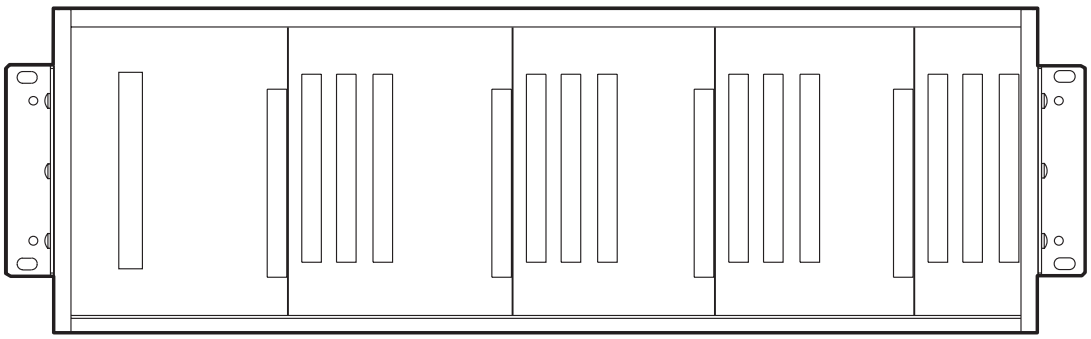
PG-FLEX 23" CENTRAL OFFICE TERMINAL SHELF

Model	List Number	Part Number	CLEI Code
FCS-719	4	150-1319-04	VAMCEE0ARA



PAIRGAIN TECHNOLOGIES, INC.
ENGINEERING SERVICES TECHNICAL PRACTICE
SECTION 363-719-104-02

Revision History of this practice.
Revision 02— June 2, 1997
A) Correct wire-wrap pin dimensions

PAIRGAIN
THE COPPEROPTICS COMPANY

TABLE OF CONTENTS

USING THIS TECHNICAL PRACTICE

Three types of messages, identified by icons, appear in the text:

A note informs you of special circumstances.

A caution indicates the possibility of equipment damage.

A warning indicates the possibility of personal injury.

A. PRODUCT OVERVIEW

1. Description and Features

1.1 The PairGain® PG-Flex™ FCS-719 List 4 23-inch Central Office Terminal (COT) Shelf (Figure 1) supports:

- one alarm unit or PGTC Interface unit common to all systems in the shelf
- four PG-Flex subscriber carrier systems where each system comprises one Line Unit and one to three Channel Units (for a shelf maximum of four line units and 12 channel units)

Additionally, the shelf provides termination points for alarms, power, metallic bypass pair, auxiliary power pairs when using a doubler, and subscriber circuits (located on the backplane at the rear of the shelf). The List 4 COT shelf provides cable adapters with 25-pair Amphenol connector terminations for the subscriber circuits.

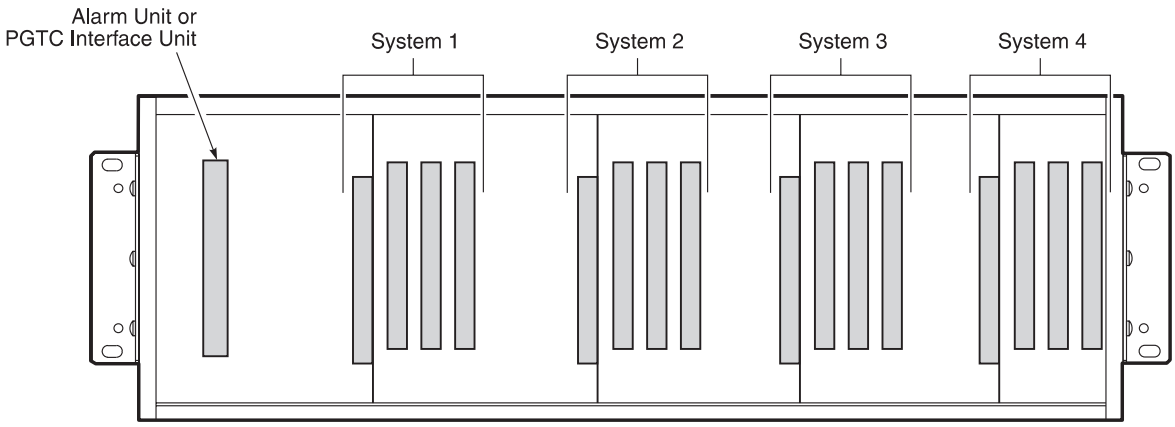


Figure 1. *FCS-719 COT Shelf*

Use the List 4 FCS-719 COT 23-inch Shelf only with a List 4x (or higher) FRE-765 Remote Terminal Enclosure.

1.2 Features of the PG-Flex FCS-719 COT Shelf are:

- universal mounting brackets for installation into a 23-inch equipment rack
- wire-wrap connections for HDSL, alarms, metallic bypass pairs, and auxiliary power pairs when using a doubler
- screw terminal connections for frame ground and Central Office (CO) battery
- DB-25 connector for Network Management Analysis (NMA) communications
- 25-pair Amphenol cable adapters for connection to CO lines
- 25-pair Amphenol connector for PGTC test interface

2. Specifications

Electrical Characteristics

Power ..... -48 Vdc CO battery

Environmental

Operating Temperature ..... -40° F to +150° F (-40° C to +65° C)

Operating Humidity ..... 5% to 95% (non-condensing)

Operating Elevation ..... -200 feet to 13,000 feet (-60 m to 4,000 m)

Physical

Dimensions

Height ..... 07.00 in. (17.8 cm)

Width ..... 23.00 in. (58.4 cm)

Depth ..... 11.75 in. (29.9 cm)

Weight ..... 15.00 lb. (06.8 kg)

B. FUNCTIONAL DESCRIPTION

3. Operational Capabilities

3.1 Each system (one Line Unit and one to three Channel Units) can support up to 24 subscriber channels. Each Channel Unit can provide four (4) or eight (8) channels, depending on the service offered. Services offered are:

- Plain Old Telephone Service (POTS)
- Integrated Services Digital Network (ISDN)

A label on the FCS-719 shelf indicates numbering for the Line and Channel Units. When the Line Units are a List 1 or 2, black numbers indicate sequential Channel Unit numbering 1 through 12. When the Line Units are List 3 or higher, blue numbers indicate Channel Unit numbering 1 through 3 for each of the four systems.

