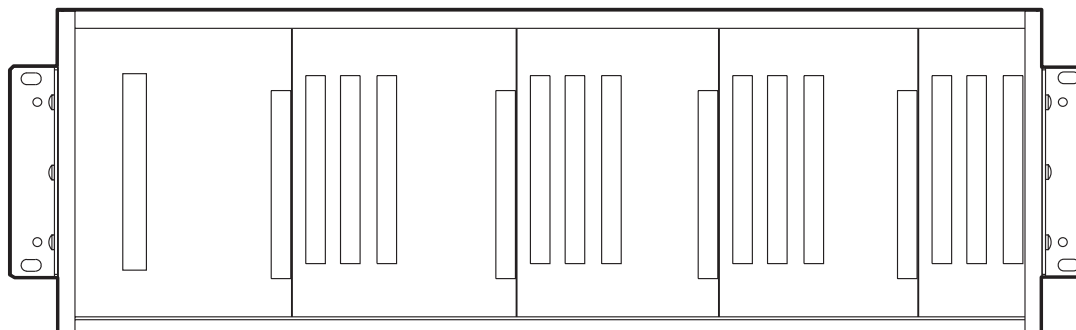

PG-FLEX 23" CENTRAL OFFICE TERMINAL SHELF

Model	List Number	Part Number	CLEI Code
FCS-719	4A	150-1319-41	VAMCHE0ARA



PAIRGAIN TECHNOLOGIES, INC.
ENGINEERING SERVICES TECHNICAL PRACTICE
SECTION 363-719-141-01

Revision History of this practice.

Revision 01— July 31, 1997

A) Initial Release

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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.

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A. PRODUCT OVERVIEW

1. Description and Features

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

- one Alarm Unit or PGTC Interface Unit common to all systems
- up to 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 pairs, auxiliary power pairs when using a doubler, and subscriber circuits (located on the backplane at the rear of the shelf). The List 4A shelf provides 25-pair male Amphenol connectors for the subscriber circuit connections.

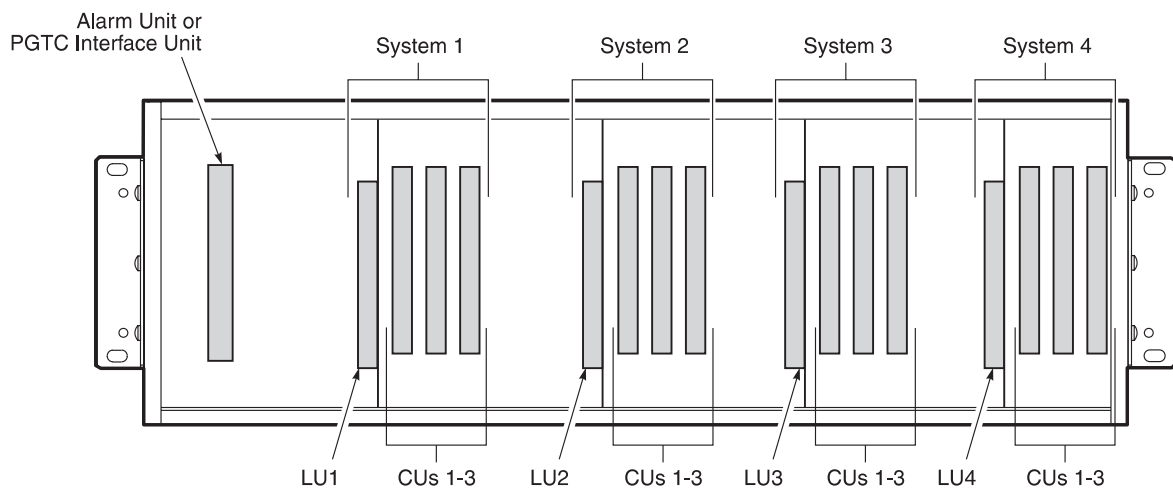


Figure 1. FCS-719 COTS (card-side, front view)



Use the List 4A FCS-719 COTS only with List 4x (or higher) FRE-765 Remote Terminal Enclosures.

1.2 Features of the PG-Flex FCS-719 COTS are:

- universal mounting brackets for installation into a 23-inch equipment bay
- wire-wrap connections for HDSL, alarms, metallic bypass pairs, and auxiliary power pairs (when using a doubler)
- split or single battery feed for shelf powering
- screw terminal connections for frame ground and Central Office (CO) battery
- DB-25 connector for Network Management Administrative (NMA) communications
- 25-pair Amphenol connectors for subscriber circuit connections
- 25-pair Amphenol connector for PGTC test interface

2. Specifications

Electrical Characteristics

Power	-48 Vdc CO battery
Composite Clock Termination	133 Ω

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)

Dimensions

Mounting	23-inch equipment bay using universal mounting brackets
Height.....	7.00 in. (17.8 cm)
Width	23.00 in. (58.4 cm)
Depth.....	11.75 in. (29.9 cm)
Weight.....	15.00 lbs (6.8 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 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. COTS 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 Rev
T/R 3	Ckt 3	Ckt 3	Ckt 3	Ckt 2 Tx
T/R 4	Ckt 4	Ckt 4	Ckt 4	Ckt 2 Rev
T/R 5	—	Ckt 5	—	Ckt 3 Tx
T/R 6	—	Ckt 6	—	Ckt 3 Rev
T/R 7	—	Ckt 7	—	Ckt 4 Tx
T/R 8	—	Ckt 8	—	Ckt 4 Rev

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

The CU numbers on top show how the channel units are numbered when using a List 3 or higher Line Unit (the channel units are numbered CU 1 through CU 3, relative to each system). The Channel Unit numbers on bottom (in parenthesis) show how channel units are numbered when using a List 1 or 2 Line Unit (the channel units are numbered sequentially from CU 1 through CU 12).

