# E2 and Square D Smart Breaker Panel

Installation and Operation Manual







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# 1 Overview

# 1.1 The Smart Breaker System

The Smart Breaker products are designed to allow the Copeland family of site controllers (REFLECS, Einstein, and E2) to command control panels that activate and deactivate lights. A breaker panel generally consists of a series of circuit breakers that are flipped from OFF to ON and from ON to OFF by commands sent from E2 through MODBUS or a Square D Smart Breaker Gateway board. Support for proof checking on individual breakers is also supported.

The Copeland line of Smart Breaker products includes E2 MODBUS direct support or a Gateway for interfacing with Square D's Powerlink G3 breaker panels. For E2 MODBUS direct support, refer to Section 2, E2 MODBUS Direct Support for Square D. For Gateway support, refer to Section 3 Square D Smart Breaker Gateway Board.

# 1.2 Breaker Numbering on the Square D Master and Slave Panels

*Figure 1-1* shows the numbering for all breaker slots on the Square D Powerlink panels (24-breaker panel shown), as they correspond to the breaker numbers mapped to groups in the HHT screen (see Section 3.6.1.2 Configuration). For the master panel (Panel #0), the odd-numbered breakers are on the same rail as the power supply, and the even-numbered breakers are on the opposite rail. For slave panels, the odd-numbered breakers are on the same rail as the address selector, and the even-numbered breakers are on the opposite rail. In either case, all breakers are numbered in ascending order from the side closest the power supply or address selector to the opposite end of the rail.

### 1.2.1 Numbering Double and Triple Breakers

If double or triple breakers are being used in the Square D Master and Slave panels, they will be plugged into more than one slot on the Square D Powerlink panel. However, double and triple breakers only respond to ON/OFF commands sent to one of its address slots.

Double breakers occupy two slots in a Square D Panel. If a double breaker is on the left side of the panel use its first slot for the control address, and if on the right side of the panel, use its second slot for the control address. For example, if a double breaker is on the left in slots 3 and 5, the breaker address slot will be 3. If a double breaker is on the right in slots 4 and 6, the breaker address slot will be 6.

For triple breakers, use the center slot as the breaker address, as this will be the same for the left and right side of the panel. For both double and triple breakers, all unused slots should be left unaddressed (i.e, assigned to Group #0 in the Gateway or unassigned with E2 direct MODBUS control).



Figure 1-1 - MODBUS Gateway to Square D Panel Wiring

1.3 The Square D Powerlink Breaker Panel



Figure 1-2 - Square D Powerlink Breaker Panel (24-Breaker Version Pictured)

The **Square D Powerlink breaker panels** are driven by an on-board power supply that handles staggered activation of breakers, proof checking and auto-reset. Copeland site controllers communicate with the Square D Powerlink panels via its MODBUS network connection. The Copeland controller directly commands the Square D Powerlink panel to turn its breakers to turn ON or OFF.

A Powerlink panel consists of two rails of breakers consisting of either 6, 9, 12, 15, 18, 21, or 24 breaker slots each, for a total of 12, 18, 24, 30, 36, 42, or 48 breakers.

### 1.3.1 Compatible Square D Panels

The E2 Square D Smart Breaker system requires one "master" panel to be equipped with a Powerlink G3 power supply module (see Table 1-1 for part numbers).

### Table 1-1 - Square D Powerlink G3 Power Supplies

Square D Part #	Description
NF120PSG3	Powerlink G3 Power Supply, 120V
NF240PSG3	Powerlink G3 Power Supply, 220/240V
NF277PSG3	Powerlink G3 Power Supply, 277V

The E2 Square D Smart Breaker system does NOT require, and cannot communicate with, Powerlink G3 controllers such as the NF500G3, NF1000G3, NF2000G3, or NF3000G3. If one of these controllers is present on the master panel, remove it before installing.

### 1.3.2 Connection To Master Panel #0 (Master)

Each Square D Smart breaker panel system has at least one panel that is the "master" panel. The master panel has a power supply that provides power to turn the breakers ON and OFF, both for itself and for expansion panels, or "slave" panels. The master panel's Square D network address is always #0; however, it is referred to in the Gateway's interface as "Panel # 1."

For E2 MODBUS direct connection, a total of up to eight (8) panels (one "master" panel and seven "slave" panels) can be addressed per E2, with the "master" panel always set up as the first panel.

To network the master panel to the Square D Gateway, use two-connector shielded cable (Belden #8761 or equivalent). Connect the Gateway's MODBUS connector (located in the top right corner of the board) to the pluggable connector on the bottom side of the master panel's power supply (see *Figure 1-3*).



Figure 1-3 - MODBUS Gateway to Square D Panel Wiring

For E2 MODBUS direct support the Gateway is not used. Wire the MODBUS network directly to the pluggable connector on the bottom side of the master panel's power supply (*Figure 1-4*):



Figure 1-4 - E2 MODBUS to Square D Panel Wiring

# 1.3.3 Networking Square D Master Panel to Square D Expansion Rails

In addition to Panel #0 mentioned in *Connection To Master Panel #0 (Master)*, the Square D Gateway can communicate with expansion panels, or "slave panels." Expansion panels must be wired in series with the master panel and the Square D Gateway. The E2 MODBUS direct support can communicate with up to eight (8) Square D breaker panels (one "master" panel and seven "slave" panels).

Locate the address selector on each expansion panel. The address selector has a four-terminal pluggable connector next to the rotary addressing switch (*Figure 1-5*).

Use Belden #27326 (4-conductor, 18 AWG Class 1 cable) or equivalent to wire the expansion panels to the MODBUS network. See *Figure 1-5*.



Figure 1-5 - MODBUS Square D Master Panel to Expansion Panel

### 1.3.4 Expansion Panel Cable Maximum Length

The total amount of wire connecting the Powerlink master panel to all slave panels is limited based on the type of power supply being used and the nominal voltage. *Table 1-2* lists the power supplies and their corresponding maximum cable lengths.

The maximum cable length does NOT include the cable connecting the master panel to the Gateway board or the E2 MODBUS network.

### Table 1-2 - Square D Powerlink G3 Power Supplies

Power Supply Part #	Nominal Voltage	Max Cable Length
NF120PSG3	120V	400 ft (122 m)
NE240BSC2	220V	100 ft (30 m)
NF240F3G3	240V	400 ft (122 m)
NF277PSG3	277V	400 ft (122 m)

### 1.3.5 Network Panel Addressing

When more than one Square D Smart breaker panel is networked with the Square D Gateway or E2, each panel must be given a unique network ID on the MODBUS network. The panel with the power supply (the master panel) is always automatically addressed as Panel #0. Expansion panels must be addressed by setting the rotary dial on the address selector. Each expansion panel should be numbered in sequence (#1, #2, and #3).

Powerlink panels have no on-board termination and must be terminated by placing a 150-ohm resistor, or by using the Copeland terminal block (*P/N 535-2711*) between the B and A terminals on the MODBUS connector *Figure 1-6*.