3.2 Tables 1 and 2 show how to utilize channels, dependent on the Channel Unit (four or eight channels) and the type of subscriber service (POTS or ISDN) selected.

Table 1. *COT Shelf Circuit Utilization*

Channel Unit	Channel Unit Service Configurations			
	4-Channel POTS	8-Channel POTS	4-Channel ISDN	4-Channel DDS
T/R 1	Ckt 1	Ckt 1	Ckt 1	Ckt 1 Tx
T/R 2	Ckt 2	Ckt 2	Ckt 2	Ckt 1 Rcv
T/R 3	Ckt 3	Ckt 3	Ckt 3	Ckt 2 Tx
T/R 4	Ckt 4	Ckt 4	Ckt 4	Ckt 2 Rcv
T/R 5	—	Ckt 5	—	Ckt 3 Tx
T/R 6	—	Ckt 6	—	Ckt 3 Rcv
T/R 7	—	Ckt 7	—	Ckt 4 Tx
T/R 8	—	Ckt 8	—	Ckt 4 Rcv

Table 2. *Channel Unit Circuit Utilization*

System 1			System 2			System 3			System 4		
CU 1 (CU 1)	CU 2 (CU 2)	CU 3 (CU 3)	CU 4 (CU 1)	CU 5 (CU 2)	CU 6 (CU 3)	CU 7 (CU 1)	CU 8 (CU 2)	CU 9 (CU 3)	CU 10 (CU 1)	CU 11 (CU 2)	CU 12 (CU 3)
ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1	ckt 1
ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2	ckt 2
ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3	ckt 3
ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4	ckt 4
ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5	ckt 5
ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6	ckt 6
ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7	ckt 7
ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8	ckt 8

Channel Unit numbers shown on top are for a List 1 or 2 Line Unit. CU numbers shown on bottom in parentheses are for a List 3 or higher Line Unit. CU is a Channel Unit.

4. Backplane Connections

4.1 Section 4.2 provides the connector pinouts located on the backplane for the Alarm or PGTC Interface Unit, Line Unit, and Channel Unit connectors.

Section 4.3 provides connectors and termination points located on the backplane for:

- CO power (TB1) and CO battery return (TB2)
- frame ground
- Local Area Network (LAN)
- data
- HDSL, test, composite clock, auxiliary power pairs, and external ACO (alarm cutoff) switch
- alarm or PGTC test interface
- subscriber lines

4.2 Table 3 lists the FCS-719 connectors (Figure 1) and where each is described in this practice.

Table 3. *FCS-719 List 4 Card Connectors*

Connector/Fuse	Go to Table	On page(s)
Alarm Unit or PGTC Interface Unit	4	5
Line Unit Connectors (Systems 1 through 4)	5	6
Channel Unit Connectors (System 1 through 4)	6	7 and 8

Use the Information in tables 4 through 6 for diagnostic and troubleshooting procedures under the direction of an authorized PairGain technical support representative.

Table 4. *Alarm Unit or PGTC Interface Unit Connector*

J1-C Pin	J1-C Signal	J1-B Pin	J1-B Signal	J1-A Pin	J1-A Signal
1	LAN	1	LGND (CDS)	1	LGND (CDS)
2	N/C	2	INHIBIT	2	N/C
3	PGTC_TIP1	3	SLEEVE1	3	TESTIN-T_1
4	PGTC_RING1	4	SLEEVE2	4	TESTIN-R_1
5	PGTC_TIP2	5	SLEEVE3	5	TESTIN-T_2
6	PGTC_RING2	6	SLEEVE4	6	TESTIN-R_2
7	PGTC_TIP3	7	OH1	7	TESTIN-T_3
8	PGTC_RING3	8	OH2	8	TESTIN-R_3
9	PGTC_TIP4	9	OH3	9	TESTOUT-T_1
10	PGTC_RING4	10	OH4	10	TESTOUT-R_1
11	N/C (BURN-IN)	11	PROCEED1	11	TESTOUT-T_2
12	LOCK1	12	PROCEED2	12	TESTOUT-R_2
13	LOCK2	13	PROCEED3	13	TESTOUT-T_3
14	LOCK3	14	PROCEED4	14	TESTOUT-R_3
15	LOCK4	15	SEIZE	15	TESTOUT-T_4
16	TMAJ	16	SEZBY	16	TESTOUT-R_4
17	+5_2	17	TSTALM	17	+5_1
18	NMA_TX	18	NMA_RX	18	NMA_DTR
19	NMA_DSR	19	NMA_TCLK	19	NMA_RCLK
20	NMA_BUS_1	20	NMA_BUS_2	20	TESTIN-T_4
21	NMA_BUS_3	21	NMA_BUS_4	21	TESTIN-R_4
22	CC1TIP	22	CC1RING	22	EXT_ACO
23	CC2TIP	23	CC2RING	23	8KHZ_CC
24	SHELF_ID_NO	24	SHELF_ID_COM	24	SHELF_ID_NC
25	MAJ_AUD_NO	25	MAJ_AUD_COM	25	MAJ_AUD_NC
26	MAJ_VIS_NO	26	MAJ_VIS_COM	26	MAJ_VIS_NC
27	MIN_AUD_NO	27	MIN_AUD_COM	27	MIN_AUD_NC
28	MIN_VIS_NO	28	MIN_VIS_COM	28	MIN_VIS_NC
29	FUSEALARM	29	MAJORALARM	29	MINORALARM
30	BATTERY-	30	BATTERY-	30	BATTERY-
31	BATTERY+	31	BATTERY+	31	BATTERY+
32	PROTGND	32	GND	32	GND

Table 5. *Line Units Connector*

System	Line Unit	Connector
1	**1**	**J2**
2	**2**	**J7**
3	**3**	**J12**
4	**4**	**J17**

