (Internal/External Boiler Control)		
0		I (NOTE 1)	O (NOTE 2)	II (NOTE 3)
(OFF / DISABLED) (To NOT use BCM as backup)		DO NOT USE	The BCM is the Gate-way for Modbus and external control. The E8 does <u>not</u> control the boiler and the BCM will <u>NOT</u> take over the boiler if the Modbus signal fails.	The E8 <u>is</u> the primary controller and the BCM allows monitoring through Modbus, but will <u>NOT</u> take over boiler if the E8 fails.
I (ON \ ENABLED) (To use BCM as backup)	-	DO NOT USE	The BCM is the Gate-way for Modbus and external control. The E8 does <u>not</u> control the boiler and the BCM <u>WILL</u> take over the boiler if the Modbus signal fails. If E8 is in Standby Mode, BCM will cycle the pump with the boiler. If E8 is in Day Mode, the E8 will continuously run the pump.	The E8 <u>is</u> the primary controller and the BCM allows monitoring, and the BCM <u>WILL</u> take over the boiler if E8 fails. If E8 is in Standby Mode, E8 will cycle the pump (must use Enable/Disable). If E8 is in Day Mode, the E8 will continuously run the pump.

NOTE 1:

DO NOT set the 3-Position Switch to Position I.

NOTE 2:

Set the 3-Position Switch to Position O ONLY when controlling Boilers from an external Controller via Modbus Communication. See Section 3.1.2 for setting HEAT Modes.

NOTE 3:

Position II is the Default position for the 3-Position Switch. Ensure it is set to this position when it arrives from the Factory. See Section 3.1.2 for setting HEAT Modes.

8.2 BCM Fault Relay

The BCM Fault Relay is activated (energized) when a fault condition occurs in the Modulex Boiler. When activated, the Fault Relay provides contact closure across pins 3 and 4 of connector Y4 on the BCM board. In addition, the red LED on the BCM board will light continuously.



8.2.1 BCM Fault Relay Wiring

If desired, pins 3 and 4 of connector Y4 (Figure 8-3) can be wired to an external source to provide a remote alarm indication when the BCM Fault Relay is activated.

8.2.2 Clearing Faults

A fault can be cleared by pressing and releasing the black Reset Switch on the front cover of the BCM. However, if the cause of the fault has not been corrected, the Fault Relay will again be activated.



Figure 8-3: BCM Fault Relay & Reset Switch Wiring

8.3 BCM Configured as Back-Up Controller

When the BCM is configured as the Back-Up Controller for the E8, it will assume control of the Modulex Boiler if the E8 fails. In the event of an E8 Controller failure, the BCM will operate the Modulex Boiler in the Constant Setpoint Mode (default setpoint = 180°F [82°C]). The primary Boiler Pump must also be wired to the BCM so it will run when the BCM assumes control in the Back-Up Mode.

If a setpoint temperature lower than 180°F is desired, the setpoint can be changed prior to boiler start-up. Refer to Section 8.3.1 for details.

8.3.1 BCM Back-Up Controller Wiring

The Primary Boiler Pump must be wired to BCM Connector Y4 as shown in Figure 8-4. Also, if a Constant Setpoint temperature lower than the default setting of 180°F (82°C) is desired in the event of an E8 failure, the appropriate resistor must be connected across terminals 6 and 7 of BCM Connector Y2 as shown in Figure 8-5.

CHAPTER 8: BOILER COMMUNICATION MODULE (BCM)





CHAPTER 8: BOILER COMMUNICATION MODULE (BCM)





Figure 8-5: Installing Resistor to Change Default Setpoint

8.4 BCM Configured as Primary Controller Utilizing Modbus

The BCM can be configured as the Primary Controller, instead of the E8, when it is connected to a Modbus Network. However, the E8 must be disconnected from the e-Bus connection on the BCM Board (see Section 8.4.3). All Modbus Networks are implemented utilizing a "Master – Slave" scenario where only one device, the "Master", can initiate a communication sequence. However, BCMs can only function as "Slave" devices on a Modbus Network. Therefore, the BCM must be interfaced to an external controlling "Master". The "Master" can be AERCO's Boiler Management System II (BMS II), AERCO Control System (ACS), or an Energy Management System (EMS)/Building Automation System (BAS) developed by other manufacturers.

The following subordinate sections provide descriptions of Modbus Network operation and required wiring connections between the BCM "Slaves and the controlling "Master" (EMS, BAS).

Detailed information on the Modbus Function Codes, Input/Holding Register Assignments and other Modbus requirements supported by the BCM are provided in Chapter 9 of this document.

8.4.1 Operating Scenario

An EMS or BAS Master can control the Networked Modulex Boilers utilizing Remote Setpoint. An AERCO BMS II Master can control the networked Modulex boilers utilizing a Modbus signal.

In the event that the external control signal from the Master BMS II or ACS, EMS, or BAS is lost, the BCM will assume control of the Modulex Boilers, if enabled. When this occurs, the BCM will maintain the boiler at a constant setpoint based on the resistor installed between terminals 6 and 7 of connector Y2 (see Figure 8-5). In addition, the BCM Fault Relay will be activated and the red Fault LED (DL2) will light.



8.4.2 Physical Modbus RS485 Wiring

Modbus RS485 devices should be wired in a "Daisy-Chain" configuration similar to the example shown Figure 8-6. DO NOT wire the units in a "Star" configuration where all devices are connected to a central point (node).



Figure 8-6. Typical Daisy-Chain Modbus/RS485 Network

The physical wiring connections for a Modbus Network should be made using shielded twistedpair wire, from 18 to 24 AWG. Examples of suitable wire are: Belden # 9841, #8761, #3105A, or equivalent.