4. Backplane Connections

4.1 Section 4.2 provides the connector pinouts located on the backplane for 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 (-48V_A, -48V_B) and CO return (BATT_RTN)
- frame ground
- Local Area Network (LAN)
- data
- HDSL, test, composite clock, auxiliary power pairs, and external ACO switch
- alarm or PGTC test interface
- subscriber lines (P1, P2, P3, and P4)

4.2 Table 3 lists the FCS-719 List 4A connectors (Figure 2) and where each is described in this practice.

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

Connector/Fuse	Go to Table	On page
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 thru 12



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	-48V_B	30	N/C	30	-48V_A
31	BATT_RTN	31	BATT_RTN	31	BATT_RTN
32	PROTGND	32	GND	32	GND

Table 5. Line Unit Connectors

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	HDSL TIP1EX _n	6	HDSL TIP2EX _n
7	HDSL RING1EX _n	8	HDSL RING2EX _n
9	N/C	10	N/C
11	BATT_RTN	12	BATT_RTN
13	-48 _n	14	-48 _n
15	-48V _x †	16	-48V _x
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	HDSL TIP1 _n	54	HDSL TIP2 _n
55	HDSL RING1 _n	56	HDSL RING2 _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.
† Where *x* is A for Systems 1 and 2 and B for Systems 3 and 4.

Table 6. Channel Unit Connector Pinouts

<u>System Channel Unit Connector</u>			<u>System Channel Unit Connector</u>		
<u>1</u>	<u>1</u>	<u>J3</u>	<u>1</u>	<u>2</u>	<u>J4</u>
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	PROTGND	2	PROTGND	1	PROTGND
3	TIP05_1	4	RING05_1	3	TIP13_1
5	TIP06_1	6	RING06_1	5	TIP14_1
7	TIP07_1	8	RING07_1	7	TIP15_1
9	TIP08_1	10	RING08_1	9	TIP16_1
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN
13	-48_1	14	-48_1	13	-48_1
15	-48V_A	16	-48V_A	15	-48V_A
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC
19	TSYNC_1	20	TSIG_1	19	TSYNC_1
21	TCLK_1	22	TSER_1	21	TCLK_1
23	GND	24	RSYNC_1	23	GND
25	RSIG_1	26	RCLK_1	25	RSIG_1
27	RSER_1	28	GND	27	RSER_1
29	SDA_1	30	CSYNC_1	29	SDA_1
31	N/C	32	SCL_1	31	N/C
33	+5_1	34	+5_1	33	+5_1
35	GND	36	GND	35	GND
37	-5_1	38	-5_1	37	-5_1
39	N/C	40	GND (CID3)	39	N/C
41	GND (CID2)	42	GND (CID1)	41	GND (CID2)
43	GND (CID0)	44	N/C	43	N/C (CID0)
45	TESTIN-T_1	46	TESTIN-R_1	45	TESTIN-T_1
47	GND	48	GND	47	GND
49	TESTOUT-T_1	50	TESTOUT-R_1	49	TESTOUT-T_1
51	TIP01_1	52	RING01_1	51	TIP09_1
53	TIP02_1	54	RING02_1	53	TIP10_1
55	TIP03_1	56	RING03_1	55	TIP11_1
57	TIP04_1	58	RING04_1	57	TIP12_1
59	PROTGND	60	PROTGND	59	PROTGND

(continued on next page)

Table 6. Channel Unit Connector Pinouts (continued)

<u>System Channel Unit Connector</u>			<u>System Channel Unit Connector</u>		
<u>1</u>	<u>3</u>	<u>J5</u>	<u>2</u>	<u>1</u>	<u>J8</u>
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	PROTGND	2	PROTGND	1	PROTGND
3	TIP21_1	4	RING21_1	3	TIP05_2
5	TIP22_1	6	RING22_1	5	TIP06_2
7	TIP23_1	8	RING23_1	7	TIP07_2
9	TIP24_1	10	RING24_1	9	TIP08_2
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN
13	-48_1	14	-48_1	13	-48_2
15	-48V_A	16	-48V_A	15	-48V_A
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC
19	TSYNC_1	20	TSIG_1	19	TSYNC_2
21	TCLK_1	22	TSER_1	21	TCLK_2
23	GND	24	RSYNC_1	23	GND
25	RSIG_1	26	RCLK_1	25	RSIG_2
27	RSER_1	28	GND	27	RSER_2
29	SDA_1	30	CSYNC_1	29	SDA_2
31	N/C	32	SCL_1	31	N/C
33	+5_1	34	+5_1	33	+5_2
35	GND	36	GND	35	GND
37	-5_1	38	-5_1	37	-5_2
39	N/C	40	GND (CID3)	39	N/C
41	GND (CID2)	42	N/C (CID1)	41	GND (CID2)
43	GND (CID0)	44	N/C	43	N/C (CID0)
45	TESTIN-T_1	46	TESTIN-R_1	45	TESTIN-T_2
47	GND	48	GND	47	GND
49	TESTOUT-T_1	50	TESTOUT-R_1	49	TESTOUT-T_2
51	TIP17_1	52	RING17_1	51	TIP01_2
53	TIP18_1	54	RING18_1	53	TIP02_2
55	TIP19_1	56	RING19_1	55	TIP03_2
57	TIP20_1	58	RING20_1	57	TIP04_2
59	PROTGND	60	PROTGND	59	PROTGND