Figure 1-6 - Powerlink Panel MODBUS Termination (Expansion Rail Connector shown)

# 2 E2 MODBUS Direct Support for Square D Breaker Panels

### 2.1 Licensing

The E2 Square D Breaker Panel application is available when activated with a license key that is obtained through Copeland. To obtain a license, go to the E2 TCP/IP Setup screen and locate your controller's MAC Address. Press  $\blacksquare$  + **T**, or from the Main Menu:

- 1. Press 🖻 (System Configuration)
- 2. Press (Remote Communications)
- 3. Press 📓 (TCP/IP Setup) to open the TCP/IP

Setup screen and locate your E2's MAC Address (circled in *Figure 2-1*).

C1: General	C2: Eng Units	C3: Modem	C4: TCP/IP	C5:	
C6:	C7:	C8: Peer Netwrk	C9: Web Server	C0: Su	sten
	Genera	1 Setup: GENERAL	SERU		
TCP/IP	Value				
DHCP Enab	led : No				
IP Addres	5 : 10.10.64.	39			
Subnet Ma	sk : 255.255.2	48.0			
DNS Serve	r1 :				
DNS Serve	r 2 :				
DNS Serve	r 3 :				
Default G	ateway: 10.10.64.	1			
Domain Na	ne :				
MAC Addre	ss : 00-0A-F6-	00-00-AF			
Enter desired	text   Name of	the Domain Server	1		

Figure 2-1 - Locating the MAC Address on the TCP/IP Screen

4. Call Technical Support at 833-409-7505 and have your MAC Address ready in order to obtain your unique license key.

Once you have received your unique license key, you can now activate the licensed feature(s) from the License Report screen. The License Report screen displays that E2 controller's unit type and firmware version, the list of all licensed features on that E2, the current number and maximum number of each of those applications allowed, and which additional features, (that require a license key), have been enabled. From the Main Menu:

- 1. Press 🖻 (System Configuration)
- 2. Press (Licensing)
- 3. Press **F1** (Add Feature)
- 4. Enter your license key to activate the desired feature:

9-06-05 🔶 🧖 🖮	BX-400 Unit 1 🍈 Add License	1	INS	13:58:29 *ALARM*
Licensed Features- 09/0 For controller model ty Feature	6/2005 - 13:58:24 - Rev: 2 pe: BX-400 Maximum In-Use	.20B12 License		
GEN LON Demand Limit Cont Flexible Combiner Time Schedule Log Group	Activate Feature			
CarrierOne ARTC/RTU Nose5	Enter License key to activate a Feature:			
HUAC Zone Analog Sensor Ctr Loop/Sequence Ctr Digital Sensor Ctr				
Lighting Control	48 1			
Trane SCC	40			
Air Handling Unit	8 1			
Digital Import Point	64 0			
Analog Import Point	64 0			
Enter desired text				
			E5 :	CANCEL

Figure 2-2 - Enter Your Unique License Key

5. Reboot the controller and open the License Report screen again to see the license key appear next to the activated feature (*Figure 2-3*):

9-01-05 🔹 🎲 🎟	BX-400 Unit 1 LICENSE REPORT	a	16:31:54 INS *ALARM*
TD Control	20		
NUCC Simulation	28	0	
Conversion Coll	120	9	
Holiday Schodulo	128	8	
Apti-Swoot Control	64	6	
Hast/Cool Control	40	6	
1601	16	6	
880	32	9	
800	16	6	
400	16	6	
Echelon 1601	32	6	
Echelon 880	16	6	
Digital Combiner	128	6	
Pulse Accumulation	64	6	
LonVorks Network	No Limit	6	
Ethernet Network	No Limit	5	
Color Display	No Limit	5	
Web Services	No Limit	5	3BBC-FE91-E504-1623
Lennox IMC	31	5	8B9F-075E-1921-FD7A
Power Monitoring	64	5	
IRLDS	16	5	
Analog Combiner	128	5	
ines 23 to 44 of 44			
1 - AND FEATURE			

Figure 2-3 - License Report Screen

# 2.2 Network Connection to E2

Connecting a Square D breaker panel to an E2 unit requires the E2 to be version 2.71 or above. Contact Copeland for upgrade information if the controller is a version prior to 2.71.

If you are using a REFLECS, Einstein, or E2 prior to version 2.71, a Gateway board is required to communicate with the Square D Smart breaker panels. Refer to Section 3 Square D Smart Breaker Gateway Board for more information.



Figure 2-4 - Square D Panel MODBUS Connection Layout



Figure 2-5 - Location of E2 COM Ports - E2 PIB Board

An E2 has up to three COM ports that can be assigned for MODBUS communication (COM2, an RS485 port on the E2 power interface board, and COM4 and COM6, which are optional ports requiring expansion cards). COM ports can only be used for one function; in other words, if COM2 is set up as the I/O network, you cannot connect MODBUS devices to COM2. Ensure your E2 is equipped with an RS485 COM Card (*P/N 637-4890*) and configured in E2 General Services (More  $2^{-1}$ , Serial tab) to enable COM4 or an E2 Expansion COM Card (*P/N 637-4871*) to enable COM6. Connect the MODBUS network cable to the three-terminal connector on the COM port you wish to assign as MODBUS. Wire RS485+ to the Square D power supply B terminal. RS485- to the Square D power supply A terminal, and the shield cable to the Square D power supply minus (-) terminal.

If other MODBUS devices are on the same network segment as the Square D breaker panels, they should be wired prior to the first Square D breaker panel. This is due to the MODBUS network wire type change when going from a Square D "master" breaker panel to a Square D "slave" breaker panel.



When Square D Breaker Panels are on the network, any MODBUS devices on the network <u>cannot</u> have an address of 58. If a MODBUS device has an address of 58, it will cause the Square D Breaker Panels to go offline.

### 2.2.1 E2 Termination

If the E2 will be the first device in the daisy-chain, set the port's termination jumpers to the TERMINATED & BIASED position (all three jumpers UP); otherwise, set all jumpers DOWN if not the first device.

# 2.3 E2 Setup of Square D Breaker Panels

### 2.3.1 Set Up Network Ports

Before setting up a Square D breaker panel, the port on the E2 that has the MODBUS cable connected must be set up as a MODBUS port.