Modbus wiring connections are made at terminals 1 and 2 of BCM connector Y2 as shown in Figure 8-7.



Figure 8-7: BCM Modbus (RS485) Connections

8.4.3 Disconnecting the E8 from the E-Bus on the BCM Board

See Table 8-1 for how to set the three position switch on the BCM to allow disconnection of the E8 from the BCM.

NOTE:

When the BCM is configured as the primary controller, the E8 will display the fault code "E200".



8.4.4 AERCO BMS II/ACS Master to BCM Slave Wiring Connections.

The AERCO BMS II/ACS contains a RS232 port for connection to an EMS/BAS or personal computer. In addition, the BMS II/ACS contains a RS485 port for connection to the BCM's Modbus input.

8.4.5 EMS or BAS Master to BCM Slave Wiring Connections

When a third-party EMS or BAS Master is used, the Modbus Network connections will depend on the available communication port(s) on the EMS/BAS. Many EMS/BAS Models contain only a RS232 (DB9) port, while others contain either a 2-Wire or 4-Wire RS485 port. In addition, some EMS/BAS models contain both a RS232 and a RS485 port. If the EMS or BAS is equipped with only a RS232 port, a RS232-to-RS485 converter will be required (such as a B&B Electronics, Model 485SD9TD or AERCO Part No. 124943).

8.5 BCM Control of Variable Speed Primary Pump

The BCM has a 0-10 V output that can be used to control a Variable Speed primary pump. There is no connection on the Modulex controller for pump mains power. Pump mains power must be supplied externally, as directed by pump manufacturer's instructions.

8.5.1 Pump Control Wiring

The 0-10 V signal wire must be wired to terminals 5 and 6 of terminal block Y2. See Figure 8-8. The positive wire connects to terminal 5 and the negative to terminal 6.

8.5.2 Pump Control Operation

Adjustment of the 0-10 V signal is done through 3 Modbus registers. For setup and operation of Modbus controls see Sections 8.7, 8.8, and 8.9. Data address 3006 is the "Pump Over-run Time" and it controls the amount of time, in minutes, that the pump will continue to run after the unit is shut down. Addresses 3007 and 3008 control the output voltage at minimum and maximum fire, respectively. The default settings will send 1VDC at 10% boiler firing rate, and 10 VDC at 100% boiler firing rate, varying linearly between the two voltages. The default pump over-run time is 5 minutes.

For further information see Table 9-4.



Figure 8-8: Primary Pump Control Wiring to BCM



8.6 RS485 Loop Termination Resistors and Bias

A terminating resistor (120 ohms) on each end of the RS485 loop is designed to match the electrical impedance characteristic of the twisted-pair loop and prevent echoes or cross-talk from corrupting data on the line. Short or medium length Modbus/RS485 loops (less than 1000 feet) can usually operate satisfactorily without the terminating resistor. However, longer loop runs (over 1000 feet), may require terminating resistors.

Bias may be necessary on the RS485 loop to minimize noise on the circuit. Loop bias is accomplished by activating pull-up/pull-down resistors on the last Boiler Communications Module (BCM) in the chain. AERCO recommends that both terminating resistors and bias be implemented on the RS485 circuit as described in Sections 8.6.1 and 8.6.2, which follow.

8.6.1 Master BMS II/ACS or EMS/BAS Terminating Resistor and Bias

All AERCO BMS II/ACS units are equipped with a built-in terminating resistor. Therefore, when the BMS II or ACS is the controlling Master, no terminating resistor needs to be added. In addition, the BMS II/ACS contains two Bias DIP switches which must be activated when the BMS II/ACS is the controlling Master. Refer to BMS II Manual GF-124/ACS Manual GF-131, Section 2.6 and Figure 2-6 for additional information on these switches.

When a third-party EMS or BAS is used as the controlling Master, consult the manufacturer's Technical Manual for termination resistor recommendations. If the EMS/BAS being used does not provide a bias and one is needed, pull-down bias can be implemented by installing a 1K ohm resistor (not provided) across terminals 2 and 4 on BCM connector Y2 (Figure 8-9).

8.6.2 BCM Controller Terminating Resistor and Bias

BCMs can function only as Slave devices on a Modbus Network. Since the Slaves are connected in a "Daisy-Chain" configuration, the terminating resistor must be enabled only in the <u>last</u> BCM Controller in the chain. Enabling the terminating resistor is accomplished by positioning jumper JP1 as shown in Figure 8-9 only on the BCM Board contained in the <u>last</u> BCM Controller.

As mentioned in Section 8.6.1, when the controlling Master is an EMS or BAS, pull-down bias may be implemented by connecting a 1K ohm resistor as shown in Figure 8-9. DO NOT install this bias resistor if the controlling Master is an AERCO BMS II or ACS. Bias will be provided by the BMS II/ACS DIP switches. The last unit in the chain must be energized (even if disabled) to enable bias.





Figure 8-9: BCM Loop Termination and Bias

8.7 Modbus Network Wiring Diagram

A "Sample" Modbus Network wiring diagram for an AERCO BMS II/ACS Master controlling BCM Slaves is shown in Figure 8-10. Activate the terminating resistor in the <u>last</u> BCM on the daisy-chain loop. DO NOT install the 1K bias resistor. Instead, activate the two bias DIP switches in the BMS II/ACS. Refer to GF-124 for the location of these switches.

CAUTION!

It is imperative that polarity be maintained between all Modbus Network connections. The Network will not operate if the proper polarity is not maintained. Also, twisted-pair wiring shields should only be terminated at the controlling Master for the Modbus Network.