(continued on next page)

Table 6. Channel Unit Connector Pinouts (continued)

<u>System Channel Unit Connector</u>			<u>System Channel Unit Connector</u>		
<u>2</u>		<u>2</u>	<u>3</u>		<u>J10</u>
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	PROTGND	2	PROTGND	1	PROTGND
3	TIP13_2	4	RING13_2	3	TIP21_2
5	TIP14_2	6	RING14_2	5	TIP22_2
7	TIP15_2	8	RING15_2	7	TIP23_2
9	TIP16_2	10	RING16_2	9	TIP24_2
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN
13	-48_2	14	-48_2	13	-48_2
15	-48V_A	16	-48V_A	15	-48V_A
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC
19	TSYNC_2	20	TSIG_2	19	TSYNC_2
21	TCLK_2	22	TSER_2	21	TCLK_2
23	GND	24	RSYNC_2	23	GND
25	RSIG_2	26	RCLK_2	25	RSIG_2
27	RSER_2	28	GND	27	RSER_2
29	SDA_2	30	CSYNC_2	29	SDA_2
31	N/C	32	SCL_2	31	N/C
33	+5_2	34	+5_2	33	+5_2
35	GND	36	GND	35	GND
37	-5_2	38	-5_2	37	-5_2
39	N/C	40	GND (CID3)	39	N/C
41	N/C (CID2)	42	GND (CID1)	41	N/C (CID2)
43	GND (CID0)	44	N/C	43	N/C (CID0)
45	TESTIN-T_2	46	TESTIN-R_2	45	TESTIN-T_2
47	GND	48	GND	47	GND
49	TESTOUT-T_2	50	TESTOUT-R_2	49	TESTOUT-T_2
51	TIP09_2	52	RING09_2	51	TIP17_2
53	TIP10_2	54	RING10_2	53	TIP18_2
55	TIP11_2	56	RING11_2	55	TIP19_2
57	TIP12_2	58	RING12_2	57	TIP20_2
59	PROTGND	60	PROTGND	59	PROTGND

(continued on next page)

Table 6. Channel Unit Connector Pinouts (continued)

System Channel Unit Connector			System Channel Unit Connector		
3 1 J13			3 2 J14		
Pin	Signal	Pin	Signal	Pin	Signal
1	PROTGND	2	PROTGND	1	PROTGND
3	TIP05_3	4	RING05_3	3	TIP13_3
5	TIP06_3	6	RING06_3	5	TIP14_3
7	TIP07_3	8	RING07_3	7	TIP15_3
9	TIP08_3	10	RING08_3	9	TIP16_3
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN
13	-48_3	14	-48_3	13	-48_3
15	-48V_B	16	-48V_B	15	-48V_B
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC
19	TSYNC_3	20	TSIG_3	19	TSYNC_3
21	TCLK_3	22	TSER_3	21	TCLK_3
23	GND	24	RSYNC_3	23	GND
25	RSIG_3	26	RCLK_3	25	RSIG_3
27	RSER_3	28	GND	27	RSER_3
29	SDA_3	30	CSYNC_3	29	SDA_3
31	N/C	32	SCL_3	31	N/C
33	+5_3	34	+5_3	33	+5_3
35	GND	36	GND	35	GND
37	-5_3	38	-5_3	37	-5_3
39	N/C	40	N/C (CID3)	39	N/C
41	GND (CID2)	42	GND (CID1)	41	GND (CID2)
43	GND (CID0)	44	N/C	43	N/C (CID0)
45	TESTIN-T_3	46	TESTIN-R_3	45	TESTIN-T_3
47	GND	48	GND	47	GND
49	TESTOUT-T_3	50	TESTOUT-R_3	49	TESTOUT-T_3
51	TIP01_3	52	RING01_3	51	TIP09_3
53	TIP02_3	54	RING02_3	53	TIP10_3
55	TIP03_3	56	RING03_3	55	TIP11_3
57	TIP04_3	58	RING04_3	57	TIP12_3
59	PROTGND	60	PROTGND	59	PROTGND

(continued on next page)

Table 6. Channel Unit Connector Pinouts (continued)