Pin	Signal*	Pin	Signal*
1	PROTGND	2	PROTGND
3	N/C	4	N/C
5	HDSLTIP1EX_***n***	6	HDSLTIP2EX_***n***
7	HDSLRING1EX_***n***	8	HDSLRING2EX_***n***
9	N/C	10	N/C
11	BATTERY+	12	BATTERY+
13	-48_***n***	14	-48_***n***
15	BATTERY-	16	BATTERY-
17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC_***n***	20	TSIG_***n***
21	TCLK_***n***	22	TSER_***n***
23	GND	24	RSYNC_***n***
25	RSIG_***n***	26	RCLK_***n***
27	RSER_***n***	28	GND
29	SDA_***n***	30	CSYNC_***n***
31	FUSEALARM	32	SCL_***n***
33	+5_***n***	34	+5_***n***
35	GND	36	GND
37	-5_***n***	38	-5_***n***
39	NMA_BUS_***n***	40	CID3
41	CID2	42	CID1
43	MAJORALARM	44	MINORALARM
45	TESTIN-T_***n***	46	TESTIN-R_***n***
47	TESTOUT-T_***n***	48	TESTOUT-R_***n***
49	N/C	50	N/C
51	BYPASS-T_***n***	52	BYPASS-R_***n***
53	HDSLTIP1_***n***	54	HDSLTIP2_***n***
55	HDSLRING1_***n***	56	HDSLRING2_***n***
57	N/C	58	N/C
59	PROTGND	60	PROTGND

* Where ***n*** is 1, 2, 3, or 4 for Systems 1, 2, 3, or 4, respectively.

Table 6. *Channel Unit Connectors*

System	Channel Unit	Connector
1	1	J3
2	4	J8
3	7	J13
4	10	J18

System	Channel Unit	Connector
1	2	J4
2	5	J9
3	8	J14
4	11	J19

Pin	Signal*	Pin	Signal*	Pin	Signal*	Pin	Signal*
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIPEX01_***n***	4	RINGEX01_***n***	3	TIPEX05_***n***	4	RINGEX05_***n***
5	TIPEX02_***n***	6	RINGEX02_***n***	5	TIPEX06_***n***	6	RINGEX06_***n***
7	TIPEX03_***n***	8	RINGEX03_***n***	7	TIPEX07_***n***	8	RINGEX07_***n***
9	TIPEX04_***n***	10	RINGEX04_***n***	9	TIPEX08_***n***	10	RINGEX08_***n***
11	BATTERY+	12	BATTERY+	11	BATTERY+	12	BATTERY+
13	-48_***n***	14	-48_***n***	13	-48_***n***	14	-48_***n***
15	BATTERY-	16	BATTERY-	15	BATTERY-	16	BATTERY-
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC_***n***	20	TSIG_***n***	19	TSYNC_***n***	20	TSIG_***n***
21	TCLK_***n***	22	TSER_***n***	21	TCLK_***n***	22	TSER_***n***
23	GND	24	RSYNC_***n***	23	GND	24	RSYNC_***n***
25	RSIG_***n***	26	RCLK_***n***	25	RSIG_***n***	26	RCLK_***n***
27	RSER_***n***	28	GND	27	RSER_***n***	28	GND
29	SDA_***n***	30	CSYNC_***n***	29	SDA_***n***	30	CSYNC_***n***
31	N/C	32	SCL_***n***	31	N/C	32	SCL_***n***
33	+5_1	34	+5_1	33	+5_1	34	+5_1
35	GND	36	GND	35	GND	36	GND
37	-5_1	38	-5_1	37	-5_1	38	-5_1
39	N/C	40	GND	39	N/C	40	GND
41	GND	42	GND	41	GND	42	GND
43	GND	44	N/C	43	GND	44	N/C
45	TESTIN-T_***n***	46	TESTIN-R_***n***	45	TESTIN-T_***n***	46	TESTIN-R_***n***
47	GND	48	GND	47	GND	48	GND
49	TESTOUT-T_***n***	50	TESTOUT-R_***n***	49	TESTOUT-T_***n***	50	TESTOUT-R_***n***
51	TIP01_***n***	52	RING01_***n***	51	TIP05_***n***	52	RING05_***n***
53	TIP02_***n***	54	RING02_***n***	53	TIP06_***n***	54	RING06_***n***
55	TIP03_***n***	56	RING03_***n***	55	TIP07_***n***	56	RING07_***n***
57	TIP04_***n***	58	RING04_***n***	57	TIP08_***n***	58	RING08_***n***
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

***** Where ***n*** is 1 on System 1, 2 on System 2, 3 on System 3, and 4 on System 4.

(continued on next page)

Table 6. *Channel Unit Connectors (continued)*

System	Channel Unit	Connector
1	3	J5
2	6	J10
3	9	J15
4	12	J20

Pin	Signal*	Pin	Signal*
1	PROTGND	2	PROTGND
3	TIPEX09_***n***	4	RINGEX09_***n***
5	TIPEX10_***n***	6	RINGEX10_***n***
7	TIPEX11_***n***	8	RINGEX11_***n***
9	TIPEX12_***n***	10	RINGEX12_***n***
11	BATTERY+	12	BATTERY+
13	-48_***n***	14	-48_***n***
15	BATTERY-	16	BATTERY-
17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC_***n***	20	TSIG_***n***
21	TCLK_***n***	22	TSER_***n***
23	GND	24	RSYNC_***n***
25	RSIG_***n***	26	RCLK_***n***
27	RSER_***n***	28	GND
29	SDA_***n***	30	CSYNC_***n***
31	N/C	32	SCL_***n***
33	+5_1	34	+5_1
35	GND	36	GND
37	-5_1	38	-5_1
39	N/C	40	GND
41	GND	42	GND
43	GND	44	N/C
45	TESTIN-T_***n***	46	TESTIN-R_***n***
47	GND	48	GND
49	TESTOUT-T_***n***	50	TESTOUT-R_***n***
51	TIP09_***n***	52	RING09_***n***
53	TIP10_***n***	54	RING10_***n***
55	TIP11_***n***	56	RING11_***n***
57	TIP12_***n***	58	RING12_***n***
59	PROTGND	60	PROTGND