Figure 8-10: AERCO BMS II Master Controlling Modulex Boiler Slaves



Figure 8-11 shows a Sample Modbus Network wiring diagram for a Master EMS/BAS controlling BCM Controller Slaves. This Figure shows an EMS or BAS Master equipped with a RS485 port. If the EMS or BAS contains a 4-Wire RS485 port, refer to Detail "A" for wiring details. If the controlling Master EMS/BAS contains only a RS232 port, a RS232-to-RS485 converter will be required to interface with connector Y2 at each BCM Controller. It should be noted that this diagram is only intended as a guide and does not include all possible scenarios. Refer to the EMS/BAS manufacturer's manual prior to attempting any network wiring connections.



Figure 8-11: EMS/BAS Master Controlling Modulex Boiler Slaves



8.8 Modbus Software Set-Up

The following sections provide the information and procedures necessary to configure the Boiler Communications Modules (BCMs) to operate on a Modbus Network.

8.8.1 BCM Set-Up For Modbus Operation

The BCM Controller can be set up for the following types of Modbus operating modes:

- Monitoring and Configuration Only
- AERCO BMS II/ACS Modbus Control and Monitoring
- Modbus Remote Setpoint Control and Monitoring

In order for the BCM Controller to be recognized by the Modbus Master, a valid address must be set at each BCM on the Modbus Network. Address selection on each BCM is accomplished by setting rotary DIP switch SW1. This switch is located in the lower right portion of each BCM as shown in Figure 8-12.

SW1 is a 10-position switch labeled 0 - 9 (Figure 8-12). SW1 is set to the desired position using a small flat-tip screwdriver. Figure 8-12 shows SW1 set to address 0 (zero) which disables the BCM on the Modbus Network. Only Modbus addresses 1 through 9 will be recognized by the Modbus Master. SW1 must be set to a different position for each Modulex Boiler being controlled on the Modbus Network.

Once the desired address has been set on each BCM, the Modulex Boiler is configured for Modbus Network control by the controlling Master EMS/BAS or AERCO BMS II/ACS. In order for the BCM to act as the Back-Up Controller if the Modbus Master signal is lost, the ENABLE/DISABLE switch must be set to ENABLE (1).

See Chapter 9 of this document and Chapter 2 of GF-124 for Modbus points for the BCM and BMS II/ACS.



Figure 8-12: Location of BCM Address Selection Switch SW1

8.8.2 Monitoring and Configuration Only

For monitoring and configuration only, set the 3-position switch to position II when the E8 is controlling the boiler. The boiler operation can be monitored via the Modbus terminals.



8.8.3 AERCO BMS II/ACS Modbus Control and Monitoring

The BCM's modulation output can be controlled by writing to its requested modulation level register (Standard Holding Register or Control Register #1). It will ramp up the boiler based on the settings in the Standard Holding Register or Setting Register 3000 to 3015. The default maximum setpoint temperature limit is 180°F as shown in register 3015. This value should not be increased, if possible. The default timeout interval is 30 seconds as shown in register 3011.

8.8.4 Modbus Remote Setpoint Control and Monitoring

To send a setpoint temperature to the BCM and have it control the boiler based on its internal settings, 2 registers need to be adjusted:

- The desired setpoint should be written to the Requested Setpoint (Address 1004) in the Standard holding Registers or Control Registers. This value should be written at least 3 times within the Communication Timeout time (Address 3011).
- The maximum modulation level should be written to "AERCO...Requested Modulation Level" (Address 1) in the Standard Holding Registers or Control Registers.

NOTE:

If power is lost, all Control Register settings return to their default values. Be sure to read them regularly and refresh if necessary. The changes to the Settings Registers are stored during power-down.

8.8.5 EMS or BAS Set-Up As Master to BCM Controller Slaves

Refer to the set-up instructions in the manufacturer's equipment manual for the Energy Management System (EMS) or Building Automation System (BAS) being used as the controlling Master.

8.9 Multiple Modulex Boiler Heating Mode – Using A BMS II or ACS

Multiple Modulex boiler plants are the ultimate energy conversion for building space heating. By modulating input at extremely high combustion efficiency, there is no wasted energy from overshoot. A multiple Modulex boiler plant offers inherent standby protection and ease of installation along with longevity.

In a boiler plant with two or more boilers, the use of an AERCO Boiler Management System II (BMS II) Model 5R5-384/AERCO Control System (ACS) is recommended for maximum efficiency and flexibility of operator control. The BMS II/ACS has the capability of controlling up to 32 boilers as well as auxiliary equipment. The BMS II/ACS system has an Internal Plant Start adjustment that can be set from 32°F to 100°F outdoor air temperature. When the boiler plant is activated, the system pump should be started simultaneously. This can be controlled from outside the BMS II/ACS, but boilers that fire with no flow will trip out on internal high temperature limit controls.

The following example briefly explains the operational sequence for a boiler plant consisting of multiple Modulex Boilers controlled by a BMS II or ACS.



8.9.1 Sequence of Operation (Example: Four-Modulex boiler installation)

When there is a need for heat, the BMS II will send a fire rate signal to the first boiler to begin firing. The Boiler Communications Module (BCM) of the first boiler will turn on one of its modules. When the BMS II/ACS fire rate signal to this boiler reaches a value twice that of the start level percentage (programmed by the user into the BMS II/ACS), the BMS II/ACS will call on the second boiler to begin firing one module, and the BMS II/ACS will then split the fire rate signal between the two boilers and send each a signal equal to the start level percentage. When the combined BMS II/ACS fire rate signal to the two boilers reaches a value three times that of the start level percentage, the BMS II/ACS will call on the third boiler to begin firing one module, and the BMS II/ACS will call on the third boiler to begin firing one module. And the BMS II/ACS will call on the third boiler to begin firing one module, and the BMS II/ACS will call on the third boiler to begin firing one module. At this point, the BMS II/ACS will call on the BCM of the fourth boiler to turn on one module. At this point, the BMS II will modulate the fire rate signal to the boilers in a parallel manner, while the BCM of each boiler sequences the individual modules.