<u>System Channel Unit Connector</u> 3 3 J15			<u>System Channel Unit Connector</u> 4 1 J18		
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	PROTGND	2	PROTGND	1	PROTGND
3	TIP21_3	4	RING21_3	3	TIP05_4
5	TIP22_3	6	RING22_3	5	TIP06_4
7	TIP23_3	8	RING23_3	7	TIP07_4
9	TIP24_3	10	RING24_3	9	TIP08_4
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN
13	-48_3	14	-48_3	13	-48_4
15	-48V_B	16	-48V_B	15	-48V_B
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC
19	TSYNC_3	20	TSIG_3	19	TSYNC_4
21	TCLK_3	22	TSER_3	21	TCLK_4
23	GND	24	RSYNC_3	23	GND
25	RSIG_3	26	RCLK_3	25	RSIG_4
27	RSER_3	28	GND	27	RSER_4
29	SDA_3	30	CSYNC_3	29	SDA_4
31	N/C	32	SCL_3	31	N/C
33	+5_3	34	+5_3	33	+5_4
35	GND	36	GND	35	GND
37	-5_3	38	-5_3	37	-5_4
39	N/C	40	N/C (CID3)	39	N/C
41	GND (CID2)	42	N/C (CID1)	41	GND (CID2)
43	GND (CID0)	44	N/C	43	N/C (CID0)
45	TESTIN-T_3	46	TESTIN-R_3	45	TESTIN-T_4
47	GND	48	GND	47	GND
49	TESTOUT-T_3	50	TESTOUT-R_3	49	TESTOUT-T_4
51	TIP17_3	52	RING17_3	51	TIP01_4
53	TIP18_3	54	RING18_3	53	TIP02_4
55	TIP19_3	56	RING19_3	55	TIP03_4
57	TIP20_3	58	RING20_3	57	TIP04_4
59	PROTGND	60	PROTGND	59	PROTGND

(continued on next page)

Table 6. Channel Unit Connector Pinouts (continued)

System Channel Unit Connector			System Channel Unit Connector		
4 2 J19			4 3 J20		
Pin	Signal	Pin	Signal	Pin	Signal
1	PROTGND	2	PROTGND	1	PROTGND
3	TIP13_4	4	RING13_4	3	TIP21_4
5	TIP14_4	6	RING14_4	5	TIP22_4
7	TIP15_4	8	RING15_4	7	TIP23_4
9	TIP16_4	10	RING16_4	9	TIP24_4
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN
13	-48_4	14	-48_4	13	-48_4
15	-48V_B	16	-48V_B	15	-48V_B
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC
19	TSYNC_4	20	TSIG_4	19	TSYNC_4
21	TCLK_4	22	TSER_4	21	TCLK_4
23	GND	24	RSYNC_4	23	GND
25	RSIG_4	26	RCLK_4	25	RSIG_4
27	RSER_4	28	GND	27	RSER_4
29	SDA_4	30	CSYNC_4	29	SDA_4
31	N/C	32	SCL_4	31	N/C
33	+5_4	34	+5_4	33	+5_4
35	GND	36	GND	35	GND
37	-5_4	38	-5_4	37	-5_4
39	N/C	40	N/C (CID3)	39	N/C
41	N/C (CID2)	42	GND (CID1)	41	N/C (CID2)
43	GND (CID0)	44	N/C	43	N/C (CID0)
45	TESTIN-T_4	46	TESTIN-R_4	45	TESTIN-T_4
47	GND	48	GND	47	GND
49	TESTOUT-T_4	50	TESTOUT-R_4	49	TESTOUT-T_4
51	TIP09_4	52	RING09_4	51	TIP17_4
53	TIP10_4	54	RING10_4	53	TIP18_4
55	TIP11_4	56	RING11_4	55	TIP19_4
57	TIP12_4	58	RING12_4	57	TIP20_4
59	PROTGND	60	PROTGND	59	PROTGND

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 4A Backplane Connectors

Connector/Fuse	Go to Table	On page
CO battery, TB1 (-48V_A) and TB2 (-48V_B), CO battery return (TB3) and frame ground (G1)	8	14
LAN connector (J6)	9	14
Data connector (J21)	10	14
HDSL, Auxiliary Power Pairs, Composite Clock, Bypass Pair, Channel Unit Test, Frame Ground, External ACO (not shown in Figure 2)	11	15
Alarm	12	16
Subscriber terminations (P1, P2, P3, and P4)	13	17
PGTC test interface (P26)	14	18

