PAIRGAIN TECHNOLOGIES PG-FLEX™ CO TERMINAL SHELF MODEL FCS-718, List 1

PairGain #150-1318-01

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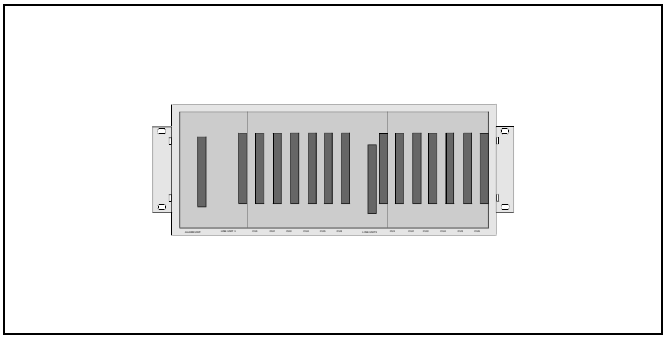

Figure 1. Front View of FCS-718 COT Shelf, List 1. The PairGain FCS-718 provides for mounting Alarm, Line, and Channel Units and termination of subscriber circuits.

CAUTION
This product incorporates static sensitive components. Proper electrostatic discharge procedures must be followed.

Power Input is Limited
For Use Only with Class II
Power Sources Rated
48 VDC 8 Amp Maximum

A. PRODUCT OVERVIEW

1. DESCRIPTION AND FEATURES

1.01 The PG-Flex FCS-718 19" Central Office Terminal (COT) Shelf (Figure 1) provides convenient mounting of COT Alarm, Line, and Channel Units, as well as termination points for subscriber circuits, alarm, power, and metallic test access. All circuit boards are installed from the front of the shelf; interconnections are located on the passive backplane at the rear of the shelf.

1.02 The COT shelf accommodates the following PG-Flex units:

- One Alarm Unit
- Two Line Units
- Twelve Channel Cards

1.03 Revision History of this practice.

Revision 01

February 12, 1996

a) Initial release.

1.04 PG-Flex FCS-718, List 1, COT Shelf features:

- Universal mounting brackets for installing in 19- or 23-inch equipment racks
- Backplane wire-wrap connections for HDSL line pairs and alarm relays
- Backplane screw terminal connections for CO battery and frame ground
- Backplane DB-25 connector for NMA communications
- Backplane Amphenol 25-pair connectors for connection to CO lines
- Backplane Amphenol 25-pair connector for PGTC Test Interface

2. SPECIFICATIONS

Operating Temperature & Humidity (non-condensing)

-40° to +65° Celsius, 5% to 95%

Operating Elevation

200 feet (60 m) below sea level to 13,000 feet (4,000 m) above sea level.

Mounting

19" or 23" equipment racks using universal mounting brackets**.**

Dimensions

Height:	7.00"	(17.8 cm)
Width:	17.25"	(43.8 cm)
Depth:	11.75"	(29.9 cm)

Weight

11.1 lb. (5.0 kg)

3. CERTIFICATION

3.01 **FCC Compliance.** The FCS-718 COT Shelf complies 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.

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

- Cabling
- Proper connections
- Grounding

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

4. WARRANTY

4.01 PairGain Technologies warrants this product to be free of defects and to be fully functional for a period of 36 months 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.

4.02 This module 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.

4.03 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 92680
ATTN: Repair and Return Dept.
(800) 638-0031

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

B. FUNCTIONAL DESCRIPTION

5. OPERATIONAL CAPABILITIES

5.01 The COT shelf mounts in standard 19" or 23" central office frames and requires four standard vertical mounting spaces. The shelf accepts any of the following plug-in units:

- Line Units
- Alarm Unit
- Channel Units

5.02 Each shelf can support two Subscriber Carrier systems; each system requires one Line Unit and one Channel Unit. Each shelf can contain up to two Line Units (one per system), 12 Channel Units (six per system) and one Alarm Unit (common to both systems). The COT is powered from -48 V dc CO battery.