- 1. Log in to the E2 with Level 4 access.
- 2. Press followed by 7 3 General Controller Info.
- 3. Press it to open the **Serial** tab of the **General Controller Info** setup screens:

:1:	General	C2: Eng Units	C3: Serial	C4: TCP/IP	C5: Peer Netwrk
6:	Web Server	C7: System	C8:	C9:	C0:
		Gener	al Setup: GENER	AL SERV	
	Serial	Value			1
	COM1 Connec	ction: Serial			
	COM1 Baud	: 115.2 Kb	aud		
	COM2 Connec	ction: MODBUS-1			
	COM2 Baud	: 19.2 Kba	ud		
	COM2 Data S	Size: 8			
	COM2 Parity	y : None			
	COM2 Stop I	Bits: 1			
	COM3 Connec	ction: Modem			
	COM3 Baud	: 115.2 Kb	aud		
	COM3 Modem	Port: No Modem			
	COM3 Modem	Type: CPC 33.6	K Internal		
	COM3 Modem	Init: ATEOUISO	=1S10=40&D2&Q5\I	40%C 0&K 0&Y 0&W 0	
	COM3 Fax In	nit : ATV1E0S0	=1S10=40&D2&Q5\I	40%C 0&K 0&Y 0&W 0	
	COM3 DTMF I	Dur : 108			
	COM3 Pause	Dur: 2			
ser	oll using Ne	ext/Prev keys	Connection Ty	be For COM2	
F1	: PREV TAB	F2: NEXT TAB	F3: EDIT	F4: LOOK UP	F5: CANCEL

Figure 2-6 - Serial Communications Manager Screen

- This screen will have a "Connection" field for all COM ports on the E2. Highlight the COM port connection field that will be used, and press F4 - LOOK UP. From the list of network types, select MODBUS.
- 5. Four fields will become visible underneath the COM port connection field, which pertain to the way the device communicates:
  - **Baud** Default setting is **19.2k**. Leave this field at the default value.
  - Data Size Leave this field at the default value (8).
  - **Parity** Leave this field at the default value (**None**).
  - Stop Bits Leave this field at the default value (1).
- 6. Press to save changes and exit.

### 2.3.2 Add and Connect Square D Breaker Panels

To enable communications between E2 and the Square D breaker panels, the devices must be added and addressed in E2.

- 1. Log in to the E2 with Level 4 access.
- 2. Press 7 7 2 Connected I/O Boards and Controllers.

	CO. IO Notwork	CO. FOT	Ch. Thind	Dautu	PE. E	holon
CA. THIS UNIL	CZ. TO HELWORK	C8-	C4. 11110	artų	C3. E	meron
	Num Ne	twork Ctrls: Net	Setup			
	Third Party Boa	rd Type	Quantity	Max	1	
	#1 : Cat	erpillar EMCP3	1	5		
	#2 : ETN	Breaker Panel	1	1		
	#3 : Ope	n Echelon	1	2		
	#4 : Spo	rlan SH Ctrl	1	5		
	#5 : SqD	Breaker Panel	4	4		

Figure 2-7 - Connected I/O Screen

- 3. On the Connected I/O screen, in a box labeled **Third Party Devices**, enter the number of Square D Panels in the **SqD Breaker Panel** number field.
- 4. Press to return to the Network Setup menu, then select **Controller Setup** (*Figure 2-8*).
- 5. Locate the Square D breaker panels you added to the network list (press and a to scroll through the list) and highlight with the cursor. The default name for a Square D breaker panel begins with a three-letter designator of the model type (SQD for Square D). If desired, enter a new name for each device in the Name field or press for Setup.

Nane	Туре	Network Add	ess	Rev	Status
THIS.03.1	RX300-Refriq	Ethernet	3	2.80A10	This Controller
LONMARK 001	LonMark Device		2	0.00	Offline
LONMARK 002	LonMark Device		3	0.00	Offline
16AI 001	16AI	IONet	: 1	0.00	No Port
8R0 001	8R0	IONet	1	0.00	No Port
8D0 001	8D0	IONet	: 1	0.00	No Port
4A0 001	460	IONet	: 1	0.00	No Port
LEAK DETECT001	IRLDS	IONet	: 1	0.00	No Port
CL RSC 001	CtrlLink RSC	(No Network):		8.88	Unknown
CL CD_001	CtrlLink CD	(No Network):		0.00	Unknown
CL ACC001	CtrlLink ACC	MODBUS-1:		8.89	Unknown
ISD2 COMP_001	ISD 2.0 Comp	MODBUS-1:		0.00	Unknown
PERF ALERT 001	Performance Alert	MODBUS-1:		0.00	Unknown
SQD BRKRPNL001	SqD Breaker Panel	MODBUS-1:	:232	0.00	
SQD BRKRPNL002	SqD Breaker Panel	MODBUS-1:	:234	0.00	
STATUS DSP_001	Status Display	Ethernet-1:	: 1	0.00	
STATUS DSP_002	Status Display	Ethernet-1	2	0.00	

Figure 2-8 - Network Summary Screen

Each Square D breaker panel is assigned a MODBUS address automatically when it is created. Each Square D panel has two addresses: one for the L rail and one for the R rail. There are three possible MODBUS ports. (For E2 versions 2.81 and above, if multiple routes are defined, select which network the device is connected to.)

The addresses start at 232 (displayed under the **Node**/ **Board#** column in *Figure 2-8*) for the first panel ("master" panel) and 234 for the second panel ("slave" panel #1), 236 for the third panel ("slave" panel #2), up to a total of eight panels. One "master" and seven "slave" panels.

- 6. Locate the Square D breaker panels you set up, and look at each device's status in the **Status** field. You will see one of the following messages:
  - **Online** The Square D breaker panel is communicating normally.
  - Offline The Square D breaker panel is not communicating, has not been commissioned, is not functional, or is not powered up. Verify the Square D breaker panel is powered up, wired correctly, and has the proper network address, baud rate, and parity (see Section 4 Troubleshooting).
  - **No Port** No port is set up in the E2 Serial Configuration Manager to be a MODBUS port. Follow the instructions in *Section 2.3.1 Set Up Network Ports*.

Name	Туре	Network Addr	ess	Rev 🕻	Status
THIS.03.1	RX300-Refrig	Ethernet:	3	2.80A1	0 This Controlle
LONMARK_001	LonMark Device		2	0.00	
LONMARK_002	LonMark Device		3	0.00	
16AI_001	16AI	IONet:	1	0.00	No Port
8R0_001	8R0	IONet:	1	0.00	No Port
8D0_001	8D0	IONet:	1	0.00	No Port
460_001	460	IONet:	1	0.00	No Port
LEAK DETECT001	IRLDS	IONet:	1	0.00	No Port
CL RSC_001	CtrlLink RSC	(No Network):		0.00	Unknown
CL CD_001	CtrlLink CD	(No Network):		0.00	Unknown
CL ACC001	CtrlLink ACC	HODBUS-1:		0.00	Unknown
ISD2 COMP_001	ISD 2.0 Comp	MODBUS-1:		0.00	Unknown
PERF ALERT_001	Performance Alert	HODBUS-1:		0.00	linimoun
SQD BRKRPNL001	SqD Breaker Panel	HODBUS-1:	232	0.00	Offline
SQD BRKRPNL002	SqD Breaker Panel	MODBUS-1:	234	0.00	0ffiine
STATUS DSP_001	Status Display	Ethernet-1:	1	0.00	
STATUS DSP_002	Status Display	Ethernet-1:	2	0.00	
F1: DELETE RCRD	F2: STATUS	E	4: C	OMMISSI	NN F5: SETU

Figure 2-9 - Square D Status on Network Summary Screen

# 2.4 Square D Application Setup in E2: Single Breaker

### 2.4.1 Add a Lighting Schedule Application

For each group of breakers to be controlled separately, set up a Lighting Schedule application from the Add New Application screen.

Press the Main Menu, then:

- 1. 6 (Add/Delete Application)
- 2. (Add New Application)

Press **F4** - **LOOK UP** to select **Lighting Schedule**. Enter the number of desired applications in the "**How Many?**" field.