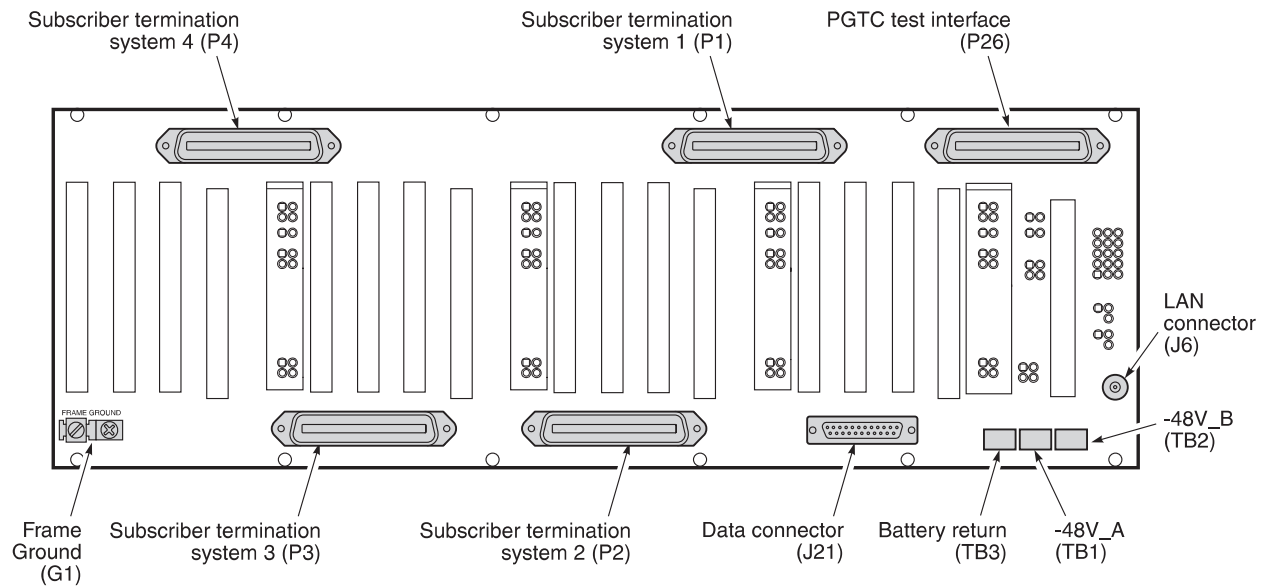


Figure 2. FCS-719 COTS Backplane



CO Battery Return is separate from Frame Ground in the PG-Flex.

CKT GND and CO Battery Return are connected inside the PG-FLEX Line Unit but are not connected on the backplane.

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

Connector	Type	Function
TB1	Screw	Battery (-48V_A) for systems 1 and 2
TB2	Screw	Battery (-48V_B) for systems 3 and 4
TB3	Screw	CO battery return
G1	Screw	Frame Ground (Protection Ground)

Table 9. LAN Connector

Connector	Type	Function
J6	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 <i>n</i>	HDSL_ <i>n</i> _T1 HDSL_ <i>n</i> _R1	.045 in. Wire-wrap	Tip and Ring terminations for HDSL Pair #1 of System <i>n</i> to Remote Terminal <i>n</i> . The HDSL termination point for each system is: P5 for system 1, P6 for system 2, P7 for system 3, and P8 for system 4. -130 Vdc is simplexed on this line for powering the Remote Terminal.
System <i>n</i>	HDSL_ <i>n</i> _T2 HDSL_ <i>n</i> _R2	.045 in. Wire-wrap	Tip and Ring terminations for HDSL Pair #2 of System <i>n</i> to Remote Terminal <i>n</i> . The HDSL termination point for each system is: P5 for system 1, P6 for system 2, P7 for system 3, and P8 for system 4. +130 Vdc is simplexed on this line for powering the Remote Terminal.
System <i>n</i>	PWR_OUT T1 PWR_OUT R1	.045 in. Wire-wrap	System <i>n</i> auxiliary Power Pair #1. Used for auxiliary power to the RT when using a PG-Flex doubler unit.
System <i>n</i>	PWR_OUT T2 PWR_OUT R2	.045 in. Wire-wrap	System <i>n</i> auxiliary Power Pair #2. Used for auxiliary power to the RT when using a PG-Flex doubler unit.
System <i>n</i>	BYPASS_ <i>n</i> _T BYPASS_ <i>n</i> _R	.045 in. Wire-wrap	Termination for the metallic bypass pair into COT System <i>n</i> from RT <i>n</i> . The termination point for each system is: P13 for system 1, P14 for system 2, P15 for system 3, P16, for system 4. Do not connect metallic bypass pairs between PG-Flex systems or between other DLC systems.
System <i>n</i>	TEST_ <i>n</i> _T IN TEST_ <i>n</i> _R IN	.045 in. Wire-wrap	Test connection looking into the CO switch for the selected subscriber for System <i>n</i> . This connection must be set up through the PG-Flex RS-232 maintenance port. The termination point for each system is: P17 for system 1, P18 for system 2, P19 for system 3, and P20 for system 4.
System <i>n</i>	TEST_ <i>n</i> _T OUT TEST_ <i>n</i> _R OUT	.045 in. Wire-wrap	Test connection looking into the COT channel unit of the selected subscriber for System <i>n</i> . 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 <i>n</i> . The termination point for each system is: P17 for system 1, P18 for system 2, P19 for system 3, and P20 for system 4.
	CC1_TIP CC1_RING CC1_TERM	.045 in. Wire-wrap	Composite Clock #1 used for primary synchronization to CO timing. These pins (P21) can be cascaded. Terminate on the CC1_TERM pins on the last shelf in the cascade.
	CC2_TIP CC2_RING CC2_TERM	.045 in. Wire-wrap	Composite Clock #2 used for secondary synchronization to CO timing. These pins (P27) can be cascaded. Terminate on the CC2_TERM pins on the last shelf in the cascade.
	FRAME_GND CKT_GND	.045 in. Wire-wrap	Frame ground is isolated from CO battery ground in PG-Flex.
	EXT_ACO CKT_GND	.045 in. Wire-wrap	External Alarm Cutoff (P23, pins 1 and 2). A momentary connection between EXT_ACO and circuit ground silences the PG-Flex audible alarms.
	INHIBIT	.045 in. Wire-wrap	PGTC Inhibit connection pin should not be connected to any other Inhibit pins in PG-Flex or other DLC systems.
	BATT RTN CKT GND	.045 in. Wire-wrap	CO battery return (TB3). This is isolated from frame ground in PG-Flex.
	SPARE		P99 are spare pins.

* 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.

Table 13. Systems 1 through 4 Subscriber Subscriber Terminations

Channel Unit	Circuit	Conn Pn* Tip	Conn Pn* 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
BYPASS		50	25	VI/SL	SL/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	21	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 Sections 11 and 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 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 kohms.

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 wire gauge size increases, the transmission distance between the COT and the RT increases as the wire gauge becomes larger (such as, 19 AWG vs. 26 AWG). 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 PG-Flex COTS 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.

