PG-FLEX

TECHNICAL PRACTICE
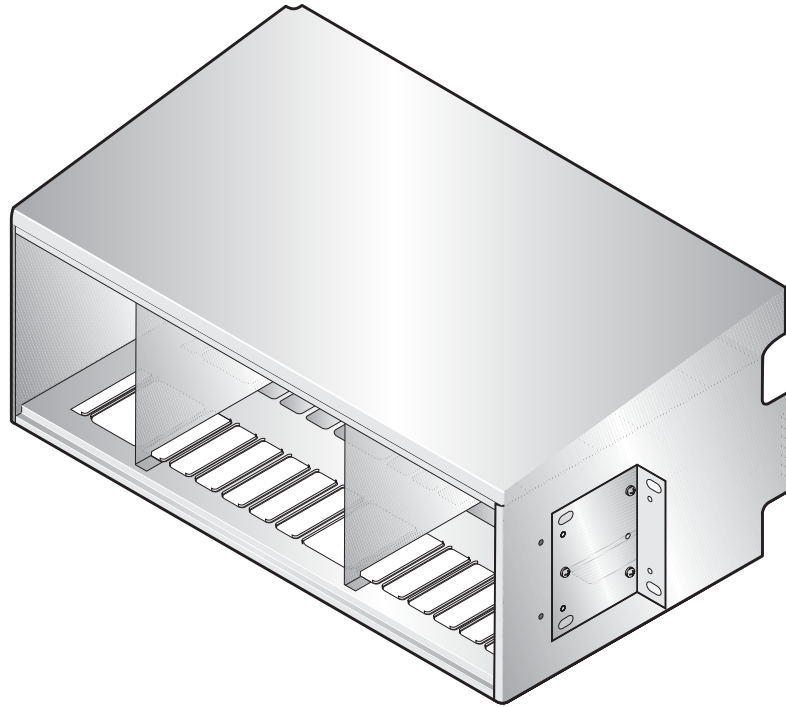
19" CENTRAL OFFICE TERMINAL SHELF

Model	List	CLEI Code
FCS-718	4B	VAMCLE0A~~

Revision History of This Practice

Revision	Release Date	Revisions Made
01	May 21, 1998	Initial Release
02	January 21, 2002	Release to rebrand document to comply with ADC standards
03	January 6, 2003	Updated Product Support Information

USING THIS TECHNICAL PRACTICE

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

Notes contain information about special circumstances.

Cautions indicate the possibility of equipment damage or the possibility of personal injury.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

PRODUCT OVERVIEW

Description and Features

The ADC® PG-Flex® FCS-718 List 4B 19-inch Central Office Terminal (COT) shelf supports (see Figure 1):

- one alarm unit or Pair Gain Test Controller (PGTC) interface unit (common to both systems)

- two PG-Flex subscriber carrier systems where each system comprises one line unit and from one to six channel units for a shelf maximum of two line units and 12 channel units

Additionally, the FCS-718 List 4B COT shelf provides backplane termination points for alarms, power, metallic bypass pairs, auxiliary power pairs when using a doubler, and subscriber circuits. The shelf provides cable adapters with 25-pair Amphenol connector terminations for the subscriber circuits.
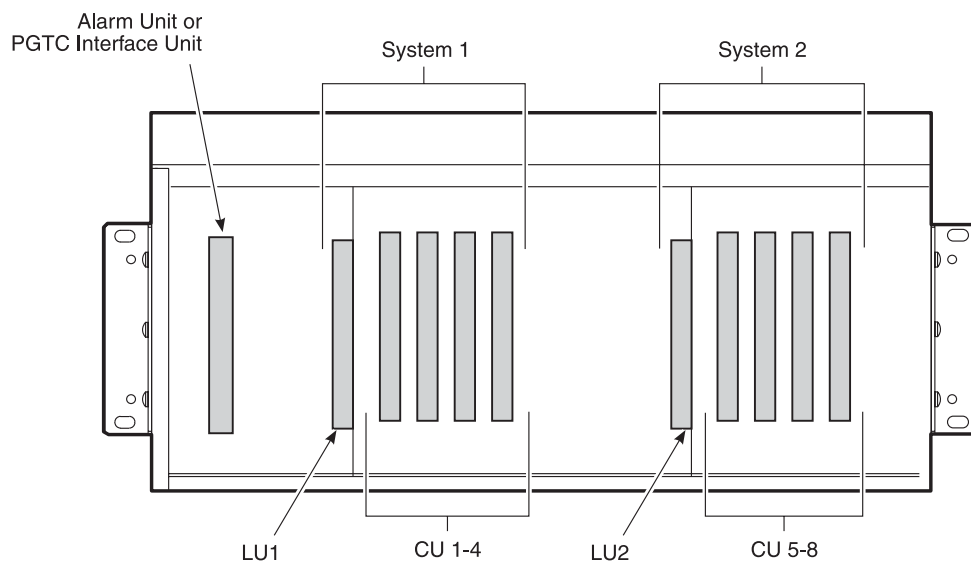
Figure 1. *FCS-718 List 4B COT Shelf*

> **Use the FCS-718 List 4B COT 19-inch shelf only with a List 4x (or higher) FRE-765 Remote Terminal (RT) enclosure.**

Features of the PG-Flex FCS-718 List 4B COT shelf are:

- universal mounting brackets for installing in a 19- or 23-inch equipment bay

- wire-wrap connections for High-bit-rate Digital Subscriber (HDSL), alarm, metallic bypass pairs, and auxiliary power pairs (when using a doubler)

- screw terminal connections for frame ground and dual Central Office (CO) battery

- DB-25 connector for Network Management Analysis (NMA) communications

- 25-pair Amphenol cable adapters for connection to CO switch subscriber lines

- 25-pair Amphenol connector for PGTC test interface

SPECIFICATIONS

Electrical Characteristics

Power .... –48Vdc 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 4000 m)

Physical

Mounting... 19- or 23-inch equipment rack using universal mounting brackets

Dimensions

Height.. 8.75 in. (22.2 cm.)

Width... 17.3 in. (43.9 cm.)

Depth... 11.8 in. (30.0 cm.)

Weight... 15.5 lb. (7.0 kg.)

FUNCTIONAL DESCRIPTION

Operational Capabilities

Each PG-Flex system (one line unit and from one to four channel units) shown in Figure 1 can support 24 or 32 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-718 List 4B COT 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 6 for each system.**

Table 1 and Table 2 show how to utilize channels, dependent on the channel unit (4 or 8 channels) and the type of subscriber service (POTS or ISDN) selected.