### 2.4.2 Light Outputs and Proof Inputs Setup

Once the Lighting Schedule applications have been added, set up the light output and proof input for each Lighting application. (Proof input setup may be optional.) The outputs of a Lighting Schedule cell control the breakers on the Square D breaker panels, and the proof inputs of the Lighting Schedule cell are the Square D panel breaker status outputs.

### 2.4.2.1 Light Outputs Setup - Outputs Tab

If on the E2 Home screen, press **F2** or **F3** to access the Lighting Schedule depending on whether a BX or CX E2 controller is being used.

 Under the Lighting Outputs tab, change the LIGHTS OUTPUT format by pressing 53 - EDIT and then 1. Alternate I/O Formats to Area Ctrl:Application:Property from the Board:Point format. 2. For the Area Ctrl property, use **F4** - **LOOK UP** to select the Square D breaker panel, for the Application property select lighting panel, and for the *Input* property select the breaker input number (**BREAKER\_IN\_X**).

Haint Ovr        Lightin        Area Ctrl        : CX 1        : CX 1        : : : :        : : : :        : : : :        : : : : :        : : : : :	C0: Inputs g Control: 30% Application SQD BRKRPNL001 : : : : : : : : : :	C9: Outputs LIGHTS Input BREAKER_IN_1	L L
Lightin Area Ctr1 : CX 1 :: : : : : : : : : : : : :	g Control: 30% Application SQD BRKRPNL001 : : : : : : :	Input BREAKER_IN_1	L
Area Ctrl : CX 1 :: : : : : : : : : : : : : : : : : :	Application SQD BRKRPNL001: : : : : : : : : : :	Input BREAKER_IN_1	L
	SQD BRKRPNL001 : : : : : : : : : : :	BREAKER_IN_1	L
			L
			L
: :			
ller   Liahts	outout		
	llow L Lights		llav I ljabte autaut

Figure 2-10 - Single Breaker Lighting Output Setup in E2 Lighting

### 2.4.2.2 Proof Inputs Setup - Setup Tab

To enable proofing, set **Enable Proofing** to **Yes** for each Lighting application under the **Setup** tab.

	62:	C3: Min On/Off	C4:	C5: Std Events
:	C7: Maint Ovr	C8: Inputs	C9: Outputs	CO: MORE
	Lighti	ng Control: 30%	LIGHTS	
Satur	112100			
Namo	• 98% LTCH1	e		
	ntrol: No	3		
Enable Pro	ofing Ves			
lise Ext Sc	hed No			
l leu/Lonic	Mode: LOGIC ON	v		
Alt Lt/Lac	Mode: LOGIC ONL	Y		
Schedif Mo	de : SCHED ONL	Y		
Alt Schdif	Mode: LLEV/LOGI	CONLY		
Schedule T	upe : MASTER			
Num Std Ev	ents: 1			
Num Date R	anges: Ø			
Show Sched	: Yes			
Show LLev	: No			
Show Logic	: Yes			
Enable Dim	ming : No			
K₩ Load	: 0			

Figure 2-11 - Enable Proofing on Setup Tab

If using a single Square D breaker, associate the proof input (**PROOF IN**) with the Square D panel (*Figure 2-12*) and status of the breaker number from the **More** tab in the Lighting application:

030 0011 A 10	Select CX Tabs	SETUP	FULL	*ALARI
C1: Setup	C2:	C3: Min On/Off	C4:	C5: Std Event
C6:	C7: Maint Ovr	C8: Inputs	C9: Outputs	C0: MORE
	Light	ing Control: 30%	LIGHTS	
Proof	Area Ctr	1 Application	Output	
Proof Typ	e : ON Only			
PROOF IN	: CX 1	:SQD BRKRPNL001:	BREAKER_1	
Proof Del	.ay : 0:00:30			
Proof Lat	ch : 0:00:00			
Clear Any	Match: No			
Pr Fail A	dv Pri: 20			

Figure 2-12 - Single Breaker Proof Input Setup in E2 Lighting

- Change the PROOF IN format by pressing **F3** EDIT and then **1. Alternate I/O Formats** to *Area* Ctrl:Application:Property from the Board:Point format.
- For the Area Ctrl property, use F4 LOOK UP to select the Square D breaker panel, for the Application property select lighting panel, and for the Output property select the breaker number (BREAKER\_X).

# 2.5 Square D Application Setup in E2: Multiple Breaker Grouping

NOTE

A Group can contain one or more breakers as defined by a user. Assigning multiple breakers to a group allows an entire group of breakers to be turned on or off simultaneously, instead of each individual breaker being turned on or off separately.

### 2.5.1 Setting Light Outputs

 To group multiple breakers to a single Lighting application, press F3 - EDIT and select 2. Set Multiple Outputs.

Setun	62:	C3: Min	On/Off C4:	C5: Std E	vents
	C7: Maint Ov	r C8: Inp	its C9: Outpu	ts C0: MORE	
	Lig	ting Contro	1: 70% LIGHTS		
Outputs	Area Ci	rl Applic	ation Input		
LIGHTS OUTP	UT : (M)	:(M)	:(M)	L	
PROOF STATU	s :				
ACTIVE SCHE	D :	-		L	
SCHED TUCOS	:	-			
SCHED ISCUS					
HLG STHIUS					

Figure 2-13 - Set Multiple Breakers in E2 Lighting

The Multiple Output Setup screen opens (*Figure 2-14*) where you can set up the **Area Ctrl, Application, and Property** Lighting outputs.

0-06-09 🔹 🧑			CX-400 Unit 1 SETUP	🖻 OAT: 83 ( Full	H: 59 18:54:5: *ALARM
		Mu	Itiple Output S	etup	
	Output:	CX 1	:70% LIGHTS	LIGHTS OUTPUT	
*	o	Area Utr	1 Application	Property	
Inputs Using	oucpuc:	6A 1 099 41	SUD BEREPALOO	1:BREAKER_IN_2	
		CA 1	200 BEKEPNL00	1.BREHKER_IN_D	
		CV 1	-SOD DEVERNING	1-DREAKEN_IN_10	
		CY 1	-SOD BRKAFHLOO	1.00CHKCN_111_12	
			1500 BIIKIII HE80		
Enter Board/C	ontrolle	r			
E1. AND RECOR	D F2. DF	LETE DOD			EE - CONCEL

Figure 2-14 - Multiple Output Setup View

For the Area Ctrl property, press F4 - LOOK UP to select the Square D breaker panel, for the Application property select lighting panel, and for the Property output select the breaker input number (BREAKER\_IN\_X). Repeat for each breaker you wish to group to this Lighting application.

### 2.5.2 Proof Inputs Setup for Multiple Breaker Grouping

Press F2 or F3 to access the Lighting Schedule from the Home screen depending on whether a BX or CX E2 controller is being used.