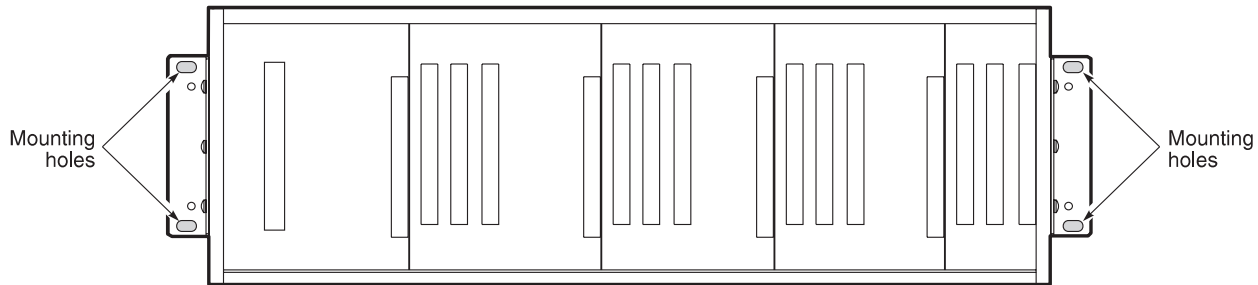


Figure 3. Mounting the FCS-719 COTS

8. Wiring

8.1 Sections 8.2 through 8.11 describe how to connect the FCS-719. Section 8.12 verifies the installation. All wiring to the COTS is performed on the back side of the backplane.



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

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

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

- 1 Remove the clear Plexiglas™ cover.
- 2 Remove the fuses in the equipment bay fuse panel for each circuit (two circuits—that is, -48V_A and -48V_B) where the PG-Flex CO battery wires 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.



The minimum frame ground wire size is 6 AWG.

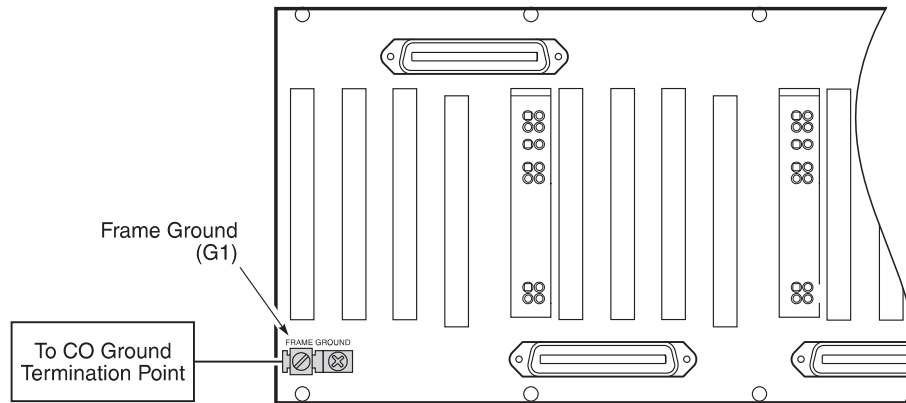


Figure 4. *Connecting the Frame Ground (Protection Ground)*

8.3 Connect the CO Battery (Figure 5). Connect the CO Battery (Figure 5). The FCS-719 List 4A COTS may be powered from a single battery feed or from a split battery feed where you would connect Battery A (-48V_A) for Systems 1 and 2, and Battery B (-48V_B) for Systems 3 and 4.

- 1 For split battery feed:
 - a Remove and discard the jumper between TB1 and TB2.
 - b Connect the wire used for the CO battery A to TB1 (-48V_A) termination point.
 - c Connect the wire used for the CO battery B to TB2 (-48V_B) termination point.
 - d Connect the wire for the CO battery return to TB3 (BATT RTN) termination point.
 - e Connect the CO battery return wire from TB3 on the COTS to the CO battery return termination point.
 - f Connect the CO battery wires from TB1 (-48V_A) and TB2 (-48V_B) on the COTS to the equipment bay fuse panel termination points.
- 2 For single battery feed:
 - a Connect the wire used for the CO battery A to TB1 (-48V_A) termination point.
 - b Connect the wire for the CO battery return to TB3 (BATT RTN) termination point.
 - c Connect the CO battery wires from TB1 (-48V_A) on the COTS to the equipment bay fuse panel termination points.

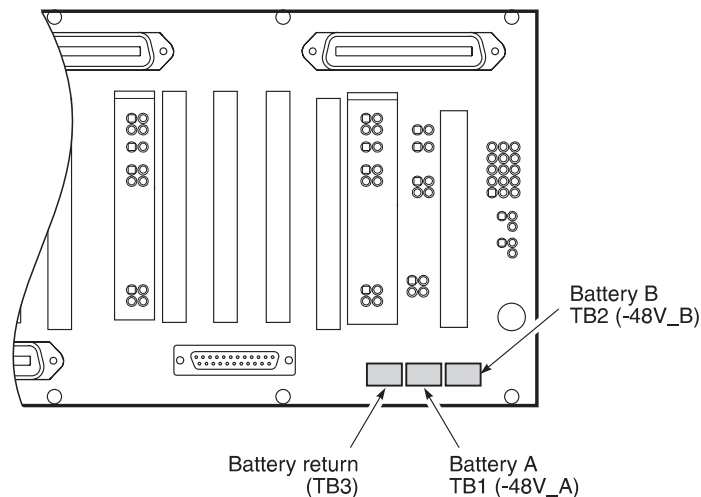


Figure 5. Connecting the CO Battery

8.4 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 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 shelf for system n .
- 3 Repeat steps 1 and 2 for each system installed.