Table 1.   *Channel Unit Circuit Utilization*

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

Table 2.   *System 1 and 2 Circuit Assignments for COT Shelf*

System 1*					System 2*			
Line Unit	**CU 1 (CU 1)**	**CU 2 (CU2)**	**CU 3 (CU 3)**	**CU 4 (CU 4)**	**Line Unit**	**CU 7 (CU 1)**	**CU 8 (CU 2)**	**CU 9 (CU 3)**	**CU 10 (CU 4)**
1	Ckt 1	Ckt 1	Ckt 1	Ckt 1	2	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 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 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 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

* The Channel Unit (CU) numbers shown on top (CU 1 through CU 10) show how they are numbered when using a List 1 or 2 line unit. CU numbers in parentheses (CU 1 through Cu 4) show how channel units are numbered when using a List 3 or higher line unit, relative to each system.

Backplane Connections

The following information provides connector pinouts located on the backplane for an alarm or PGTC interface unit, line units, and channel units.

Table 3 lists the FCS-718 List 4 COT shelf connectors and where each is described in this practice. (Refer to Figure 1 for connector locations.)

__Table 3.__   *FCS-718 List 4B COT Shelf Card Connectors*

Connector/Fuse	Go to	On
Alarm Unit or PGTC Interface Unit	Table 4	Page 5
Line Unit Connectors (Systems 1 and 2)	Table 5	Page 6
Channel Unit Connectors (Systems 1 and 2)	Table 6	Pages 7 and 8

Use the information in Table 4 **through** Table 6 **for diagnostic and troubleshooting procedures under the direction of an authorized ADC 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	NMA_CD
2	CRIT_MAJ_NO	2	INHIBIT	2	CRIT_MAJ_COM
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	N/C
8	PGTC_RING3	8	OH2	8	N/C
9	PGTC_TIP4	9	OH3	9	TESTOUT-T_1
10	PGTC_RING4	10	OH4	10	TESTOUT-R_1
11	(BURN-IN)	11	PROCEED1	11	TESTOUT-T_2
12	LOCK1	12	PROCEED2	12	TESTOUT-R_2
13	LOCK2	13	PROCEED3	13	N/C
14	LOCK3	14	PROCEED4	14	N/C
15	LOCK4	15	SEIZE	15	N/C
16	TMAJ	16	SEZBY	16	N/C
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	N/C
21	N/C	21	N/C	21	N/C
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 (BATT)	30	N/C-	30	-48V_A (BATT)-
31	BATT_RTN	31	BATT_RTN	31	BATT_RTN
32	PROTGND	32	GND	32	GND

Table 5. *Line Unit Connectors*

System Line Unit Connector
J2 (System 1)
J10 (System 2)

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	BATT_RTN	12	BATT_RTN
13	-48_n	14	-48_n
15	-48V_x (BATT)	16	-48V_x (BATT)
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	GND = System 1 N/C = System 2
41	GND (CID2)	42	GND (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 for system 1 and 2 for system 2. Where x is A for system 1 and B for system 2.

Table 6.   *Channel Unit Connectors*

System Channel Unit Connector J3 (System 1) J11 (System 2)				System Channel Unit Connector J4 (System 1) J12 (System 2)			
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIP05_n	4	RING05_n	3	TIP13_n	4	RING13_n
5	TIP06_n	6	RING06_n	5	TIP14_n	6	RING14_n
7	TIP07_n	8	RING07_n	7	TIP15_n	8	RING15_n
9	TIP08_n	10	RING08_n1	9	TIP16_n	10	RING16_n
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN	12	BATT_RTN
13	-48_n	14	-48_n	13	-48_n	14	-48_n
15	-48V_x (BATT)	16	-48V_x (BATT)	15	-48V_x (BATT)	16	-48V_x (BATT)
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_n	34	+5_n	33	+5_n	34	+5_n
35	GND	36	GND	35	GND	36	GND
37	-5_n	38	-5_n	37	-5_n	38	-5_n
39	N/C	40	GND (CID3)	39	N/C	40	GND (CID3)
41	GND (CID2)	42	GND (CID1)	41	GND (CID2)	42	GND (CID1)
43	GND (CID0)	44	N/C	43	GND (CID0)	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	TIP09_n	52	RING09_n
53	TIP02_n	54	RING02_n	53	TIP10_n	54	RING10_n
55	TIP03_n	56	RING03_n	55	TIP11_n	56	RING11_n
57	TIP04_n	58	RING04_n	57	TIP12_n	58	RING12_n
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

* Where ***n*** is 1 for system 1 and 2 for system 2. Where ***x*** is A for system 1 and B for system 2.

Table 6. *Channel Unit Connectors (continued)*

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
System Channel Unit Connector **J5 (System 1)** **J13 (System 2)**				**System Channel Unit Connector** **J6 (System 1)** **J14 (System 2)**			
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIP21_n	4	RING21_n	3	TIP29_n	4	RING29_n
5	TIP22_n	6	RING22_n	5	TIP30_n	6	RING30_n
7	TIP23_n	8	RING23_n	7	TIP31_n	8	RING31_n
9	TIP24_n	10	RING24_n	9	TIP32_n	10	RING32_n
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN	12	BATT_RTN
13	-48_n	14	-48_n	13	-48_n	14	-48_1
15	-48V_x (BATT)	16	-48V_x (BATT)	15	-48V_x (BATT)	16	-48V_x (BATT)
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_n	34	+5_n	33	+5_n	34	+5_n
35	GND	36	GND	35	GND	36	GND
37	-5_n	38	-5_n	37	-5_n	38	-5_n
39	N/C	40	GND (CID3)	39	N/C	40	GND (CID3)
41	GND (CID2)	42	GND (CID1)	41	GND (CID2)	42	GND (CID1)
43	GND (CID0)	44	N/C	43	GND (CID0)	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	TIP17_n	52	RING17_n	51	TIP25_n	52	RING25_n
53	TIP18_n	54	RING18_n	53	TIP26_n	54	RING26_n
55	TIP19_n	56	RING19_n	55	TIP27_n	56	RING27_n
57	TIP20_n	58	RING20_n	57	TIP28_n	58	RING28_n
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

* Where n is 1 for system 1 and 2 for system 2. Where x is A for system 1 and B for system 2.

Table 7 lists the FCS-718 List 4B COT shelf backplane connectors and where each is described in this practice. (Refer to Figure 2 for connector locations.)