1. To enable proofing, set **Enable Proofing** to **Yes** for each Lighting application under the **Setup** tab.



Figure 2-15 - Enable Proofing on Setup Tab

When grouping multiple breakers to a Lighting application, add a Digital Combiner application for proofing inputs. (To add an application, follow the steps for adding an application in *Section 2.4.1 Add a Lighting Schedule Application*) Once added, go to the Digital Combiner application:

10-06-09 🔍 🤭 📖 Use Ctrl-X to Select CX Tabs	CX-400 Unit 1 SETUP	DAT: 83	OH: 59	18:58:39 *ALARM
C1: General C2: Comb Ins	C3: Ctrl Ins	C4: Outputs	65:	
Digital Co	mbiners: 70% LG	HT PROOF		
General Value Name :70% LGHT P Num Inputs : 5	ROOF			
Eng Units : ON-OFF Comb Method : <mark>AND</mark> ALT Comb Method: VOTE				
Emerg Out : OFF Output On Fail : OFF ENABLE : :	:			
Scroll using Next/Prev keys	Normal input co	mbination method	1	
	FOR FOLT	EL 1 000 UD		0.4110.51

Figure 2-16 - Digital Combiner For Input Proof Grouping

- 2. For grouping, set the combination method to **AND** under the **Comb Method** parameter in the General Setup and add a name that will associate the proof input group to the Lighting application.
- 3. Set the number of inputs to the number of breakers in the group.
- Under the Comb Ins tab, change the DIG INPUT1 format by pressing F3 EDIT and then 1. Alternate I/O

**Formats** to Controller: Application: Property from the Board: Point format.

5. For the *Controller* property, press **F4** - **LOOK UP** to select the Square D breaker panel, for the *Application* property select Lighting Panel, and for the *Inputs* property select the breaker numbers that are included in the group.

	Ctrl-X to S	elect	C	X Ta	abs		SETUP	F	ULL		*ALARM*
:1:	General	C2:	Co	лb	Ins	C3 :	Ctrl Ins	C4: Outpu	ts	C5:	
				Digi	ital (	Combi	ners: 70% L	GHT PROOF			
	Oash Inc			<b></b>				0			1
	DIC INDUT			nnes PV 4	L GUP	- 500	раточетон	- DDEOVED 2			
	DIG INFUTT			50 97 - 2		-500	DRKKFNL001	DDEAVED 6			
	DIG INPUTS			ex e		-500	BRKRPNI 881	BREAKER 8			
	DIG INPUTA			CX 1		- 500	BRKRPNI 881	BREAKER 10			
	DIG INPUTS		1	CX 1		-500	BRKRPNI AG1	BREAKER 12			
	ord rinors					1040	Dimini ne oo i				
Ent	er Board/Co	ntrol	10	r I	Digi	tal i	nputs				

Figure 2-17 - Grouping Inputs in Digital Combiner

6. Go back to the Lighting application under the **More** tab and associate the Lighting group (*Figure 2-18*) with the Digital Combiner application:

Use Ctrl-X to	Select	CX Tabs	SETUP	FULL	*ALARM*
C1: Setun	62:		C3: Min On/Off	64:	C5: Std Events
C6:	C7: I	laint Ovr	C8: Inputs	C9: Outputs	C0: MORE
		Lightir	g Control: 70%	LIGHTS	
Proof		Area Ctrl	Application	Output	
Proof Ty	,pe :	ON Only			
PROOF I	4 :	CX 1	70% LGHT PROOF:	DUTPUT	
Proof De	elay :	0:00:30			
Proof La	atch :	0:00:00			
Clear An	ny Match:	No			
Pr Fail	Adv Pri:	20			

Figure 2-18 - The Digital Combiner Used To Group Inputs

When using the Digital Combiner method above, the **Proof Type** must be set to **ON Only**.

- Under the More tab, change the PROOF IN format by pressing F3 EDIT and then 1. Alternate I/O Formats to Area Ctrl:Application:Property from the Board:Point format.
- 8. For the Area Ctrl property, press **F**<sup>4</sup> **LOOK UP** to select the E2 Name, for the Application property select the Digital Combiner that you created, and for the Output property select **OUTPUT**.

# 3 Square D Smart Breaker Gateway Board

### 3.1 Overview



Figure 3-1 - Square D Gateway Layout

The Copeland **Square D Smart Breaker Gateway Board** serves as an interface between the Copeland refrigeration and building controllers (REFLECS, Einstein, and E2) and the Square D Powerlink breaker panels. The Gateway Board connects to the Copeland controller via the RS485 I/O network (COM A & D on the REFLECS) and behaves identically to one 16AI input boards and two 8RO output boards, meaning any of the controller's lighting schedule applications may be used to control breakers on the Square D Powerlink panels by addressing them as output points.

The Gateway Board connects to up to four Square D Powerlink panels via a MODBUS network connection. Within the Gateway Board's software, breakers on the Powerlink panels can be grouped together so that one virtual output point can be used to control multiple breakers. Up to 16 groups of breakers can be created for up to four panels of 42 breakers each.

Proof states for each breaker on the network are passed to the Gateway Board, which are then combined based on the breaker groupings into a single digital proof value for the entire group. This combined proof state is fed back to the Copeland site controller via the board's "virtual 16AI points" for purposes of displaying and alarming.



Figure 3-2 - Square D Panel Layout

# 3.2 Mounting

The Square D Gateway is typically mounted in the same area as the Square D Breaker panels. The Gateway is designed to fit into a standard 3" snap track (supplied with the board) or may be mounted in a panel or on stand-offs. Follow the dimensions in *Figure 3-3* for panel mounting.



Figure 3-3 - Gateway Board Mounting Dimensions

### 3.2.1 Environmental Specifications

The Square D Gateway should be mounted in an environment with ambient temperature between -40°F and 150°F, with a non-condensing relative humidity between 5% and 95%.

### 3.2.2 Square D Breaker Panel Mounting

Refer to the documentation and diagrams supplied with your Square D breaker panel(s).

# 3.3 Power Wiring

### 3.3.1 Square D Smart Breaker Gateway

#### Table 3-1 - Gateway Power Requirements

Input Voltage	24VAC, Class 2, center-tapped, 50/60Hz
Power	5VA

The Square D Gateway requires 24VAC power from a Class 2 *center-tapped* transformer.

Copeland supplies several sizes of center-tapped transformers for powering multiple 16AIs, 8ROs, and other RS485 peripheral boards of the Einstein and REFLECS systems.

Refer to your controller's user manual for information on how to use the center-tapped transformers listed in *Table 3-2* to power multiple RS485 I/O devices.

*Figure 3-4* and *Figure 3-5* show how to connect the 56VA and 80VA transformers to the Square D Gateway power connector.

### Table 3-2-Power Ratings for Copeland Transformers

	Three-Board	Six-Board
P/N	640-0056	640-0080
Power Rating	56 VA	80 VA



Figure 3-4 - Pinout for the 56VA (640-0056) and 80VA (640-0080) Transformers



Figure 3-5 - Power Wiring on Square D Gateway

### 3.4 Networking

# 3.4.1 Wiring the Square D Gateway to a Site Controller (I/O Network)

Each Einstein or REFLECS site controller that will command a Square D Smart breaker panel must have a Square D Gateway installed on its RS485 I/O Network. For Einstein and E2 controllers, this means the Gateway will be installed on the I/O Network; for RMCC, BEC, BCU, and other REFLECS products, the Gateway will be installed on the COM A or COM D network.