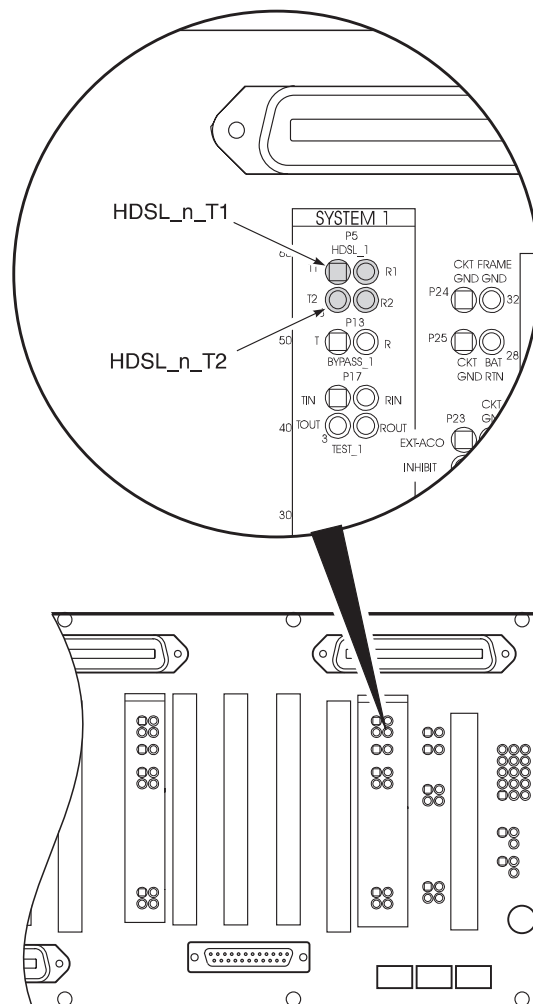


Figure 6. Connecting the HDSL Lines

8.5 Bypass Pairs.

If subscriber drop testing is required, connect the metallic bypass pairs (Figure 7). Note that *n* is:

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



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

- 1 For System *n*, 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 COTS.
- 2 Repeat step 1 for each system installed.

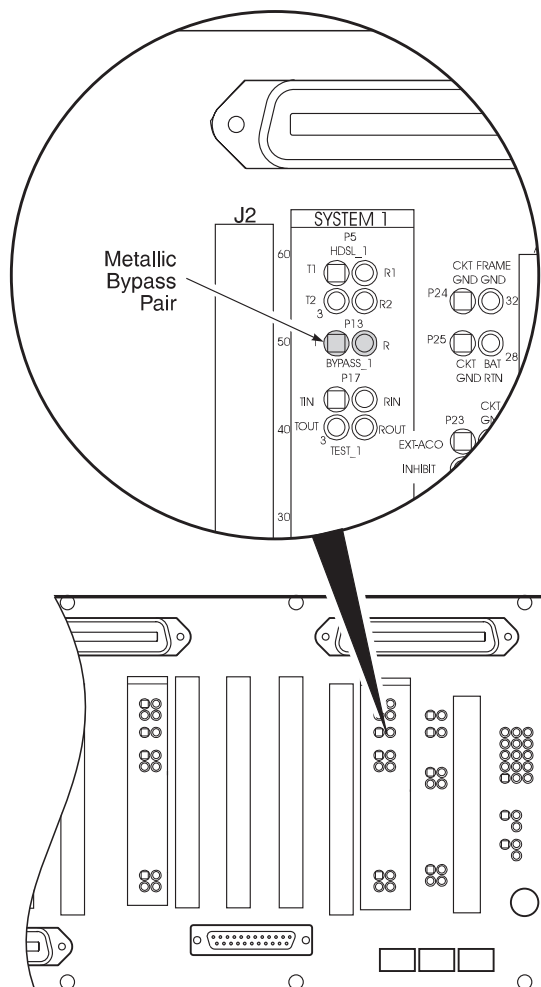


Figure 7. Connecting the Metallic Bypass Pair

8.6 Composite Clock. When required for digital services, connect the composite clock (Figure 8).

You can cascade the composite clock to other PG-Flex shelves.

- 1 Connect the composite clock leads from the primary master clock source in the CO to CC1_TIP and CC1_RING termination pins on the backplane.
- 2 Connect the composite clock leads from the secondary master clock source in the CO to CC2_TIP and CC2_RING termination pins on the backplane.
- 3 When cascading the composite clock to other PG-Flex shelves, install a jumper from CC1 TERM to CC1 TIP and from CC2 TERM to CC2 TIP only on the last shelf in the cascade.



The composite clock must be terminated only at the end of its cable.