Table 7. *FCS-718 List 4 COT Shelf Backplane Connectors*

| Connector/Fuse	Go to	On
CO Battery TB1 (-48V_A) and TB2 (-48V_B), CO Battery Return TB3 (RTN_B), CO Battery Return TB4 (RTN_A), and Frame Ground (G1)	Table 8	Page 10
LAN connector (J21)	Table 9	Page 10
Data connector (J18)	Table 10	Page 10
HDSL, Auxiliary Power Pairs, Bypass Pair, Channel Unit Test, Composite Clock, Frame Ground, External Alarm Cutoff (not shown in Figure 2)	Table 13	Page 16
Alarm Terminations (see Figure 8)	Table 14	Page 20
System 1 Subscriber Terminations (P1, P3)	Table 15	Page 22
System 2 Subscriber Terminations (P2, P4)	Table 16	Page 23
PGTC test interface (P12)	Table 17	Page 24
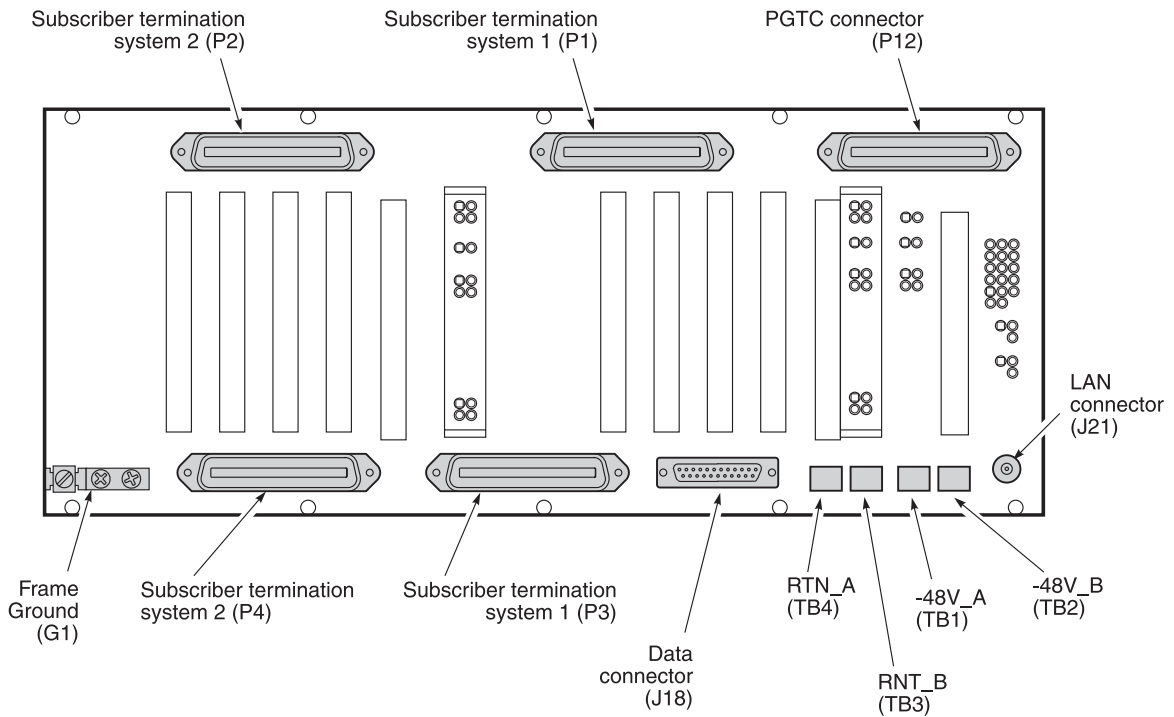
Figure 2. *FCS-718 List 4B COT Shelf Backplane*

CO battery return (RTN_A, RTN_B) is separate from frame ground (G1) in PG-Flex equipment.

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 system 1
TB2	Screw	Battery (-48V_B) for system 2
TB3	Screw	CO battery return B (RTN_B)
TB4	Screw	CO battery return A (RTN_A)
G1	Screw	Frame ground (Protection ground)

Table 9.   *LAN Connector*

Connector	Type	Function
J21	BNC	(Not currently used)

Table 10.   *Data Connector*

DB-25 (F) Pins	Function
1	Frame Ground (GND)
2	Transmit Data
3	Receive Data
6	Data Set Ready
7	Signal Common (GND)
8	Carrier Detect
15	Transmit Clock
17	Receive Clock
20	(Not currently used)

INSTALLATION AND TEST

Unpacking

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 ADC. 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 ADC as described in the Product Support section. If you must store the equipment for a prolonged period, store the equipment in its original container.

Selecting HDSL Lines

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

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

•   nonloaded cable only

•   multi-gauge restricted to two gauge changes, except for stubbing or fusing

•   total bridge taps cannot exceed 2.5 kft. No single bridge tap may exceed 2.0 kft

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 wire gauge
(19 AWG vs. 26 AWG), the greater the distance between the COT and the RT. Table 11 and Table 12 identify these distances (at a cable temperature of 68°F).

Table 11.   *12 and 24 Channel HDSL Transmission Distance*

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

Table 12.   *16 and 32 Channel HDSL Transmission Distance*

Gauge	Loop Length	Resistance
19 AWG	19.4 kft	312 Ω
0.9 mm	5.9 km	
22 AWG	13.7 kft	444 Ω
0.6 mm	4.2 km	
24 AWG	10.7 kft	554 Ω
0.5 mm	3.3 km	
26 AWG	8.1 kft	672 Ω
0.4 mm	2.5 km	

Mounting

The FCS-718 List 4B COT shelf mounts in a standard 19- or 23-inch CO equipment bay. When installing the FCS-718 List 4B COT shelf into a 23-inch frame, use rack adapters or reverse the mounting bracket (short flange against the shelf). The shelf has a mounting height requirement of 8.75 inches.