***** Where ***n*** is 1 on System 1, 2 on System 2, 3 on System 3, and 4 on System 4.

4.3 Table 7 lists the FCS-719 backplane connectors (Figure 2) and where each is described in this practice.

Table 7. *FCS-719 List 4 Backplane Connectors*

Connector	Go to Table	On page
Battery, CO Battery Return, and Frame Ground	8	10
LAN	9	10
Data	10	10
HDSL, Bypass Pair, Channel Unit Test, Composite Clock, Auxiliary Power Pairs, Frame Ground, External ACO switch	11	11
Alarm	12	12
Subscriber Terminations	13	13
PGTC	14	14

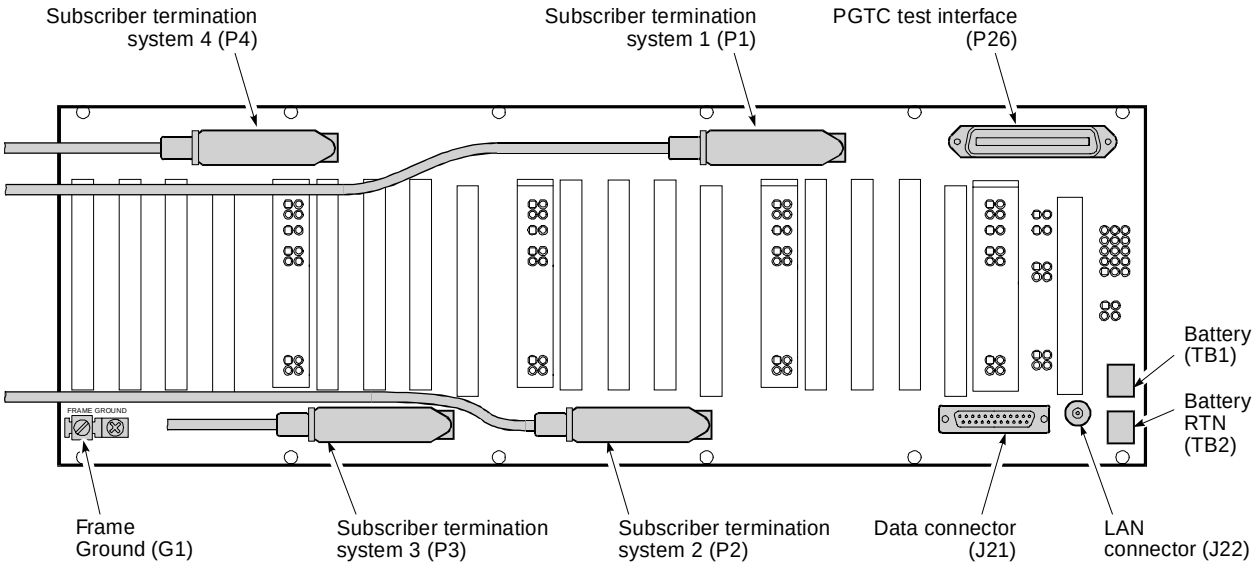


Figure 2. *FCS-719 COT Shelf Backplane*

Table 8. *Battery, CO Return and Frame Ground*

Connector	Type	Function
TB1	Screw	Battery (-48 Vdc)
TB2	Screw	CO battery return
G1	Screw	Frame Ground (Protection Ground)

CO BATTERY RETURN is separate from FRAME GROUND in PG-Flex.

CKT GND and CO BATTERY RETURN are connected inside the PG-FLEX Line Unit, but are not connected on the backplane.

Table 9. *LAN Connector*

Connector	Type	Function
J22	BNC	(Not currently used)

Table 10. *Data Connector*

Connector	Type	Function
J21	DB-25 (F)	(Not currently used)

Table 11. *HDSL, Test, And Miscellaneous Connectors*

System*	Connector	Type	Function
System ***n***	HDSL_***n***_T1 HDSL_***n***_R1	.045 in. Wire-Wrap	Tip and Ring terminations for HDSL Pair #1 of System ***n*** to Remote Terminal ***n***. +130 Vdc is simplexed on this line for powering the Remote Terminal.
System ***n***	HDSL_***n***_T2 HDSL_***n***_R2	.045 in. Wire-Wrap	Tip and Ring terminations for HDSL Pair #2 of System ***n*** to Remote Terminal ***n***. -130 Vdc is simplexed on this line for powering the Remote Terminal.
System ***n***	PWR_***n***_T1 PWR_***n***_R1	.045 in. Wire-Wrap	System ***n*** auxiliary Power Pair #1. Used for additional power to the RT when a Doubler is used.
System ***n***	PWR_***n***_T2 PWR_***n***_R2	.045 in. Wire-Wrap	System ***n*** auxiliary Power Pair #2. Used for additional power to the RT when a Doubler is used.
System ***n***	BYPASS_***n***_T BYPASS_***n***_R	.045 in. Wire-Wrap	Termination for the metallic bypass pair into COT System ***n*** from RT ***n***.
System ***n***	TEST_***n***_T IN TEST_***n***_R IN	.045 in. Wire-Wrap	Test connection looking into the CO equipment for the selected subscriber for System ***n***. This connection must be set up through the PG-Flex RS-232 maintenance port.
System ***n***	TEST_***n***_T OUT TEST_***n***_R OUT	.045 in. Wire-Wrap	Test connection looking into the CO Channel Unit of the selected subscriber for System ***n***. This connection must be set up through the PG-Flex RS-232 maintenance port. In some applications, this pair will be jumpered to the BYPASS pair from RT ***n***.
	CC1_IN_TIP CC1_IN_RING	.045 in. Wire-Wrap	Composite Clock #1. Used for primary synchronization to CO timing. These pins may be daisy chained to additional Composite Clock inputs in other PG-Flex systems.
	CC2_IN_TIP CC2_IN_RING	.045 in. Wire-Wrap	Composite Clock #2. Used for secondary synchronization to CO timing. These pins may be daisy chained to additional Composite Clock inputs in other PG-Flex systems.
	FRAME_GND CKT_GND	.045 in. Wire-Wrap	Frame ground. This is isolated from CO battery ground in PG-Flex.
	EXT_ACO CKT_GND	.045 in. Wire-Wrap	External Alarm Cutoff. A momentary connection between EXT_ACO and circuit ground will silence the PG-Flex audible alarms.
	INHIBIT	.045 in. Wire-Wrap	PGTC Inhibit connection. This pin should not be connected to any other Inhibit pins in PG-Flex or other DLC systems.
	GND CKT_GND	.045 in. Wire-Wrap	CO battery return. This is isolated from frame ground in PG-Flex.