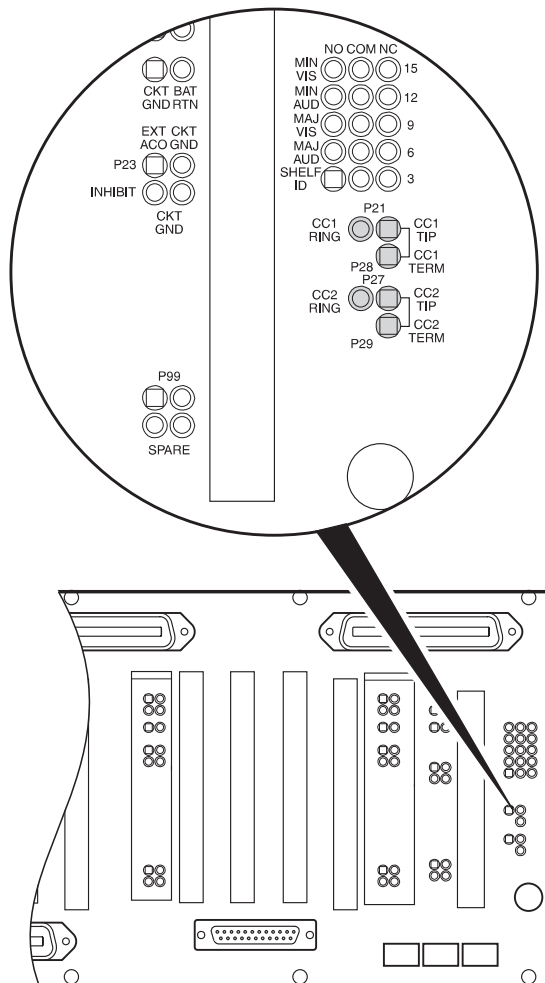


Figure 8. Connecting the Composite Clock and Alarms

8.7 Alarms. If external audible and 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 according to local practice, Figure 8, and Table 12.

8.8 External Alarm Cutoff (EXT_ACO, CKT_GND). A momentary connection between EXT_ACO (P23, pin 1) and CKT_GND (P23, pin 2) will silence the PG-Flex audible alarms (Figure 8, and Table 11).

8.9 Subscriber Lines. Connect the subscriber circuits to the subscriber terminations:

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

8.10 Auxiliary Power Pairs. When PG-Flex is used with a doubler, wire the auxiliary power pairs to the COTS (Figure 9) as follows:

- 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_2_T2 (Tip) and PWR_2_R2 (Ring) for system 2.
- 3 Repeat steps 1 and 2 when required for systems 2, 3, and 4.

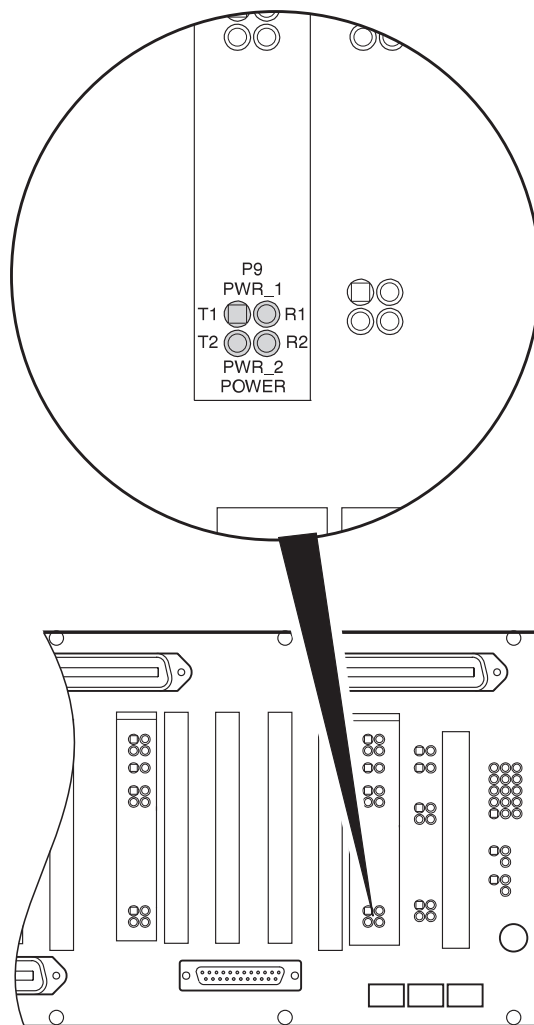


Figure 9. Installing the Auxiliary Power Pairs

- 8.11 Fuse.** When the FCS-719 List 4A COTS is configured for split power, insert a 6 amp fuse in the equipment bay's fuse panel for each circuit (two circuits) where the PG-Flex CO battery wires are terminated. When the FCS-719 List 4A COTS is powered from a single battery feed, insert a 10 amp fuse in the equipment bay's fuse panel where the PG-Flex CO battery wire is terminated.

8.12 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 (-48V_A) and TB3 (BATT RTN) screw terminals on the COTS.
- 2 When the COTS is split powered, verify that there is a minimum of -42 Vdc and a maximum of -56 Vdc between the TB2 (-48V_B) and TB3 (BATT RTN) screw terminals on the COTS.
- 3 Visually verify the HDSL lines are terminated properly and with the correct polarity.
- 4 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 kohm resistance between the Tip and Ring, Tip and Ground, and Ring and Ground of each of the HDSL circuits terminated on the shelf.
- 5 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, CA 92780-7013
ATTN: Repair and Return Dept.
- 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 4A COTS 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

ACO	Alarm Cut Off
CC1	Composite Clock 1
CC2	Composite Clock 2
CKT	Circuit
COTS	Central Office Terminal Shelf
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
PGTC	PairGain Test Controller
POTS	Plain Old Telephone Service
RT	Remote Terminal

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