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

2   Install the mounting screws.
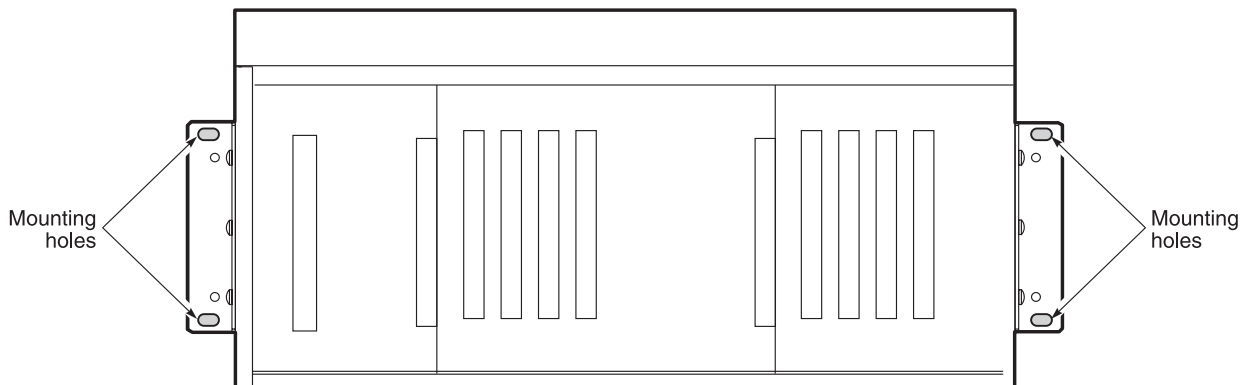
Figure 3. *Mounting the FCS-718 COT Shelf*

Wiring

The sections below describe how to wire the FCS-718 List 4B COT shelf. See the Cabling Verification section to verify the installation. Perform all wiring to the FCS-718 List 4B COT shelf on the back side of the shelf (see Figure 2).

> **Follow the provisions of the current edition of the National Electric Code for wiring external to the product(s).**
>
> **Use 12 AWG or larger wire (or multiple wires of a smaller gauge) to ensure good power connections to PG-Flex equipment.**

Before You Begin

1   Remove the clear Plexiglas™ from the backplane.

2   Remove the fuses in the equipment bay fuse panel for each circuit (two circuit, -48V_A and -48V_B) where the PG-Flex CO battery wires will be terminated.

Connect the Frame Ground

Follow the instructions below and refer to Figure 4 to connect the frame ground.

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

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

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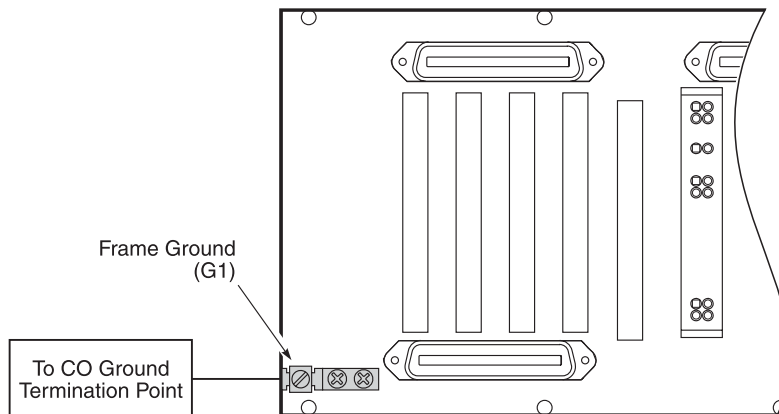

Figure 4. *Connecting the Frame Ground*

Connect the CO Battery

The FCS-718 List 4B COT shelf may be powered from a single battery feed or from a split battery feed where you would connect Battery A (-48V_A) for system 1, and Battery B (-48V_B) for system 2. (Refer to Figure 5 for battery terminal locations.)

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

1   For single battery feed:

  a   Connect the wires from the CO battery and the CO battery return to TB1 (-48V_A) and TB4 (RTN_A) screw terminals.

  b   Connect the CO battery return wire from TB4 (RTN_A) on the FCS-718 List 4B COT shelf to the CO battery ground return termination point.

  c   Connect the CO battery wire from TB1 (-48V_A) on the FCS-718 List 4B COT shelf to the equipment bay fuse panel termination point.

2   For split battery feed:

  a   Remove and discard the jumper between TB1 and TB2.

  b   Connect the wire from CO battery A to TB1 (-48V_A) termination point.

  c   Connect the wire from CO battery B to TB2 (-48V_B) termination point.

  d   Connect the wire for the CO battery return A to TB4 (RTN_A) termination point.

  e   Connect the wire for the CO battery return B to TB3 (RTN_B) termination point.

  f   Connect the CO battery return wire from TB4 (on the FCS-718 List 4B COT shelf) to the CO battery return termination point.

  g   Connect the CO battery return wire from TB3 (on the FCS-718 List 4B COT shelf) to the CO battery return termination point.

  h   Connect the CO battery wires from TB1 (on the FCS-718 List 4B COT shelf) to the equipment bay fuse panel termination points.

  i   Connect the CO battery wires from TB2 (on the FCS-718 List 4B COT shelf) to the equipment bay fuse panel termination points.
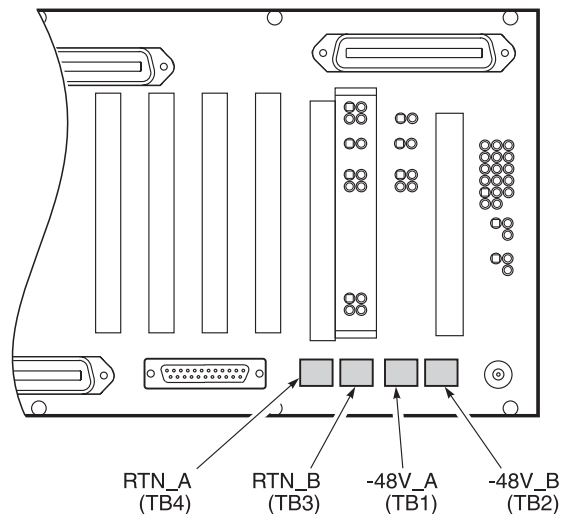

RTN_A   RTN_B   -48V_A   -48V_B
(TB4)   (TB3)   (TB1)   (TB2)

Figure 5. *Connecting the CO Battery*

Connect the HDSL Pairs

Connect the HDSL lines as shown in Figure 6 (refer to Table 13 for HDSL terminations and functions):

1   For System 1 installation:

    a   Connect HDSL Pair #1 on System 1 onto wire-wrap pins HDSL_1_T1 (Tip) and HDSL_1_R1 (Ring) on the FCS-718 List 4B COT shelf.

    b   Connect HDSL Pair #2 on System 1 onto wire-wrap pins HDSL_1_T2 (Tip) and HDSL_1_R2 (Ring) on the FCS-718 List 4B COT shelf.