### 3.4.1.1 Wire Connection

Using shielded two-conductor network cable (Belden #8761 or equivalent), connect the RS485 I/O Network wire to the three-terminal connector on the Gateway board as shown in *Figure 3-6*. For further information about how RS485 networks are configured, refer to your site controller's user manual.



Figure 3-6 - Connecting the Square D Gateway to the RS485 Network

### 3.4.1.2 Gateway Board I/O Network Addressing



The network dip switch on the Square D Gateway board does <u>not</u> set the board number. Board numbering must be done with a Hand-Held Terminal.

A Square D Gateway board behaves on the network as if it were one (1) 16AI board and two (2) 8RO boards. Though the Gateway board has a set of dip switches on it labeled "Network Switch," this switch is not used to set the board numbering. Board numbering must be done in the Gateway's software using a Hand-Held Terminal.

With the Gateway board powered up, plug a HHT in the board's HHT jack. When the screen titled "SQUARED-GW" appears, press the down arrow key once to access the HHT screen used to set up network addressing.



Press the RIGHT arrow key to make the cursor appear, and enter the address of the virtual 16AI board this Gateway will represent.

Press the down arrow key to move the cursor to the 8RO ADDR field. The number you enter in this field will determine the address of the two virtual 8RO boards. One board will use the address you enter, and the second will be the next address number in the sequence. For example, setting this field to 4 will cause the two virtual 8RO boards to be numbered 4 and 5.

### 3.4.1.3 Setting the Baud Rate Dip Switches

Dip switches 6 and 7 control the baud rate at which the Square D Gateway communicates with the site controller on the RS485 Network. These switches must be set to the same baud rate setting as the Einstein or REFLECS (usually 9600 baud).

The MODBUS baud rate used by the Gateway board to communicate with the Square D panels is fixed at 19200 baud, since this is the only baud rate used by this device.



Figure 3-7 - Dip Switch Setting for Square D Gateway Baud Rate

# 3.4.1.4 Setting the RS485 I/O Termination Jumpers

As part of a site controller's RS485 I/O (COM A or COM D) Network, a Gateway must be terminated if it is the end device of a daisy chain. Refer to the site controller's user manual for information about daisy chain networks and how they are terminated.

To terminate the Gateway, set the I/O Network Jumpers to the RIGHT position as shown in *Figure 3-8*. To unterminate the Gateway, set the jumpers to the LEFT position.



Figure 3-8 - Square D Gateway RS485 I/O Network Termination

### 3.4.2 Gateway with Square D Panel

Connection between the Gateway and the Square D Panel(s) is achieved through the MODBUS network connector at the top right of the Gateway board and the network connectors on the Square D panels.

### 3.4.2.1 MODBUS Network Termination



Figure 3-9 - Square D Gateway MODBUS Network Termination

Like the RS485 I/O network, the two end devices on the MODBUS network must be terminated. Typically, one of the end devices will be the Gateway board and the other a master or slave panel.

*Figure 3-9* shows the location of the MODBUS termination jumpers on the Gateway board. Non-Gateway E2 Software Setup (Direct Connection to E2).

# 3.5 Site Controller Software Setup -Gateway Board

### 3.5.1 REFLECS

Each group set up in the Gateway has its own virtual 8RO and 16AI point command of the relay and proof feedback (respectively). Refer to your REFLECS controller's manual for set up instructions.

### 3.5.2 E2 and Einstein

### 3.5.2.1 Board and Application Setup

Set up the number of boards (one 16AI and two 8ROs) on the I/O Network from the Connected I/O screen. Press the Wey to open the Main Menu and press:

1. <sup>7</sup> (System Configuration)

- 2. **Network Setup**)
- 3. (Connected I/O Boards and Controllers)

If using an Einstein controller, from the Main Status/Home screen, press (Actions), Network Status/Setup, and then Connected I/O Boards & Controllers.

05-25-07 🔹 🧑 💷	BX-300 Unit 1 🖻 CONNECTED I/O	6:21:1
1 Unit Number	THIS.01.1 Unit Name	
_I/O Net Devices		
Num Ctrl Type	Num Ctrl Type	
1 16AI	0 ARTC/RTU	
_ 2 8R0	0 MultiFlex RCB	
8 8D0		
0 4AO		
0 IRLDS		
ECT Devices		
Echelon Devices		
Ø RT100-Roof Top		
Ø Echelon 16AI		
0 Echelon 8R0		
Enter 0 to 32   Enter de	sired number of these controllers	



Add one 16AI and two 8RO boards on this screen, and press to save and exit.

### 3.5.2.2 Adding Lighting Schedule Applications

For each group of breakers to be controlled separately, set up a Lighting Schedule application from the Add New Application screen.

Press the Main Menu, then:

- 1. (Add/Delete Application)
- 2. (Add New Application)
- 3. **F4 LOOK UP** to select **Lighting Schedule**. Enter the number of desired applications in the "**How Many?**" field.

If using an Einstein controller, from the Home screen or Enhanced Lighting Status screen, press (Actions),

# (Control Appl Setup), and then (Add Control

Application). Press (Look Up) to select Enhanced

Lighting. Press (Home) to return to the Home screen.

# NOTE

**TRY THIS:** When creating a name for your Lighting application, incorporate the application's corresponding group number into the name. For example, PARKLIGHTS01 associates the parking lot breakers with Group 1.

### 3.5.2.3 Proof Inputs and Light Outputs Setup

Once the Lighting Schedule applications have been added, set up the proof inputs and light outputs for each Lighting application. The outputs of a Lighting Schedule cell control the breakers on the Square D panels, and the inputs are the combined proofs of all the breakers that are part of the group being controlled by the application.

### **Proof Inputs Setup**

Set up 16AI board inputs in Proof Setup. To enable proofing, set Enable Proofing to Yes for each Lighting application by accessing the Lighting Control Setup screen. From the Main Menu:

- 1. Press **F3** (Lighting Sched) and select the a Lighting application.
- 2. **F5** (Setup) to go the Setup screen for that Lighting application.

If using an Einstein controller, from the Home screen or **Enhanced Lighting Status** screen, press (Actions), (Setup), and choose the S1:Setup tab. (Note that the Proof tab is S8 and the **Outputs** tab is S9).