***** Where ***n*** is 1 on System 1, 2 on System 2, 3 on System 3, and 4 on System 4.

Table 12. *Alarm Termination*

Posts	Contact Post NO*	Contact Post COM*	Contact Post NC*	FUNCTION†
SHELF_ID	1	2	3	Shelf ID indicates a major or minor shelf alarm is active.
MAJ_AUD	4	5	6	Indicates a major alarm. The alarm can be silenced using the ACO button. Connect this relay to the major alarm audible indicator of the CO alarm system.
MAJ_VIS	7	8	9	Indicates a major alarm. This alarm cannot be disabled. Connect this relay to the major alarm visual indicator of the CO alarm system.
MIN_AUD	10	11	12	Indicates a minor alarm. The alarm can be silenced using the ACO button. Connect this relay to the minor alarm audible indicator of the CO alarm system.
MIN_VIS	13	14	15	Indicates a minor alarm. This alarm cannot be disabled. Connect this relay to the minor alarm visual indicator of the CO alarm system.

* For the relay contacts, NO is normally opened, NC is normally closed, and COM is common.
† All relays provide form "C" contacts.

Use the cable adapter (part number 120-1110-02) that is installed on the FCS-719 List 4 Shelf to ensure the subscriber terminations shown in Table 13.

Table 13. *Systems 1 through 4 Subscriber Terminations Using Cable Adapters*

Channel Unit	Circuit	Connector P*n** Tip	Connector P*n** Ring	Tip	Ring
1	1	26	1	WH/BL	BL/WH
	2	27	2	WH/OR	OR/WH
	3	28	3	WH/GN	GN/WH
	4	29	4	WH/BN	BN/WH
	5	30	5	WH/SL	SL/WH
	6	31	6	RD/BL	BL/RD
	7	32	7	RD/OR	OR/RD
	8	33	8	RD/GN	GN/RD
2	1	34	9	RD/BN	BN/RD
	2	35	10	RD/SL	SL/RD
	3	36	11	BK/BL	BL/BK
	4	37	12	BK/OR	OR/BK
	5	38	13	BK/GN	GN/BK
	6	39	14	BK/BN	BN/BK
	7	40	15	BK/SL	SL/BK
	8	41	16	YL/BL	BL/YL
3	1	42	17	YL/OR	OR/YL
	2	43	18	YL/GN	GN/YL
	3	44	19	YL/BN	BN/YL
	4	45	20	YL/SL	SL/YL
	5	46	21	VI/BL	BL/VI
	6	47	22	VI/OR	OR/VI
	7	48	23	VI/GN	GN/VI
	8	49	24	VI/BN	BN/VI

***** Where *n* is 1 on System 1, 2 on System 2, 3 on System 3, and 4 on System 4.
Shaded terminations are used only with 8 Channel POTS and DDS Units.

Table 14. *PGTC Connector Pinouts*

Pin	Signal	Pin	Signal
1	PGTC_RING1	26	PGTC_TIP1
2	PGTC_RING2	27	PGTC_TIP2
3	PGTC_RING3	28	PGTC_TIP3
4	PGTC_RING4	29	PGTC_TIP4
5	SLEEVE2	30	SLEEVE1
6	SLEEVE4	31	SLEEVE3
7	OH2	32	OH1
8	OH4	33	OH3
9	PROCEED2	34	PROCEED1
10	PROCEED4	35	PROCEED3
11	LOCK2	36	LOCK1
12	LOCK4	37	LOCK3
13	N/C	38	N/C
14	N/C	39	N/C
15	N/C	40	N/C
16	N/C	41	N/C
17	TMAJ	42	TSTALM
18	N/C	43	N/C
19	N/C	44	N/C
20	N/C	45	N/C
21	N/C	46	N/C
22	SEZBY	47	SEIZE
23	N/C	48	N/C
24	N/C	49	N/C
25	N/C	50	N/C

C. INSTALLATION AND TEST

5. Unpacking

5.1 Upon receipt of the equipment:

1 Unpack each container and visually inspect it for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to PairGain. Order replacement equipment if necessary.

2 Check the contents against the packing list to ensure complete and accurate shipment. If the shipment is short or irregular, contact PairGain as described in Section 12. If you must store the equipment for a prolonged period, store the equipment in its original container.

6. Pre-Provisioning—HDSL Lines

6.1 The HDSL transmission scheme uses two pairs between the COT and Remote Terminal (RT). The wire pairs should have identical electrical make-ups. Differences in total wire length, wire gauge, bridge taps, and exposure to crosstalk should be kept to a minimum. Pair isolation (Tip-Ring, Tip-Ground, and Ring-Ground) must be ≥ 100 kΩ.

6.2 The wire pairs from the COT to the RT must meet the following design guidelines:

- Nonloaded cable only.
- Multigauge is restricted to two gauge changes, except for stubbing or fusing.
- Total bridge taps may not exceed 2.5 kft. No single bridge tap may exceed 2.0 kft.

6.3 The distance limitation for HDSL transmission is based on a maximum signal attenuation of 35 dB. Since signal attenuation decreases as cable size increases, the larger the gauge (i.e., 19 AWG vs. 26 AWG), the greater the distance between the COT and the RT. Table 15 identifies these distances (at a cable temperature of 68°F).

Table 15. *12/24 Channel HDSL Transmission Distance*

Gauge	Loop Length	Resistance
19 AWG 0.9 mm	22.8 kft 7.0 km	367 Ω
22 AWG 0.6 mm	16.1 kft 4.9 km	521 Ω
24 AWG 0.5 mm	12.3 kft 3.7 km	638 Ω
26 AWG 0.4 mm	9.0 kft 2.7 km	750 Ω

7. Mounting

7.1 The COT shelf mounts in a standard 23 inch CO equipment bay. The shelf has a mounting height requirement of 7 inches.