2   For System 2 installation:

    a   Connect HDSL Pair #1 on System 2 onto wire-wrap pins HDSL_2_T1 (Tip) and HDSL_2_R1 (Ring) on the FCS-718 List 4B COT shelf.

    b   Connect HDSL Pair #2 on System 2 onto wire-wrap pins HDSL_2_T2 (Tip) and HDSL_2_R2 (Ring) on the FCS-718 List 4B COT shelf.

> **For ease of identification and added safety, install the red vinyl caps (provided) over the HDSL wire-wrap pins.**
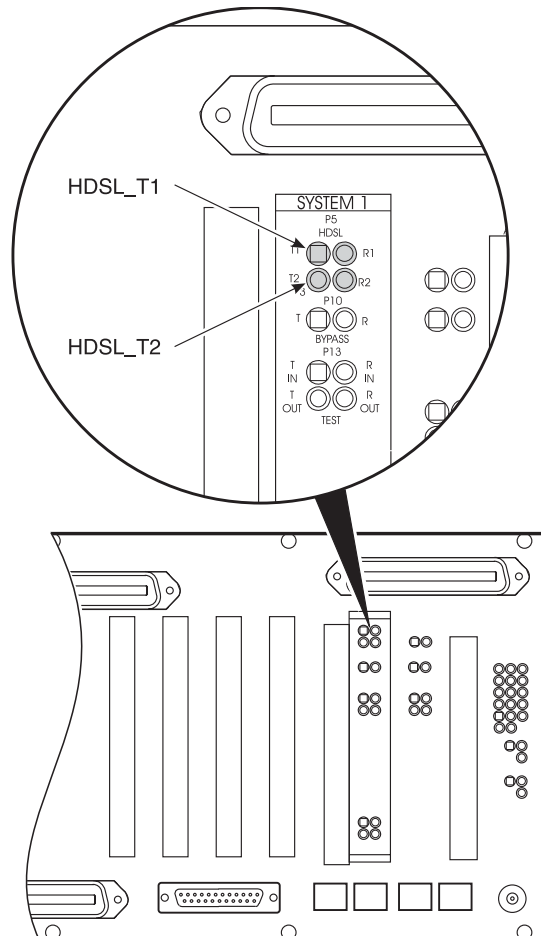

Figure 6. *Connecting the HDSL Pairs*

Table 13. *HDSL, Test, And Miscellaneous Terminations*

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* Power Pair #1. Used for auxiliary RT power when a doubler is used.
System *n*	PWR_*n*_T2 PWR_*n*_R2	.045 in. Wire-Wrap	System *n* Power Pair #2. Used for auxiliary RT power 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 toward the CO switch for the selected subscriber for System *n*. This connection must be set up through the PG-Flex Craft port.
System *n*	TEST_*n*_T_OUT TEST_*n*_R_OUT	.045 in. Wire-Wrap	Test connection looking toward the subscriber for the selected subscriber for System *n*. This connection must be set up through the PG-Flex Craft port.
	CC1_TIP CC1_RING CC1 TIP TERM	.045 in. Wire-Wrap	Composite Clock #1. Used for primary synchronization to CO timing. When cascaded, terminate only on the last shelf in the cascade. A 133 Ω termination resistor (provided on the COT shelf backplane) is placed across CC1_TIP and CC1_RING by installing a jumper between CC1_TIP and CC1_TERM.
	CC2_TIP CC2_RING CC2_TERM	.045 in. Wire-Wrap	Composite Clock #2. Used for secondary synchronization to CO timing. When cascaded, terminate only on the last shelf in the cascade. A 133 Ω termination resistor (provided on the COT shelf backplane) is placed across CC2_TIP and CC2_RING by installing a jumper between CC2_TIP and CC2_TERM.
	FRAME_GND	.045 in. Wire-Wrap	Frame ground (G1). This is isolated from CO battery return in PG-Flex.
	EXT_ACO CKT_GND	.045 in. Wire-Wrap	External Alarm Cutoff. A momentary connection between EXT_ACO and circuit ground silences PG-Flex audible alarm relays.
	INHIBIT †	.045 in. Wire-Wrap	When a PGTC interface card is installed, the PGTC inhibit connection pin is used to sense whether a shared bypass pair is available or is currently in use by another system under test.
	BAT RTN CKT GND	.045 in. Wire-Wrap	CO battery return. This is isolated from frame ground in PG-Flex.

* Where *n* is 1 for System 1 and 2 for System 2.

† Connecting the inhibit pins of multiple PG-Flex systems that are sharing the same bypass pair prevents other systems from attempting to use the bypass pair when it is currently in use by another system. The inhibit pin is grounded when the bypass pair is in use, and -48 Vdc when the bypass pair in inactive (available).

Bypass Pairs

If subscriber drop testing is required, connect the metallic bypass pair from the RT enclosure to the FCS-718 List 4B COT shelf backplane as shown in Figure 7 (refer to Table 13 for bypass pair teminations and functions). The bypass pairs can be connected directly to each PG-Flex FCS-718 List 4B COT shelf, or shared between other PG-Flex shelves.

Connecting Bypass Pairs

To connect the bypass pairs to a FCS-718 List 4B COT shelf, do the following (Refer to Figure 7 for the bypass pair locations):

    1   For System 1 installation, connect the metallic bypass pair from the Main Distribution Frame (MDF) to wire-wrap posts BYPASS_1_T and BYPASS_1_R on the FCS-718 List 4B COT shelf.

    2   For System 2 installation, connect the metallic bypass pair from the MDF to wire-wrap posts BYPASS_2_T and BYPASS_2_R on the FCS-718 List 4B COT shelf.

Connecting Shared Bypass Pairs

To share bypass pairs between PG-Flex shelves do the following (Refer to Figure 7 for the bypass pair locations):

> **When metallic bypass pairs are shared between PG-Flex shelves or to other Digital Loop Carrier (DLC) systems, the INHIBIT lead must be connected between each shelf sharing the bypass pair.**

1   Connect the metallic bypass pair from the Main Distribution Frame (MDF) to wire-wrap posts BYPASS_*n*_T and BYPASS_*n*_R on the backplane on the first FCS-718 List 4B COT shelf sharing the bypass pair.

2   Connect the metallic bypass pair BYPASS_*n*_T and BYPASS_*n*_R on the first COT to the next bypass pair terminations on the next COT shelf sharing the bypass pair.