Go:  C7: Haint Our  C8: Inputs  C9: Outputs  C9: Outputs    Go:  C7: Haint Our  C8: Inputs  C9: Outputs  C0:    Lighting Control:  30% LIGHTS    Name  :30% LIGHTS    Use Alt Control:  NO    Enable Proofing:  Yes    Use Ext Sched :  NO    Llev/Logic Hode:  LOGIC ONLY    Alt Lt/Lg: Hode:  LOGIC ONLY    Alt Schdif Hode:  SCHED ONLY    Schedig Type:  TWASTER	MORE
Lighting Control: 30% LIGHTS Setup Ualue Name : 30% LIGHTS Use Alt Control: No Enable Proofing: Use Use Ext Sched : No Llev/Logic Hode: LOGIC ONLY Alt Lt/Lg: Hode: LOGIC ONLY Alt Schedif Hode: SLEUVLOGIC ONLY Schedulf Tyde : MSTER Schedulf Uye : MSTER	
Setup Ualue Name : 30% LIGHTS Use Alt Control: No Enable Proofing: VS Use Ext Sched : No Liev/Logic Hode : LOBIC ONLY Alt Lt/Lge Hode : LOBIC ONLY Schedif Hode : SLEUDURY Att Schedif Hode : LEU/LOBIC ONLY Schedule Type : HASTER	
Setup Value Name 30% LIGHTS Use Alt Control: No Enable Proofing: Veg Use Ext Sched : No Llev/Logic Hode: LOGIC DNLY Alt Lt/lgc Hode : LOGIC DNLY Schedif Mode : SLEV/LOGIC DNLY Alt Schdif Mode : LEV/LOGIC DNLY Schedule Type : HMSTER	
Name : 30% LIGHIS Use Ait Control: No Enable Proofing: Vos Use Ext Sched : No Llev/Logic Hode: LOGIC ONLY Ait Lt/Lgc Hode : LOGIC ONLY Schedif Hode : SCHED ONLY Alt Schdif Hode : LEU/LOGIC ONLY Schedule Type : HMSTER	
USE ALT CONTYOL: NO Enable Proving: Yes USE Ext Sched : No Llev/Logic Hode: LOGIC ONLY Alt Ll/Lg Hode : LOGIC ONLY Schedif Hode : Sched DNLY Alt Schdif Hode : LLEV/LOGIC ONLY Schedule Type : HMSTER	
Enable Probling: Ves Use Ext Sched : No Llev/Logic Mode: LOBIC ONLY Aft Lf/Lge Mode: LOBIC ONLY Schedif Mode : SCHED ONLY Alt Schdif Mode: LLEV/LOBIC ONLY Schedule Type : MASTER	
USE EXT SCHEOT : MO Llev/Logic Mode: LUBIC ONLY Alt Lt/Lgc Mode: LUBIC ONLY Schedif Mode : SCHEO ONLY Alt Schdif Mode : LLEV/LOBIC ONLY Schedule Type : MBSTER	
Llev/Logic Hode: Losic UNLY Alt Ll/Lgc Hode: Losic DNLY Schedif Hode : SCHED UNLY Alt Schdif Hode: LLEV/LGGIC UNLY Schedule Type : HASIER	
NICLEVLGCHODE:LUGICUNKY Schedif Mode : SCHED ONLY Alt Schdif Hode:LLEV/LOGIC ONLY Schedule Type : HASTER	
Alt Schdif Hode: LLEV/LOGIC ONLY Schedule Type : MASTER	
Schedule Type : MASTER	
scheddre type : hinsten	
Num Std Eugente • 1	
Num Date Ranges: Ø	
Show Sched : Yes	
Show LLev : No	
Show Logic : Yes	
Enable Dimming : No	
KW Load : Ø	

Figure 3-11 - Setup Lighting Control

- Under the C1: Setup tab, set Enable Proofing to Yes.
  (C8:Proof tab becomes visible once you cursor across the tabs. See Figure 3-12.)
- 4. Press **F2** (Next Tab) or **F1** (Prev Tab) to cursor over to **C8:Proof** tab.

10-09-09 • (39)	Mart CY Tabe	CX-400 Unit 1	OAT: 82	OH: 59 14:2
Cd. Satur			1 OLL	
ca: secup	CZ: Maint Our	C8: Inputs	CQ: Outputs	CO: SLU EC
	Lightin	ng Control: 30%	LIGHTS	OUT HOME
Proof		Board	Point	
Proof Typ	e : ON Only			
PROOF IN				
Proof Del	ay : 0:02:00			
Proof Lat	ch : 0:00:00			
Clear Any	Match: No			
Pr Fail A	dv Pri: 20			
Enter Point/A	pplication   Proo	F input		
		EQ EDIT		55 0411



5. Set **Proof Type** to **ON Only**. If the light circuit is read as open when it should normally be closed, the 16AI board will send a "fail" input relay to the controller. The Gateway proofs both ON and OFF so that the user can select the desired proof type as **ALL Values**, **ON Only**, or **OFF Only**. If any breaker within a group fails the proof, the entire group will fail the proof.

- 6. In the **PROOF IN** input, enter the virtual board and point address of the proof input on the gateway for the lighting group.
- 7. Set **Proof Delay** to a minimum of two minutes. (0:02:00)
- 8. Press **F2** (Next Tab) or **F1** (Prev Tab) to cursor over to **C9: Outputs** tab.



If a breaker is assigned to a group that is not set up, a proof failure message will occur.

### Light Outputs Setup

The Lighting Outputs Setup screen is where you will set up the 8RO board and point numbers for each group for all Lighting applications.

Refer to *Table 5-3* to associate the inputs and outputs with their corresponding group, board and point numbers.



Figure 3-13 - Lighting Outputs Setup Screen

For more information on setting up Lighting Schedules, refer to Section 9.7, Lighting Schedules in the E2 RX Refrigeration and BX HVAC I&O Manual.

# 3.6 Software Setup

### 3.6.1 Smart Breaker Gateway (HHT)

Connect the HHT to the Gateway board via the HHT jack (refer to *Figure 3-1*). Use the HHT to assign individual breakers to a particular group.

### Table 3-3 - 8RO Mapping

HHT Keys	Function
F1	Home screen key
F2	Quick access to status information
<b>~</b> >	Left and right arrow keys point to the desired field to be configured
↓	Up and down arrow keys scroll through all breakers on panel screens
Cancel	Deletes number you have chosen and changes it to zero, and cancels overrides on selected field
Enter	Saves changes (optional - use the DOWN arrow)
-	Toggles between override ON and OFF
•	Toggles between override ON and OFF

### 3.6.1.1 HHT Screens

The Home screen is the first screen that appears. Press  ${\bf F1}$  at any time to return to the Home screen:

SQUARED GW	
810-3721	
VER: 1. 10B05	
$(PRESS \downarrow)$	

Figure 3-14 - Home Screen

Press the **DOWN** arrow key to move to the Starting Board Addresses screen.



Figure 3-15 - Starting Board Addresses Screen

The Gateway emulates one 16AI and two 8ROs on the I/O Network. Set the 16AI and 8RO addresses using the left or right arrow keys to activate the corresponding fields, and number the boards accordingly. The 16AI address should be the first unused board number with a valid range of 1-16. The 8RO should be the next available 8RO I/O Network address with a valid range of 1-31.

For example, if you currently have three 16Als and six 8ROs, set the 16Al address to 4 and the 8RO address to 7. If you add a 16Al and 8RO after the Gateway, set their addresses as follows: 16Al to 5 and the 8RO to 9.

Next, arrow down to the Option screen:

OPTI C	N: 3	
1= S	STATUS	
2= D	NAGS	
3= C	XONFI G	

Figure 3-16 - Option Screen

#### Table 3-4 - Option Choices Chart

Option No.	Function
1	Status information that can be overridden. (An asterisk "*" signifies a proof failure)
2	Diagnostics for troubleshooting
3	Configuration settings

### 3.6.1.2 Configuration

Use the left or right arrows to activate the **OPTION:** field and choose the desired option number. (Select **3** to start configuring each Panel's breakers to groups.) Press the down arrow to move to the next screen.