1 Align the shelf (Figure 3) universal mounting brackets with the four vertical mounting holes.

2 Install the mounting screws.

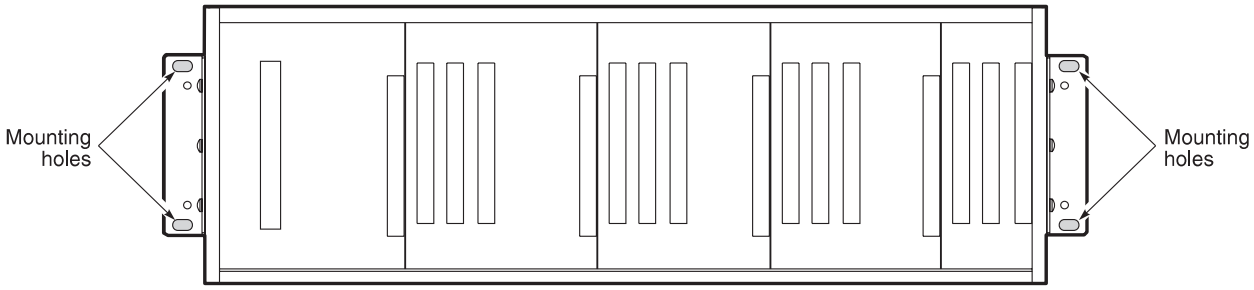


***Figure 3**. Mounting the FCS-719 COT Shelf*

8. Wiring

8.1 Sections 8.2 through 8.9 describe how to connect the FCS-719. Section 8.10 verifies the installation. All wiring to the COT shelf is performed on the back side of the backplane.

Follow the provisions of the National Electric Code (current edition) for wiring external to the product(s).

8.2 **Frame Ground and Battery.** Connect the frame ground and battery:

1 Remove the clear Plexiglas™ cover.

2 Remove the fuse in the equipment bay fuse panel for the circuit where the PG-Flex CO battery wire will be terminated.

Follow local grounding practices to ensure a good frame ground connection to PG-Flex. This frame grounding is required for secondary voltage protection of the PG-Flex equipment.

3 Connect the frame ground (Figure 4):

a Connect one end of the frame ground wire to the grounding lug G1 (Frame Ground).

b Connect the other end of the frame ground wire to the CO ground termination point.

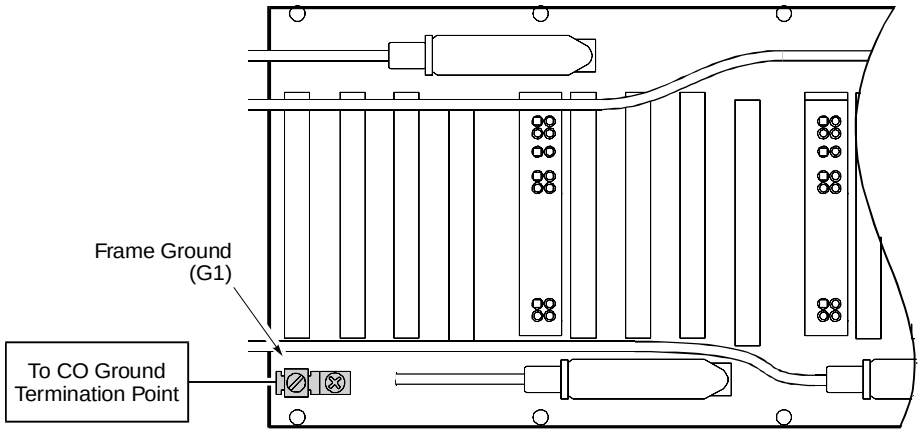


Figure 4. *Connecting the Frame Ground (Protection Ground)*

Use 12 AWG or larger wire (or multiple wires of a smaller gauge) to ensure good power connections to PG-Flex.

4 Connect the battery (Figure 5):

a Connect the wires used for the CO battery and the CO battery return to TB1 (-48 Vdc) and TB2 (BATT RTN) screw terminals.

b Connect the wire for the CO battery return from TB2 on the COT shelf to the CO battery return termination point.

c Connect the CO battery wire from TB1 on the COT Shelf to the equipment bay fuse panel termination point.

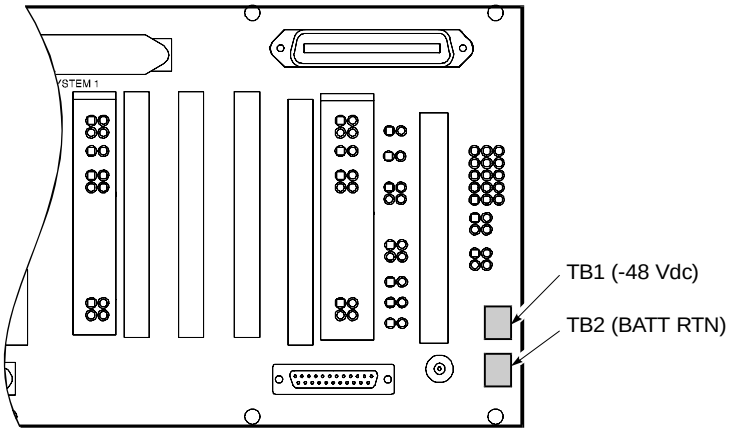


Figure 5. *Connecting the CO Battery*

8.3 HDSL Lines. Connect the HDSL lines (Figure 6). Note that ***n*** is:

- 1 for System 1
- 2 for System 2
- 3 for System 3
- 4 for System 4

1 Connect the HDSL Pair #1 onto wire-wrap pins HDSL_***n***_T1 (Tip) and HDSL_***n***_R1 (Ring) on the COT shelf for system ***n***.

2 Connect the HDSL Pair #2 onto wire-wrap pins HDSL_***n***_T2 (Tip) and HDSL_***n***_R2 (Ring) on the COT shelf for the same system ***n***.