3   Connect the INHIBIT line from the first COT shelf to the next FCS-718 List 4B COT shelf sharing the metallic bypass pair.

4   Repeat steps 2 and 3 for each PG-Flex shelf in the cascade.

> **The INHIBIT lead is used only when the metallic bypass pair is shared between two, or more, systems installed in more than one shelf.**
>
> **An FPI-729 PGTC interface unit or FAU-728 List 2 alarm unit must be installed in each PG-Flex shelf where the INHIBIT lead is used.**
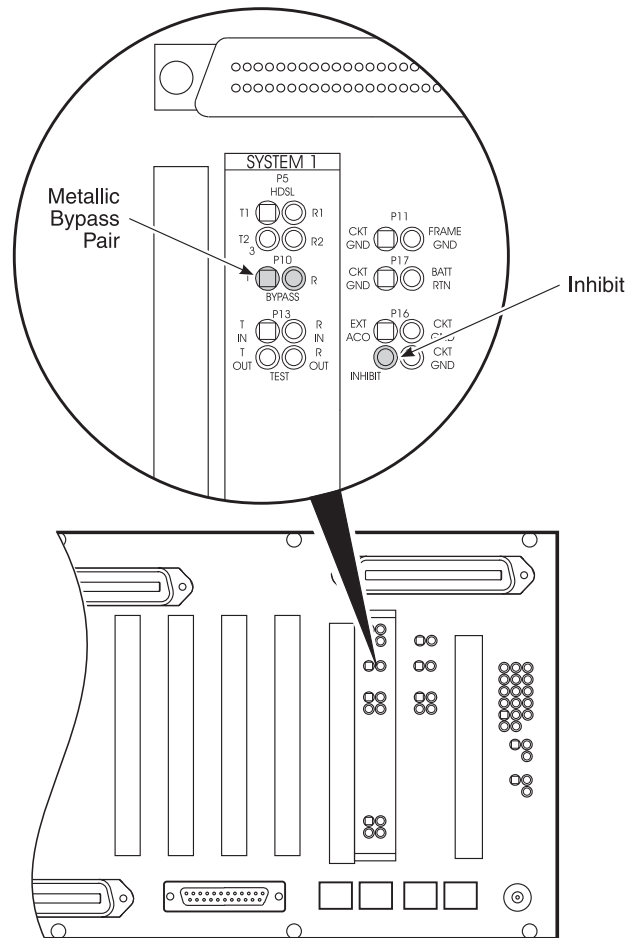
Figure 7. *Connecting the Metallic Bypass Pair*

Composite Clock

When required for digital services, connect the composite clock (CC1, CC2) as shown in Figure 8 (refer to Table 13 for composite clock terminations and functions). You can cascade the composite clock to other PG-Flex shelves. When cascading the composite clock to other PG-Flex shelves, terminate only on the last shelf in the cascade.

1 Connect the primary composite clock leads from the master clock source in the CO to CC1_TIP and CC1_RING wire-wrap pins on the backplane.

2 Connect the secondary composite clock leads from the master clock source in the CO to CC2_TIP and CC2_RING wire-wrap pins on the backplane.

> **If the composite clock is connected, it must be terminated by connecting a jumper from CC1_TIP to CC1_TERM wire-wrap pins, and from CC2_TIP to CC2_TERM wire-wrap pins at the last shelf in the cascade.**

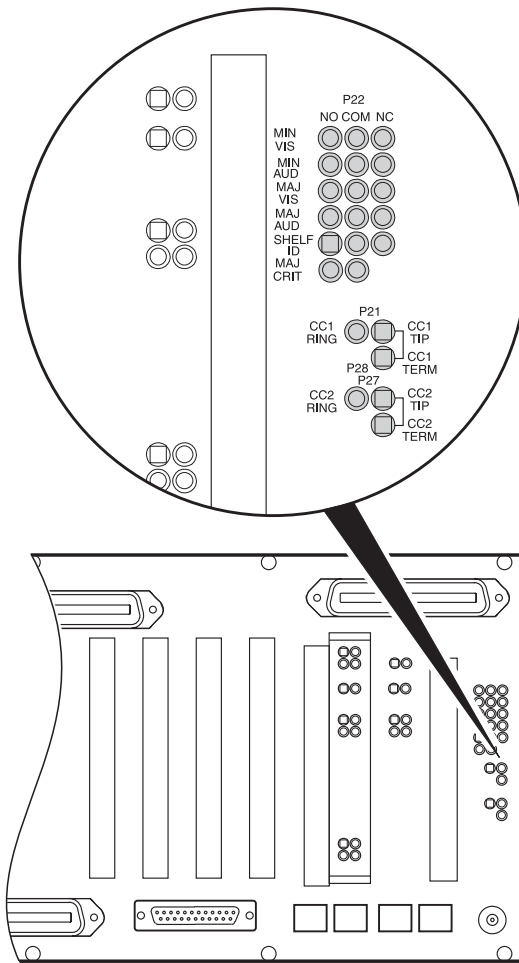**Figure 8.** *Connecting the Composite Clock and Alarms*

Alarms

If external audible or visual alarm indications are required, connect the audible and visual alarm leads from the CO alarm panel to the FCS-718 List 4B COT shelf alarm wire-wrap pins according to local practice. (Refer to Figure 8 for alarm wire-wrap pin locations and Table 14 for alarm terminations).

Table 14. *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 (located on the front panel of the channel unit). 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.
MAJ_CRIT		17	18	Not currently supported.

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

Subscriber Lines

Connect the subscriber lines (see Figure 9):

1   For PG-Flex system 1, connect the CO switch cables to the P1 and P3 terminations. Refer to Table 15 for subscriber terminations.