Boiler inputs will modulate down and come off line in response to the BMS II/ACS in a reverse manner. Whether the BMS II/ACS is set in a Constant Temperature or Modulating Temperature mode, it will use the modulating ability to prevent header temperature fluctuation and maximize efficiency. As well, the BMS II/ACS can stage auxiliary equipment such as combustion air dampers and fans. Refer to BMS II Operations and Maintenance Manual GF-124/ACS Manual GF-131, and Product Spec BMS-II for details.



(This page intentionally blank)



CHAPTER 9: BCM MODBUS AND ADDRESS ASSIGNMENTS

CHAPTER 9: BCM MODBUS AND ADDRESS ASSIGNMENTS

9.1 BCM Modbus Comm. & Support Requirements

The Modbus communication support requirements incorporated in the BCM are as follows:

9.1.1 Function Codes

The BCM supports the Modbus Function Codes shown in Table 9-1.

TABLE 9-1: Supported Modbus Function Codes			
FUNCTION CODE	DESCRIPTION		
03	Read up to 8 contiguous Holding Registers		
04	Read up to 8 contiguous Address Registers		
06	Write a single 16 bit Register		

9.1.2 Modbus Support Requirements

The Modbus Network must conform to the support requirements listed in Table 9-2.

TABLE 9-2: Modbus Support Requirements			
CHARACTERISTIC	DESCRIPTION		
Communication Medium			
BMS II/ACS or EMS Master to BCM Slave	RS485 2-Wire Differential Bus With Shield		
RS485 Allowable Cable Length	4000 Feet Maximum		
Address Support From Master EMS	1 to 9 via Address Select Switch (SW1). (Addresses from 10 to 127 can be implemented via software)		
Transmission Mode Support	RTU (Remote Terminal Unit)		
Timing Specifications:			
Baud Rate:	Fixed at 9600		
Data Framing:	8 data bits, no parity, 1 stop bit		
Message Framing:	Silent period of at least 3.5 character times <u>Before</u> first character and <u>After</u> last character		
Character Framing:	No more than 1.5 character times of silence between received and transmitted characters.		
Heartbeat Timeout:	Adjustable (0 or 1 – 240 seconds)		



CHAPTER 9: BCM MODBUS AND ADDRESS ASSIGNMENTS

9.2 BCM Controller Standard Holding Register Assignments

9.2.1 BCM Controller Standard Input Register Assignments

The BCM Controller has only two Read Only Input Register addresses as shown in Table 9-3.

TABLE 9-3: BCM Controller Standard Input Register Address Mapping				
Modbus Data Address	Menu Item	Units and Range		
0	Error Code	0 – 0xFFFF LSB: Error Code MSB: Identification code of fault device: 0: BMM #0 to 7: BMM #7 255: BCM		
1	Unit Status	enum (1, 3, 5) 1 = Standby (ready to run but not fired) 3 = Remote (fired) 5 = Fault (failure detected)		
2	Flow Sensor Temp	14° to 212° F(-10° to 100° C) (Valve X10)		
3	Return Flow Temp	32° to 212° F(0° to 100° C) (Valve X10)		

9.2.2 BCM Controller Standard Holding Register Assignments

The BCM Controller Holding Registers contain functions that are Read Only, Write Only or both Read & Write. The address assignments for these functions are listed in Table 9-4 and are grouped into the following major categories: Control Registers, Operating Data Registers, System Data Settings and Test Registers. Functions within each group are not necessarily in hex address order.

The Read Only, Write Only or Read/Write status for each function in Table 9-4 is shown in the Default/Comments column.



TABLE 9-4: BCM Standard Holding Register Address Mapping						
Modbus Data Address	Menu Item	Units and Range	Default/(Comments)			
CONTROL REGIS	CONTROL REGISTERS					
1	AERCO BMS II/ACS Requested Modulation Level	% (0 to 100)	(Read/Write) A value other than 0 requests Run mode and supersedes the value set for Max Modulation Level (address 0x03F9)			
1017	Maximum Modulation Level	% (0 to 100) (Value x 2)	(Read/Write) 100° (50%)			
1004	Requested Setpoint	32°F – 212°F (0°C – 100°C) (Value x 10)	(Read/Write) 180°F			
1001	System Command	enum (0xAA)	(Read/Write) 0xAA: Restart Slave identification procedure			
1021	Heat Request Command	enum (0x01, 0x33, 0x44, 0x55, 0xBB, 0xCC, 0xEE) 0x01: No action 0x33: Space Heating mode enabled 0x44: Space Heating & DHW modes enabled 0x55: DHW mode enabled 0x55: DHW mode enabled 0xBB: Space Heating requested & DHW enabled 0xCC: Check request 0xEE: Space Heating request If enum is none of the above, Standby is selected.	(Read/Write) 0x01			
1022	Requested DHW Setpoint	32°F – 212°F (0°C – 100°C) (Value x 10)	(Read/Write)			
1023	Pump Control	enum (0, 1, 2) 0 = No action 1 = Switch OFF 2 = Switch ON	(Read/Write)			
1030	Error/Reset	enum (0x5A)	(Read/Write)			
1031	Run Counters Clear	enum (0x5A)	(Read/Write)			