3 Repeat steps 1 and 2 for each system installed.

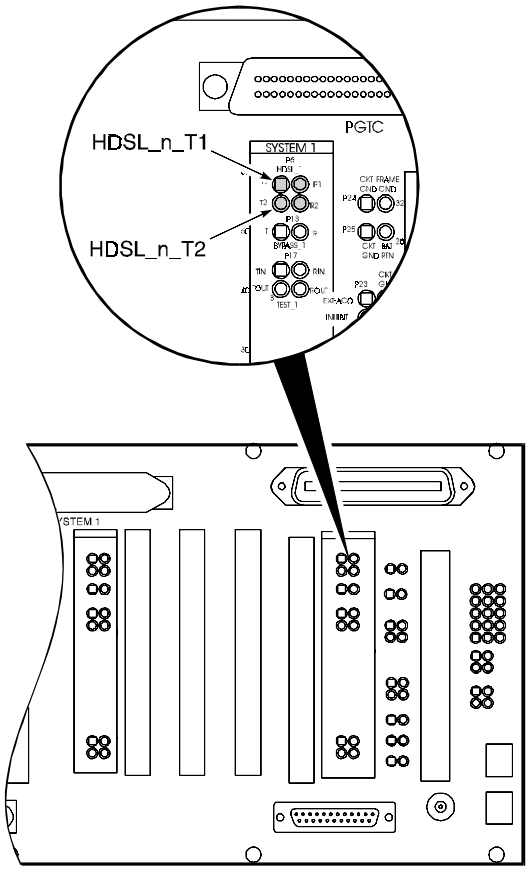


Figure 6. *Connecting the HDSL Lines*

8.4 Bypass Pairs. If subscriber drop testing is required, connect the metallic bypass pairs (Figure 7).

Do not connect metallic bypass pairs between PG-Flex systems or to other digital loop carrier (DLC) systems.

1. Connect the metallic bypass pair from the main distribution frame (MDF) to wire wrap posts BYPASS_1_T (Tip) and BYPASS_1_R (Ring) on the COT shelf for system 1.
2. Repeat step 1 for Systems 2, 3, and 4 using these pin pairs:
   - BYPASS_2_T and BYPASS_2_R for system 2
   - BYPASS_3_T and BYPASS_3_R for system 3
   - BYPASS_4_T and BYPASS_4_R for system 4

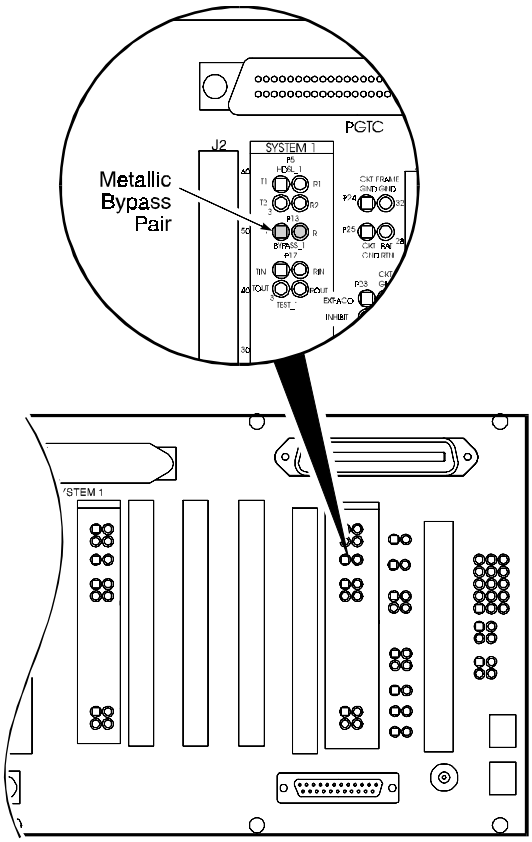


Figure 7. *Connecting the Metallic Bypass Pair*

8.5 Composite Clock. When required for digital service, connect the composite clock (Figure 8):

1 Connect the composite clock leads from the primary master clock source in the CO to CC1_IN_TIP and CC1_IN_RING termination pins on the backplane.

2 Connect the composite clock leads from the secondary master clock source in the CO to CC2_IN_TIP and CC2_IN_RING termination pins on the backplane.

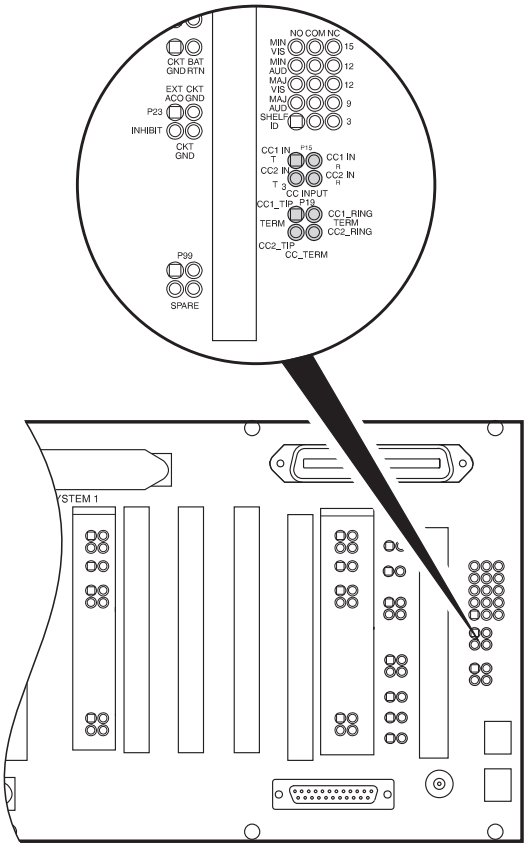


Figure 8. *Connecting the Composite Clock and Alarms*

To cascade the composite clock to other PG-Flex shelves:

1 Terminate only on the last shelf in the cascade.

2 Wire-wrap a 130 to 135 Ω resistor on the CC_TERM_CC1_IN_TIP and CC_TERM_CC1_IN_RING pins to terminate clock 1 (Figure 8).

3 Wire-wrap a 130 to 135 Ω resistor on the CC_TERM_CC2_IN_TIP and CC_TERM_CC2_IN_RING pins to terminate clock 2.

8.6 Alarms. If external audible and/or visual alarm indications are required, connect the audible and visual alarm leads from the CO alarm panel to the COT alarm contacts on PG-Flex (Figure 8).

8.7 Subscriber Lines. Connect the subscriber lines:

Use the cable adapter (part number 120-1110-02) that is installed on the FCS-719 List 4 Shelf to ensure the subscriber terminations that are shown in Table 13.