2   For PG-Flex system 2, use, connect the CO switch cables to the P2 and P4 terminations. Refer to Table 16 for subscriber terminations.
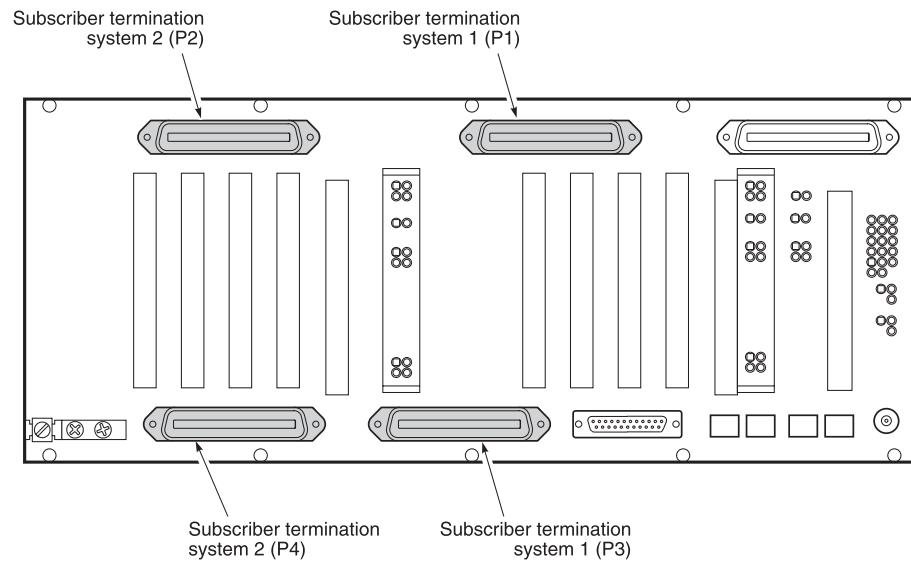
Subscriber termination
system 2 (P2)

Subscriber termination
system 1 (P1)

Subscriber termination
system 2 (P4)

Subscriber termination
system 1 (P3)

Figure 9. *Connecting the Subscriber Lines*

Table 15. *System 1 Subscriber Terminations*

CU	Circuit	Conn P1 Tip	Conn P1 Ring	Tip	Ring	Conn P3 Tip	Conn P3 Ring	Circuit	CU
	1	26	1	WH/BL	BL/WH	26	1	1	
	2	27	2	WH/OR	OR/WH	27	2	2	
	3	28	3	WH/GN	GN/WH	28	3	3	
	4	29	4	WH/BN	BN/WH	29	4	4	
1	5	30	5	WH/SL	SL/WH	30	5	5	4
	6	31	6	RD/BL	BL/RD	31	6	6	
	7	32	7	RD/OR	OR/RD	32	7	7	
	8	33	8	RD/GN	GN/RD	33	8	8	
	1	34	9	RD/BN	BN/RD	34	9	1	
	2	35	10	RD/SL	SL/RD	35	10	2	
	3	36	11	BK/BL	BL/BK	36	11	3	
	4	37	12	BK/OR	OR/BK	37	12	4	
2	5	38	13	BK/GN	GN/BK	38	13	5	5
	6	39	14	BK/BN	BN/BK	39	14	6	
	7	40	15	BK/SL	SL/BK	40	15	7	
	8	41	16	YL/BL	BL/YL	41	16	8	
	1	42	17	YL/OR	OR/YL	42	17	1	
	2	43	18	YL/GN	GN/YL	43	18	2	
	3	44	19	YL/BN	BN/YL	44	19	3	
	4	45	20	YL/SL	SL/YL	45	20	4	
3	5	46	21	VI/BL	BL/VI	46	21	5	6
	6	47	22	VI/OR	OR/VI	47	22	6	
	7	48	23	VI/GN	GN/VI	48	23	7	
	8	49	24	VI/BN	BN/VI	49	24	8	

Shaded terminations are used only with 8 channel POTS and DDS CUs.

Table 16. *System 2 Subscriber Terminations*

CU*	Circuit	Conn P2 Tip	Conn P2 Ring	Tip	Ring	Conn P4 Tip	Conn P4 Ring	Circuit	CU*
7 **(1)**	1	26	1	WH/BL	BL/WH	26	1	1	**10** **(4)**
	2	27	2	WH/OR	OR/WH	27	2	2	
	3	28	3	WH/GN	GN/WH	28	3	3	
	4	29	4	WH/BN	BN/WH	29	4	4	
	5	30	5	WH/SL	SL/WH	30	5	5	
	6	31	6	RD/BL	BL/RD	31	6	6	
	7	32	7	RD/OR	OR/RD	32	7	7	
	8	33	8	RD/GN	GN/RD	33	8	8	
8 **(2)**	1	34	9	RD/BN	BN/RD	34	9	1	**11** **(5)**
	2	35	10	RD/SL	SL/RD	35	10	2	
	3	36	11	BK/BL	BL/BK	36	11	3	
	4	37	12	BK/OR	OR/BK	37	12	4	
	5	38	13	BK/GN	GN/BK	38	13	5	
	6	39	14	BK/BN	BN/BK	39	14	6	
	7	40	15	BK/SL	SL/BK	40	15	7	
	8	41	16	YL/BL	BL/YL	41	16	8	
9 **(3)**	1	42	17	YL/OR	OR/YL	42	17	1	**12** **(6)**
	2	43	18	YL/GN	GN/YL	43	18	2	
	3	44	19	YL/BN	BN/YL	44	19	3	
	4	45	20	YL/SL	SL/YL	45	20	4	
	5	46	21	VI/BL	BL/VI	46	21	5	
	6	47	22	VI/OR	OR/VI	47	22	6	
	7	48	23	VI/GN	GN/VI	48	23	7	
	8	49	24	VI/BN	BN/VI	49	24	8	

* The CU numbers in parentheses are for a List 3 or higher LU. The numbers not in parentheses are for a List 1 or 2 LU.

Shaded terminations are used only with 8 channel POTS and DDS CUs.

PGTC Connection

Connect the PGTC test interface cable to connector P12 (see Figure 10). Refer to Table 17 for PGTC Telco connector pinouts.
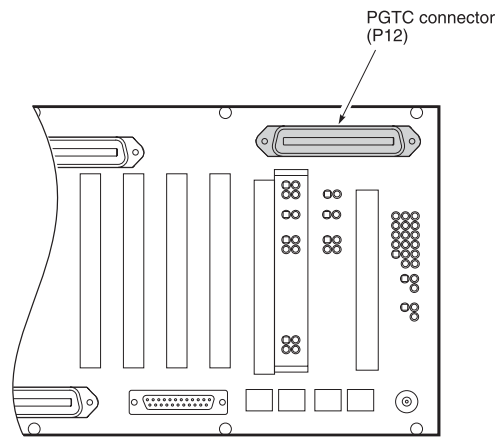

Figure 10. Connecting the PGTC Telco Test Interface Cable

Table 17.   PGTC Telco Connector P12

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

Auxiliary Power Pairs

When a PG-Flex system is used with a doubler, wire the FCS-718 List 4B COT shelf as shown in Figure 11 (refer to Table 11 for auxiliary power pair terminations and functions):