TABLE 9-4: BCM Standard Holding Register Address Mapping (Continued)					
Modbus Data Address	Menu Item	Units and Range	Default (Comments)		
CONTROL REG	ISTERS (Continue	d)			
1041 Check Mode, Inserted burner control Bit 0: BMM #0 to Bit 7: BMM #7		(Read/Write) Bit 0 (BMM #0) is auto- matically set at Check Mode start			
OPERATING DA	ATA REGISTERS				
0	Error Code	0 – 0xFFFF LSB: Error Code MSB: Identification code of fault device: 0: BMM #0 to 7: BMM #7 255: BCM	(Read Only)		
10	Run Hours	0-50000			
11	Run Counts	0-50000			
1000	Cascade Control Status	enum (0, 1, 2, 4) 0: Stop 1: Slave identification procedure 2: Normal operation 4: Monitor mode	(Read Only)		
1002	Flow Sensor Temperature	14°F to 212°F (-10°C to 100°C) (Value x 10)	(Read Only)		
1003	Return Flow Temperature	32°F to 212°F (0°C to 100°C) (Value x 10)	(Read Only)		
1005	External Sensor Temperature	-31°F/-22°F to 86°F (-35°C/-30°C to 30°C) (Value x 10)	(Read Only) -31°F (-35°C) if not connected		
1008	Global Actual Modulation Level	0 – 100%	(Read Only)		
1016	Actual Target Setpoint	32°F to 212°F (0°C to 100°C) (Value x 10) Should increase up to "Target Setpoint" temp as boiler heats up	(Read Only)		
1018	Target Setpoint	32°F to 212°F (0°C to 100°C) (Value x 10)	(Read Only)		
1019	DHW Maximum Setpoint	32°F to 212°F (0°C to 100°C) (Value x 10)	(Read Only)		



TABLE 9-4: BCM Standard Holding Register Address Mapping (Continued)				
Modbus Data Address	Menu Item	Units and Range	Default (Comments)	
OPERATING DA	TA REGISTERS_(Continued)			
1020	Operating Mode	enum (0, 1, 2, 3, 6) 0: Standby 1: Space Heating 2: DHW 3: Check 6: Test	(Read Only)	
1100	Linked BMM	Flags (0 -255) Bit 0: BMM #0 to Bit 7: BMM #7	(Read Only)	
1101	Inserted BMM	Flags (0 -255) Bit 0: BMM #0 to Bit 7: BMM #7	(Read Only)	
1102	BMM in Check Mode	Flags (0 -255) Bit 0: BMM #0 to Bit 7: BMM #7	(Read Only)	
1103	BMM Flame Status	Flags (0 – 255) Bit 0: BMM #0 to Bit 7: BMM #7	(Read Only)	
1104	BMM Alarm Status	Flags (0 – 255) Bit 0: BMM #0 to Bit 7: BMM #7	(Read Only)	
1108	BMM Maximum Modulation Level	0 – 100% (Value x 10)	(Read Only)	
1109	Pump Modulation Output	0 – 10V	(Read Only)	
1200	Monitor Only	0 – 100%	(Read Only) Global modulation level from Cascade Manager	
2n00	BMM #n Error Code $(n = 0 - 7)$	0 – 0xFFFF	(Read Only)	
2n02	BMM #n Outlet Temperature $(n = 0 - 7)$	14°F to 212°F (-10°C to 100°C) (Value x 10)	(Read Only)	
2n08	BMM #n Actual Modulation Level (n = $0 - 7$)	0 – 100%	(Read Only)	



TABLE 9-4: BCM Standard Holding Register Address Mapping (Continued)				
Modbus Data Address	Menu Item	Units and Range	Default (Comments)	
OPERATING DA	TA REGISTERS (Continued)			
2n10	BMM #0 Capacity $(n = 0 - 7)$	0 – 255 kW	(Read Only)	
2n11	BMM #n Configuration (n = 0 – 7)	Flag (0, 1) 0: Space Heating Only 1: Space Heating and DHW	(Read Only)	
2n20	BMM #n Operating Flags (n = 0 – 7)	Flags (0-255) Bit 3: Flame detected Bit 4: Check mode Bit 6: Pump status Bit 7: Alarm	(Read Only)	
SYSTEM DATA				
1550	Firmware Code & Firmware Revision	0x3400 – 0x34FF High byte: Firmware Code Low byte: Firmware Revision	(Read Only)	
1011	Boiler Global Capacity	0 – FFFF kW	(Read Only)	
12	Boiler Mode = AERCO BMS II/ACS	2	(Read Only)	
13	Remote Signal = Network	3	(Read Only)	
SETTINGS				
19	Modbus Address	1 - 127	(Read/Write)	
3000	Burner OFF Hysteresis	9°F to 36°F (5°C to 20°C) (Value x 10)	(Read/Write) 9°F	
3001	Minimum Inserted Burner	1 - 8	(Read/Write) 1	
3002	Temp. Control: Slope Limit	2°F to 54°F/minute (1°C to 30°C/minute)	(Read/Write) 9°F	
3003	Temp. Control: Proportional Band	0°F to 90°F (0°C to 50°C)	(Read/Write) 45°F	
3004	Temp. Control: Integral Gain	0 - 50	(Read/Write) 12	
3005	Temp. Control: Derivative Gain	0 - 50	(Read/Write) 12	
3006	Pump Over-run Time	1 – 10 minutes	(Read/Write) 5 min.	