	PANE	L 1	
BRK	1	GRP	1
BRK	2	GRP	1
BRK	3	GRP	1

Figure 3-17 - Panel 1 Breakers to Group Screen

From this screen you can begin assigning breakers on panels 1 through 4 to breaker groups. Refer to

*Figure 1-1* for a diagram of the Square D Powerlink panel and the numbered breaker addresses.



The address numbers of the Square D panels <u>do not</u> correspond to what the HHT Gateway interface calls "panel numbers." The master panel is referred to in the HHT interface as "Panel #1," even though its network address is zero. Also, the panels addressed #1, #2, and #3 are referred to in the interface as Panel #2, Panel #3, and Panel #4 respectively.

Use the left and right arrow keys to configure the breaker's group number. Change the group number to the group you want to associate the breaker with (a maximum number of 16).

A group number field becomes active when you see the arrow appear next to the number. Use the down arrow key to scroll through all 42 breakers on each of the four panels and set the group numbers as you scroll through the breakers.

NOTE

If a breaker is assigned to a group that is not set up, a proof failure message will occur.

### 3.6.1.3 Status

From the Option screen, select **1** for Status. The Status screen shows the status of the 16 groups and shows the ON or OFF state of each group and any proof failures (a proof failure is indicated by "\*" after the ON or OFF state). Press the down arrow key to scroll through the groups. After the groups are displayed, continue pressing the **DOWN** arrow key to see the ON or OFF state and any proof failures of each of the 42 breakers and all panels.

If a group is not assigned or set to zero, a "-" will appear as the breaker status.

OPTION: 1	
1= STATUS	
2= DI AGS	
3= CONFIG	

Figure 3-18 - Option Screen

# 4 Troubleshooting

### Troubleshooting Square D Breaker Panels and the MODBUS Network

Problem: Square D Breaker Panel Offline

- 1. **Check Wiring** Verify the Square D breaker panel is properly connected to the MODBUS cable. Verify the network polarity is correct (MODBUS 485+ to Square D terminal B, MODBUS 485- to Square D terminal A, MODBUS shield to terminal -) and there are no loose wires. If none of the Square D breaker panels are online, check wiring connections on the E2. Check the cable jackets to make sure all network cable is Belden #8761 or equivalent.
- 2. Verify MODBUS Port Setup Press + O on the E2 front panel. Verify COM2, COM4, or COM6 is set up as a MODBUS port. If so, verify that the MODBUS cable is connected to the proper connectors. Verify the COM port fields (*Figure 2-5*) are properly set for ECT MODBUS (19.2k baud, data size=8 bits, Parity=NONE, stop bits=1).
- 3. Check Square D Breaker Panel Slave Address Selector Numbering Verify that the slave selector matches the "address selector" parameter under the Devices tab in E2.
- 4. Verify Slave Bus Interconnect Cable For panels with both L and R rails, verify the slave bus interconnect cable is connected to one end to the L and the other to the R. Both ends of the cable are connected to both the L and R rails.
- 5. Verify 4 Conductor Wiring Between The Master Panel And Slave Panels Verify the B A + polarity is consistent from master to slave panels, and the max length does not exceed 400 ft (100 feet for 220V panels).
- 6. Check Network Termination The two devices on either end of the MODBUS network should be terminated, with all other devices in the daisy chain unterminated. Check jumper settings for all devices on the network.

# 5 Worksheets

# 5.1 Breaker Group Assignment

Use the workspace below to assign breakers to groups. If using the Gateway board, refer to *Table 5-3* for group number board and point assignment.

Table 5-1 - Assign Breakers to	<b>Group Numbers</b>
--------------------------------	----------------------

F	Panel 1 B	reakers		I	Panel 2 E	Breakers		Panel 3 Breakers			Panel 4 Breakers				
Grou	up#	Grou	nb#	Gro	up#	Grou	nb#	Grou	nb#	Grou	nb#	Gro	up#	Grou	up#
1		22		1		22		1		22		1		22	
2		23		2		23		2		23		2		23	
3		24		3		24		3		24		3		24	
4		25		4		25		4		25		4		25	
5		26		5		26		5		26		5		26	
6		27		6		27		6		27		6		27	
7		28		7		28		7		28		7		28	
8		29		8		29		8		29		8		29	
9		30		9		30		9		30		9		30	
10		31		10		31		10		31		10		31	
11		32		11		32		11		32		11		32	
12		33		12		33		12		33		12		33	
13		34		13		34		13		34		13		34	
14		35		14		35		14		35		14		35	
15		36		15		36		15		36		15		36	
16		37		16		37		16		37		16		37	
17		38		17		38		17		38		17		38	
18		39		18		39		18		39		18		39	
19		40		19		40		19		40		19		40	
20		41		20		41		20		41		20		41	
21		42		21		42		21		42		21		42	

# 5.2 Gateway Board Group to Point Number Calculation

This worksheet is for mapping breaker group numbers to board and points (**Bd**:**Pt**). Up to a maximum of 16 groups can be set up, but an unlimited amount of breakers can be assigned to any given group.

*Table 5-2* shows the correlation between the group numbers and the virtual 16AI and 8RO points of the Gateway. Y represents the 16AI address and X represents the 8RO address of the Gateway configured in Section 3.6.1.1 HHT Screens as shown in *Figure 3-15*.

Light Schedule	Proof In (Bd)	Proof In (Pt)	Lights Output (Bd)	Lights Output (Pt)
Group	16Al Addr	16AI Points	8RO Addr	8RO Points
1	Y	1	X	1
2	Y	2	X	2
3	Y	3	X	3
4	Y	4	X	4
5	Y	5	X	5
6	Y	6	X	6
7	Y	7	X	7
8	Y	8	X	8
9	Y	9	X+1	1
10	Y	10	X+1	2
11	Y	11	X+1	3
12	Y	12	X+1	4
13	Y	13	X+1	5
14	Y	14	X+1	6
15	Y	15	X+1	7
16	Y	16	X+1	8

### Table 5-2 - Mapping Group Numbers to Point Numbers

# 5.3 Gateway Board Group to Point Number Mapping

**16AI Address =** \_\_\_\_\_ Fill in the Gateway 16AI board address that you set with the HHT.

8RO Address = \_\_\_\_Fill in the Gateway 8RO board address that you set with the HHT for Groups 1-8. For Groups 9-16, use the next consecutive 8RO board address (add 1).

Table 5-3 - Mapping Group Numbers to Point Numbers

Light Schedule	Proof In (Bd)	Proof In (Pt)	Lights Output (Bd)	Lights Output (Pt)	Group Name
Group	16AI Addr	16AI Points	8RO Addr	8RO Points	
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	
6		6		6	
7		7		7	
8		8		8	
9		9		1	
10		10		2	
11		11		3	
12		12		4	
13		13		5	
14		14		6	
15		15		7	
16		16		8	

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