1   Wire-wrap auxiliary power pair 1 to PWR_OUT_T1 (Tip) and PWR_OUT_R1 (Ring) for system 1.

2   Wire-wrap auxiliary power pair 2 to PWR_OUT_T2 (Tip) and PWR_OUT_R2 (Ring) for system 1.

3   Repeat steps 1 and 2 when required for system 2.

> **For ease of identification and added safety, install the red vinyl caps (provided) over the auxiliary power pair wire-wrap pins.**
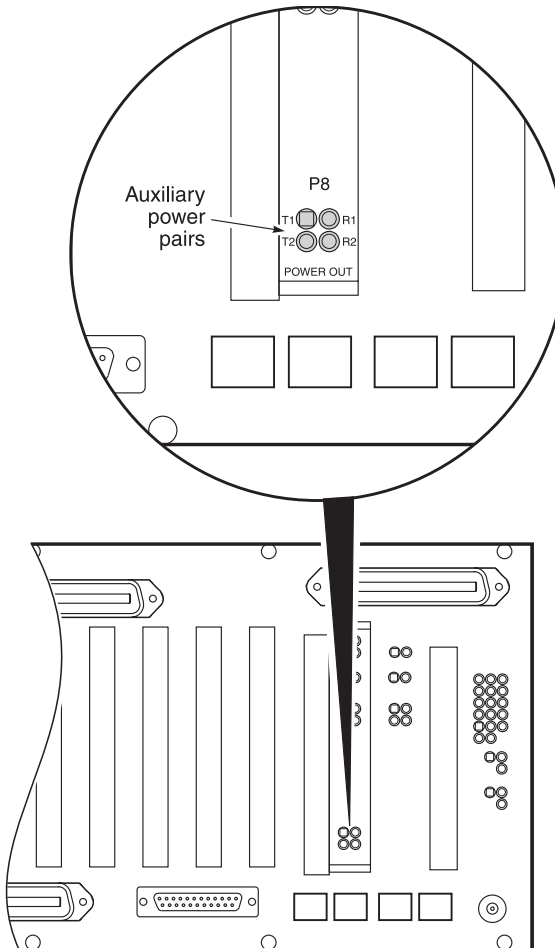

Figure 11. *Connecting the Auxiliary Power Pairs*

Fuse

The FCS-718 List 4B COT shelf can be configured for split power or a single battery feed. When configured for split power, insert a 3 amp fuse in the equipment bay's fuse panel for each of the two circuits where the PG-Flex CO battery wires are terminated. When the shelf is powered from a single battery feed, insert a 5 amp fuse in the equipment bay's fuse panel where the PG-Flex CO battery wire is terminated.

Cabling Verification

> **The following verifications should be done before any cards are inserted in the FCS-718 List 4B COT shelf.**

1   Verify a minimum of -42 Vdc and a maximum of -56 Vdc between TB1 (–48V_A) and TB4 (RTN_A) screw terminals on the FCS-718 List 4B COT shelf.

2   When the COT shelf 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 (RTN_B) screw terminals on the COT shelf.

3   Verify the following for the HDSL lines:

> **If the HDSL lines are not connected properly, the COT will not communicate with the RT.**

   a   Visually check that the HDSL lines are properly terminated and with the correct orientation.

   b   Verify that the HDSL lines are "dry."

   c   Verify 0 Vdc between the Tip and Ring, Tip and Ground, and Ring and Ground for each of the HDSL circuits terminated on the shelf.

   d   Verify > 100 kΩ resistance between the Tip and Ring, Tip and Ground, and Ring and Ground for each of the HDSL circuits terminated on the shelf.

4   Replace the clear Plexiglas cover on the rear of the FCS-718 List 4B COT shelf.

Turn-Up and Testing

Refer to the COT or RT line unit technical practices for complete turn up and testing procedures.

Troubleshooting

Refer to the COT or RT line unit technical practices for complete troubleshooting procedures.

PRODUCT SUPPORT

TECHNICAL SUPPORT

Technical Assistance is available 24 hours a day, 7 days a week by the contacting Customer Service Engineering group at:

Telephone: 800.366.3891
The 800 telephone support line is toll-free in the U.S. and Canada.

Email: wsd_support@adc.com

Knowledge   http://adc.com/Knowledge_Base/index.jsp
Base:

Web: www.adc.com

LIMITED WARRANTY

Product warranty is determined by your service agreement. Refer to the ADC Warranty/Software Handbook for additional information, or contact your sales representative or Customer Service for details.

RETURNS

To return equipment to ADC:

1 Locate the number of the purchase order under which the equipment was purchased. To obtain a return authorization number, you need to provide the original purchase order number to ADC's Return Material Authorization (RMA) Department.

2 Call or write ADC's RMA Department to ask for an RMA number and any additional instructions. Use the telephone number, fax number or email address listed below:

  • Telephone: 800.366.3891

  • Email Address: rma@ADC.com

3 Include the following information, in writing, along with the equipment you are returning:

  • Company name and address.

  • Contact name and telephone number.

  • The shipping address to which ADC should return the repaired equipment.

  • The original purchase order number.

  • A description of the equipment that includes the model and part number of each unit being returned, as well as the number of units that you are returning.

  • The reason for the return. For example:

    – The equipment needs an ECO/ECN upgrade.

    – The equipment is defective.

If the equipment is defective, please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.

If there is another reason for returning the equipment, please let us know so we can determine how best to help you.

4   Pack the equipment in a shipping carton.

5   Write ADC's address and the RMA Number you received from the RMA Department clearly on the outside of the carton and return to:

ADC DSL Systems, Inc.
14352 Franklin Ave.
Tustin, CA 92780-7013

Attention: **RMA (Number)**

All shipments are to be returned prepaid. ADC will not accept any collect shipments.

FCC CLASS A COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, 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 use will be required to correct the interference at his own expense.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by ADC Technologies, Inc. voids the user's warranty.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code.

ACRONYMS

ACO	Alarm Cutoff
AWG	American Wire Gauge
CC1, CC2	Composite Clock #1 and #2
COT	Central Office Terminal
CU	Channel Unit
DDS	Dataphone Digital Service
DLC	Digital Loop Carrier
FCS	PG-Flex Central Office Terminal Shelf
HDSL	High bit-rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LU	Line Unit
MDF	Main Distribution Frame
NMA	Network Management Analysis
PGTC	Pair Gain Test Controller
POTS	Plain Old Telephone Service
RT	Remote Terminal

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ISO 9001

DNV

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