TABLE 9-4: BCM Standard Holding Register Address Mapping (Continued)					
Modbus Data Address	Menu Item	Units and Range	Default (Comments)		
SETTINGS (Conti	SETTINGS (Continued)				
3007	Pump Modulation Output @ Minimum Burner Level	0 – 10V (Value x 10)	(Read/Write) 3V		
3008	Pump Modulation Output @ Maximum Burner Level	0 – 10V (Value x 10)	(Read/Write) 10V		
3009	Burner Minimum Modulation Level	0 – 100%	(Read/Write) 35%		
3010	Water Δ Temp. Protection	0°F/2°F – 90°F (0°C/1°C-50°C)	(Read/Write) 36°F		
3011	Communication Timeout Time	0/10 - 240 sec. (in 10 sec. intervals) 0 = Disable	(Read/Write) 30 sec.		
3012	Temperature Limits	0/1; 0 =°C, 1 = °F	1 = °F		
3013	Analog Input Function	0/1; 0 = Setpoint Adjust, 1 = Outdoor Temp Sensor	(Read/Write) 0		
3014	(Not Used)				
3015	Maximum Target Temperature	113°F to 185°F (45°C to 85°C	(Read/Write) 180°F		
3050	Application Code	0/1	0 = Burners Array 1 = Standalone Burners		
3051	Services Enable	0-255	0 = None 1 = CH 2 = Frost Protection 3 = CH & Frost Protect		
TEST REGISTE	TEST REGISTERS				
1040	Test Mode Control	enum (0xA5/0x5A) 0xA5: Test mode release 0x5A: Test mode request	(Write Only) This command is only executed in Standby mode. The other Write messages are executed only in Test mode.		



TABLE 9-4: BCM Standard Holding Register Address Mapping (Continued)				
Modbus Data Address	Menu Item	Units and Range	Default (Comments)	
TEST REGISTER (Continued)			
3100	Digital Inputs Status [0, 1]	Flags (0 - 0x1F80) bit 0: eBUS RX bit 1: eBUS-1 RX bit 2: eBUS -1 detect (true, false) bit 7: Room Stat (open, close) bit 8: 0, not used bit 9: RESET by Low Voltage Detector bit 10: RESET by clock monitor bit 11: RESET by Watchdog timer bit 12: RESET (open, close) bit 13: SW1-1 bit 14: SW1-2 bit 15: SW1-4	(Read Only)	
3101	Digital Outputs Status [0, 1]	Flags (0 - 0x0F) bit 0: Burner [OFF, ON] bit 1: Pump [OFF, ON] bit 2: Not used Bit 3; Alarm [OFF, ON] bit 4: DL1 [OFF, ON] bit 5: eBUS TX bit 6: eBUS-1 TX bit 7: eBUS Supply [OFF, ON]	(Read Only)	
3102	Digital Output Control in Test Mode [0, 1]	Flags (0 - 0x0F) bit 0: Not used bit 1: Pump [OFF, ON] bit 2: MPump-PWM [100%, 0%] bit 3; Alarm [OFF, ON] bit 4: DL1 [OFF, ON] bit 5: eBUS TX bit 6: eBUS-1 TX bit 7: eBUS Supply [OFF, ON]	(Read/Write)	



CHAPTER 10: E8, BCM, AND BMM FAULT CODES

This section provides tables for identifying faults (with fault troubleshooting tips) and describes the procedures required to clear a displayed fault code after the cause of the fault has been corrected. Fault codes are displayed in the upper right area of the LCD display on the E8 Controller as shown in Figure 10-1.

NOTE:

See the Trouble-Shooting Guide in Chapter 6 of the Modulex EXT manual (GF-136) for more detailed Fault Code descriptions and trouble-shooting procedures.



Figure 10-1: E8 Controller Fault Code Location



10.1 Processing and Clearing Fault Codes

When a fault occurs, the appropriate fault code will be displayed along with a "Flashing Triangle" (Figure 10-2).



Figure 10-2: E8 Controller Fault Code and Flashing Triangle Location

To process and clear the fault, proceed as follows:

NOTE:

If the cause of the fault has not been corrected, the displayed Fault Code will reappear after performing the following steps.

Processing and Clearing a Fault Code

- 1. Open the hinged cover on the controller.
- 2. Press the Program Key. The red LED will light. Also the display will show the fault code and the number of the suspect module.
- 3. Correct the cause of the fault.
- 4. Press the Program Key again. The red LED will go off and the Fault Code will clear.
- 5. If more than one fault (or more than 1 failed module) exists, repeat the above steps until all fault codes are cleared.
- 6. Close the hinged cover on the Controller.
- 7. Monitor the display to ensure no other Fault Codes appear.
- 8. Resume normal operation after all faults have been cleared.

10.2 Fault Codes and Descriptions

All fault codes are displayed in the E8 Controller display. There are fault codes for three different devices as follows:

- **E8 Controller:** These are divided into four basic categories: PCB Element Faults, System Manager Faults, Communication Faults, and Internal Faults. These fault codes are shown in Table 10-1.
- **BCM (Boiler Control Module):** Use Table 10-2 to determine the meaning of the displayed BCM fault code, then look up BCM fault codes in Table 10-3.
- **BMM (Burner Management Module):** Use Table 10-2 to determine the meaning of the displayed BMM fault code, then look up BMM fault codes in Table 10-4.



10.2.1 E8 Controller Fault Code Table

The table below lists the fault codes and fault descriptions associated with the E8 Controller.