1. Refer to Table 13 to connect the CO switch subscriber lines to the cable adapter on P1 using a 25-pair Amphenol cable for system 1.
2. Repeat step 1 for each system you install, using the adapter cables on:
   - P2 for system 2
   - P3 for system 3
   - P4 for system 4

8.8 Auxiliary Power Pairs. When PG-Flex is used with a doubler, wire the COT shelf:

1. Wire-wrap auxiliary power pair 1 to PWR_1_T1 (Tip) and PWR_1_R1 (Ring) for system 1.
2. Wire-wrap auxiliary power pair 2 to PWR_1_T2 (Tip) and PWR_1_R2 (Ring) for system 1.
3. Repeat steps 1 and 2 when required for systems 2, 3, and 4.

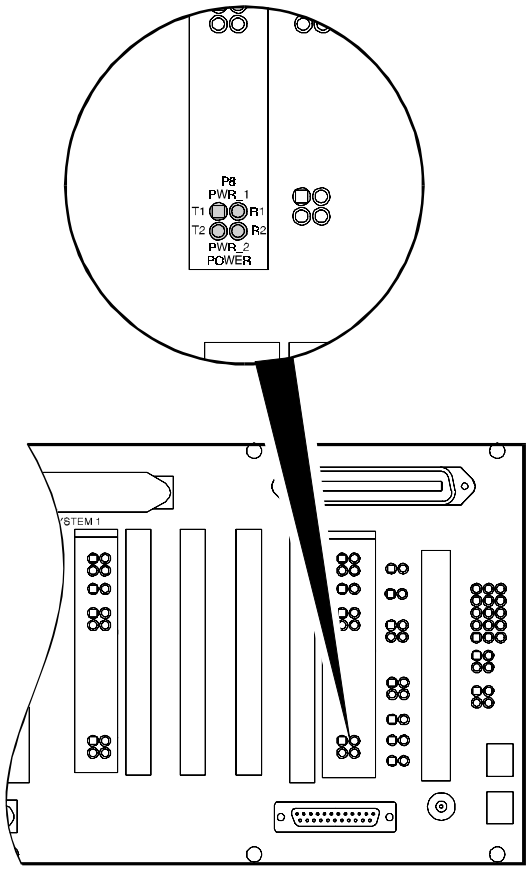


Figure 9. *Wiring the Auxiliary Power Pairs*

8.9 **Fuse.** Insert a 10 amp fuse in the equipment bay's fuse panel for the circuit where the PG-Flex CO battery wire is terminated.

8.10 **Cabling Verification.** Verify connections:

The following verifications should be done before any cards are inserted into the FCS-719.

1. Verify that there is a minimum of -42 Vdc and a maximum of -56 Vdc between the TB1 (-48 Vdc) and TB2 (BATT RTN) screw terminals on the COT shelf.
2. Visually verify the HDSL lines are terminated properly and with the correct orientation.
3. Verify that the HDSL lines are "dry":
   a. There should be 0 Vdc between the Tip and Ring, Tip and Ground, and Ring and Ground of each of the HDSL circuits terminated on the shelf.
   b. There should be > 100 kΩ resistance between the Tip and Ring, Tip and Ground, and Ring and Ground of each of the HDSL circuits terminated on the shelf.
4. Replace the clear Plexiglas cover.

9. Turn-Up and Testing

9.1 Refer to the COT or RT Line Unit Technical Practices for complete COT and RT turn up and testing procedures.

10. Troubleshooting

10.1 Refer to the COT or RT Line Unit Technical Practices for complete COT and RT troubleshooting procedures.

11. Technical Support

11.1 PairGain Technical Assistance is available 24-hours-a-day, 7-days-a-week by contacting PairGain Customer Service at:

Telephone:	**(800) 638-0031 or (714) 832-9922**
Fax:	**(714) 832-9924**

11.2 During normal business hours (8:00 AM to 5:00 PM, Pacific Time, Monday-Friday, excluding holidays), technical assistance calls are normally answered directly by a Customer Service Engineer. At other times, a request for technical assistance is handled by an on-duty Customer Service Engineer through a callback process. This process normally results in a callback within 30 minutes of initiating the request.

11.3 In addition, PairGain maintains a computer bulletin board system for obtaining current information on PairGain products, product troubleshooting tips and aids, accessing helpful utilities, and for posting requests or questions. This system is available 24-hours-a-day by calling (714) 730-3299. Transmission speeds up to 28.8 kbps are supported with a character format of 8-N-1.

D. WARRANTY AND COMPLIANCE

12. Warranty

12.1 PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 5 years from the date of original shipment, given proper customer installation and regular maintenance. PairGain will repair or replace any unit without cost during this period if the unit is found to be defective for any reason other than abuse or improper use or installation.

12.2 The FCS-719 should not be field repaired. If it fails, replace it with another unit and return the faulty unit to PairGain for repair. Any modifications of the unit by anyone other than an authorized PairGain representative will void the warranty.

12.3 If a unit needs repair, call PairGain for a Return Material Authorization (RMA) number and return the defective unit, freight prepaid, along with a brief description of the problem, to:

PairGain Technologies, Inc.
14402 Franklin Avenue
Tustin, California 92780-7013
Attn: Customer Repair Facility

12.4 PairGain will continue to repair faulty modules beyond the warranty program at a nominal charge. Contact your PairGain sales representative for details and pricing.

13. Certification

13.1 **FCC Compliance.** The FCS-719 List 4 COT Shelf has been tested and found to comply with the limits for Class A digital devices pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

13.2 Refer to the installation section of the instruction manual of the unit you are installing for information on:

- cabling
- proper connections
- grounding

13.3 Follow the provisions of the current edition of the National Electrical Code Wiring external to the product(s).

E. ABBREVIATIONS

14. Abbreviations

COT	Central Office Terminal
DLC	Digital Loop Carrier
HDSL	High bit-rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MDF	Main Distribution Frame
NMA	Network Management Analysis
POTS	Plain Old Telephone Service
RT	Remote Terminal

Corporate Office
14402 Franklin Avenue
Tustin, CA 92780

Tel: (714) 832-9922
Fax: (714) 832-9924

For Technical Assistance:
(800) 638-0031

ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

PAIRGAIN
THE COPPEROPTICS COMPANY