TABLE 10-1: E8 Controller Fault Codes						
FAULT CODE	FAULT DESCRIPTION					
PCB Element Fault						
E 1	High limit thermostat					
E 2	Supplier low gas pressure					
E 4	Flame absence during ignition time					
E 5	Flame absence during operation time					
E 6	High temperature on element (> 203°F)					
E 8	Low water pressure (only with SensorLogic)					
E 10	Local PCB failure					
E 11	Flame presence before ignition cycle					
E 12	Local flow sensor failure					
E 13	Auxiliary sensor failure (DHW)					
E 14	Global return sensor failure					
E 15	Difference between global return sensor and local flow sensor > 86°F (rp +10)					
E 16	Low temperature: risk of freeze					
E 20	Flame present after burner shut off					
E 22	Air pressure switch does not close within 30 sec. in the ignition cycle					
E 23	Air pressure switch always active					
E 24	Fan out of control: doesn't achieve correct speed within 30 sec. of ignition cycle start					
E 26	Fan out of control: does not stop within 30 sec. from the stop of the burner					
E 27	Air pressure switch fault during the ignition time					
E 30	Parameters setting alteration					
E 32	Electrical supply < 108 VAC					
E 40	Low system flow rate (only with SensorLogic)					
E 41	Presence of air in the pump (only with SensorLogic)					
E 42	Pump blocked (only with SensorLogic)					
E 43	Pump wire failure (only with SensorLogic)					
System Manag	ger Fault – Sensor Defective (break/short circuit)					
E 69	E8: F5 – flow sensor HC2					
E 70	E8: F11 – flow sensor HC1					
E 71	E8: F1 – buffer storage tank low sensor					
E 72	E8: F3 – buffer storage tank top sensor					
E 75	E8: F9 – outdoor sensor					
E 76	E8: F6 – storage tank sensor					
E 78	E8: F8 – boiler sensor					
E 80	E8: F2 – room sensor HC1					
E 83	E8: F15 – room sensor HC2					
E 135	F12: HVV Storage Tank Low Sensor, Multi-Function 2					
E 136	F13: (P11000): HS2, Collector 2, Multi-Function 3					
E 137	F14: (P11000): Collector 1, Multi-Function 4					
E 138	F15 – room temperature HC2					





TABLE 10-1: E8 Controller Fault Codes (Continued)					
FAULT CODE	FAULT DESCRIPTION				
Communication	Communication Fault				
E 90	E8: Address 0 and 1 on BUS. IDs BUS 0 and 1 may not be used simultaneously				
E 91	E8: BUS ID used. The set BUS ID is already in use by another device				
E 99	E8: Internal failure				
E 200	Communication Error HS1				
E 201	Communication Error HS1				
E 202	Communication Error HS1				
E 203	Communication Error HS1				
E 204	Communication Error HS1				
E 205	Communication Error HS1				
E 206	Communication Error HS1				
E 207	Communication Error HS1				
Internal Fault					
E 81	E8: EEPROM error. The invalid value has been replaced with default value (Check parameter values)				



10.2.2 BCM and BMM Fault Code Conversion Table

The table below shows how to interpret the displayed fault code, while Table 10-4, on the next page, shows a description of the fault and troubleshooting tips associated with the BCM.

In order to derive the correct error code from that displayed in the E8 Controller display, use Table 10-2 below to determine the working error code. To use the table, identify the displayed number from the first column, identify the affected module from the second column, apply the formula from the third column, and identify the Error Table to reference from the fourth column.

TABLE 10-2: BCM and BMM Fault Code Conversion					
Observed Code	Observed Code	Code to Look Up in	Table		
Code = 0	N/A	No Fault	-		
Code between 1 and 255	BMM #0 Fault	Look up code	11-4		
Code between 256 and 511	BMM #1 Fault	Subtract 256 from reading	10-4		
Code between 512 and 767	BMM #2 Fault	Subtract 512 from reading	10-4		
Code between 768 and 1023	BMM #3 Fault	Subtract 768 from reading	10-4		
Code between 1024 and 1279	BMM #4 Fault	Subtract 1024 from reading	10-4		
Code between 1280 and 1535	BMM #5 Fault	Subtract 1280 from reading	10-4		
Code between 1536 and 1791	BMM #6 Fault	Subtract 1536 from reading	10-4		
Code between 1792 and 2047	BMM #7 Fault	Subtract 1792 from reading	10-4		
Code between 2048 and 65279	N/A	Invalid Codes	-		
Code above 65280	BCM Fault	Subtract 65280 from reading	10-4		

Example:

Based on the above, a code reading of "261" means the fault occurred on BMM #1. The fault code is (261 - 256 =) 5. An Error Code of 5 from the BMM Fault Codes table means "Flame Loss During Run".



10.2.3 BCM Fault Code Table

The table below lists the fault codes and troubleshooting tips associated with the BCM.

TABLE 10-3: BCM Fault Codes					
CODE	DESCRIPTION	EFFECT	CORRECTION	RESET	
17	Boiler Pipe is frozen. FlowSensor temp. is 36°F or less.	Ignition is inhibited. Pump runs for 5 min at max speed.	Carefully defrost boiler	AUTOMATIC - when FlowSensor is greater than 41°F.	
18	Maximum Δ - temperature protection. Flow temperature - Return Temperature > Water Δ -Temp Protection + 50°F	All burners turned OFF and Pump ON at maximum speed.	Check the system installation.	AUTOMATIC - when Δ- temperature < Water Δ- Temp Protection.	
19	High outlet temperature. FlowSensor temperature > 203°F.	All burners turned OFF and Pump ON at maximum speed.	Check Flow Sensor or system pump	AUTOMATIC - when FlowSensor < 176°F.	
37	Crash	Ignition is inhibited	Change the BCM	MANUAL – push reset switch to cycle power	
38	Settings Corrupted	Ignition is inhibited. Pump runs for 5 min at max speed.	Re-program the settings. Contact Factory	MANUAL - push reset switch or cycle power.	
50	Internal Failure	Ignition is inhibited.	Contact Factory for new BCM.	MANUAL - cycle the power.	
56	Standby. No remote control detected and Request input is open.	Ignition is inhibited.	Close Request input for Manual operation.	MANUAL - push reset switch or cycle power.	
57	No BMM detected.	Ignition is not possible.	Check the BMM eBus wiring.	MANUAL - push reset switch or cycle power.	
58	FlowSensor fault.	All burners turned OFF.	Check flow sensor or wiring.	AUTOMATIC	



10.2.4 BMM Fault Code Table

The table below lists the fault codes and troubleshooting tips associated with the BMM.

TABLE 10-4: BMM Fault Codes						
CODE	DESCRIPTION	EFFECT	CORRECTION	RESET		
1	High Limit (STB) Thermostat activated	All burners turned OFF and Pump ON at maximum speed.	Check FlowSensor thermal connection to boiler.	MANUAL - push reset switch when temperature goes below limit.		
2	Low Gas Pressure	All burners turned OFF.	Check gas pressure or gas pressure switch.	AUTOMATIC - when gas pressure switch closes.		
4	No flame detected at burner start	Burner control lockout.	Check flame rod or combustion.	MANUAL - push reset switch or cycle power.		
5	Flame loss during run.	Ignition retry.	Check combustion and wiring.	MANUAL - push reset switch or cycle power.		
6	High outlet temperature. FlowSensor temperature > 203°F.	All burners turned OFF and Pump ON at maximum speed.	Check Flow Sensor or system pump.	AUTOMATIC - when FlowSensor < 176°F.		
10	Internal Failure	Ignition is inhibited.	Contact Factory for new BCM.	MANUAL - cycle the power.		
11	Flame signal detected before ignition.	Ignition is inhibited.	Disconnect flame rod wire from BMM. If problem goes away change flame rod and/or wire. If problem does not go away change BMM.	MANUAL - push reset switch or cycle power.		
12	FlowSensor fault.	All burners turned OFF.	Check flow sensor or wiring.	AUTOMATIC		
13	Aux Sensor fault	The boiler will operate from the FlowSensor without the AuxSensor.	Check aux sensor or wiring.	AUTOMATIC		





TABLE 10-4: BMM Fault Codes (Continued)						
CODE	DESCRIPTION	EFFECT	CORRECTION	RESET		
14	Return Sensor fault	All burners turned OFF.	Check return sensor or wiring.	AUTOMATIC		
15	Maximum Δ - temperature protection. Flow temperature - Return Temperature > Water Δ -Temp Protection + 50°F	All burners turned OFF and Pump ON at maximum speed.	Check the system installation.	AUTOMATIC - when Δ- temperature < Water Δ-Temp Protection.		
16	Boiler Pipe is frozen. FlowSensor temperature is 36°F or less.	Ignition is inhibited. Pump runs for 5 min at max speed.	Carefully defrost boiler.	AUTOMATIC - when FlowSensor is greater than 41°F.		
20	Flame signal detected after burner is OFF.	Ignition is inhibited.	Disconnect gas valve wire from BMM. If failure goes away, check wiring or change BMM. If failure remains check or change gas valve.	MANUAL - push reset switch or cycle power.		
22	No air flow at burner after fan started for 30 seconds.	Ignition retry after 60 second delay and failure remains until we have a successful burner operation.	If fan is stopped, check supply voltage and fan wiring. If OK try another fan. If still not working change the BMM. If fan is not stopped, check the exhaust gas outlet for blockage. If OK then check the air pressure switch wiring. If still not working try another air pressure switch. If still not working, change the BMM.	AUTOMATIC/ MANUAL		
23	The air pressure switch doesn't switch off.	Ignition is inhibited.	Disconnect the air proving switch. If problem goes away install a new switch. If not, check the wiring. If wiring OK then change BMM.	AUTOMATIC		





TABLE 10-4: BMM Fault Codes (Continued)					
CODE	DESCRIPTION	EFFECT	CORRECTION	RESET	
24	Fan speed out of control: It doesn't reach pre-purge speed within 30 seconds.	Ignition retry after 60 second delay and failure remains until we have a successful burner operation.	Check fan wiring.	AUTOMATIC/ MANUAL	
26	Fan speed out of control: It doesn't stop within 30 seconds after turned OFF.	Ignition is inhibited.	Check fan wiring.	AUTOMATIC	
27	Air flow failure during ignition.	Restart pre- purge timer. The failure remains until we have a successful burner operation.	Check fan and wiring. Check air proving switch and wiring.	AUTOMATIC	
28	Flue/Chimney Obstruction	Ignition is inhibited.	Check flue/chimney		
29	Water inside the combustion chamber.	Ignition is inhibited.	Check for water in the exhaust manifold		
30	Settings Corrupted	Ignition is inhibited. Pump runs for 5 min at max speed.	Re-program the settings. Contact Factory	MANUAL - cycle the power or send reset message.	
32	Line voltage too low. (<96 VAC)	Wait for proper line voltage. (>102 VAC)	Check input voltage else try another BMM.	AUTOMATIC	
40	Low Water Flow. Low water flow switch activated.	Burners turned OFF.	Check water flow or check switch.	AUTOMATIC	



Change Log:					
Date	Description	Changed By			
02/22/2017	Rev B: PIR 934-115: In section 8.9, clarified when to use BMS II or ACS.	Curtis Harvey			
09/25/2017	Rev C: DIR 401: Various updates, clarified default value of menu options CAP/MODULE, T-LIMIT DAY, T-LIMIT N, HEATSLOPE, NEW CONFIG, PUMP MODE, clearification of relationship between MAX-T Flow to MAX T-COLL (Chapter 6), . DIR 17-008: Added new EXT model numbers (front cover), updated formatting per current standard DIR 17-056: Clarified Modbus Remote Setpoint registers needing adjustment (Section 8.8.4).	Chris Blair			