6. BACKPLANE CONNECTIONS

6.01 The backplane of the FCS-718 COT Shelf (Figure 2) contains the following connectors:

- CO Power (Table 1)
- Local Area Network (Table 2)
- Data (Table 3)
- HDSL, Test, and Miscellaneous (Table 4)
- Alarm (Table 5)
- Subscriber Line (Tables 6 through 9)
- PGTC Test Interface (Table 10)

6.02 Tables 1 through 10 identify each connector by type and list the function of each connector terminal.

TABLE 1. COT SHELF CONNECTORS (CO POWER)

Connector	*Type*	*Function*
TB1 -48V	Screw	CO battery (-48 V dc)
TB2 GND	Screw	CO ground
FRAME GROUND	Screw	Frame ground

Note: CO ground is separate from frame ground in PG-Flex. These can be connected on the COT shelf Backplane by connecting the "FRAME GND" wire-wrap post to the adjacent "CKT GND" wire-wrap post.

TABLE 2. COT SHELF CONNECTORS (LAN)

Connector	*Type*	*Function*
J21	BNC	*(Not currently used)*

TABLE 3. COT SHELF CONNECTOR (DATA)

Connector	*Type*	*Function*
J18	DB-25F	*(Not currently used)*

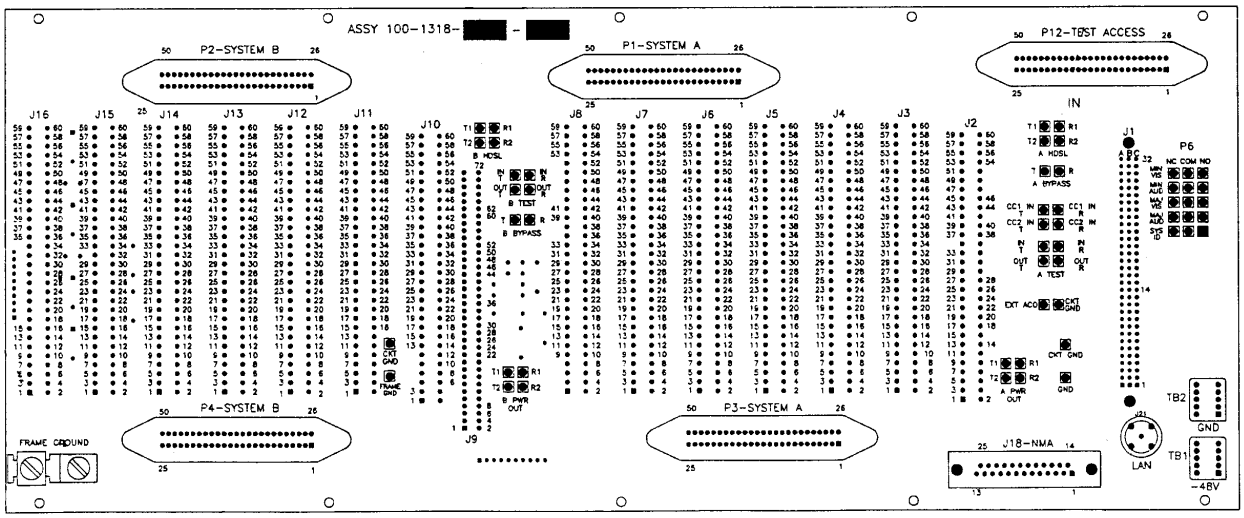

Figure 2. FCS-718 COT Shelf Backplane.

TABLE 4. COT SHELF CONNECTORS (HDSL, TEST, AND MISCELLANEOUS)

Connector	*Type*	*Function*
A_HDSL_T1 A_HDSL_R1	0.45 mm Wire Wrap	Tip and ring terminations for HDSL Pair #1 of System #1 to Remote Terminal #1. +130 Vdc is simplexed on this line for powering the Remote Terminal.
A_HDSL_T2 A_HDSL_R2	0.45 mm Wire Wrap	Tip and ring terminations for HDSL Pair #2 of System #1 to Remote Terminal #1. -130 V dc is simplexed on this line for powering the Remote Terminal.
B_HDSL_T1 B_HDSL_R1	0.45 mm Wire Wrap	Tip and ring terminations for HDSL Pair #1 of System #2 to Remote Terminal #2. +130 V dc is simplexed on this line for powering the Remote Terminal.
B_HDSL_T2 B_HDSL_R2	0.45 mm Wire Wrap	Tip and ring terminations for HDSL Pair #2 of System #2 to Remote Terminal #2. -130 V dc is simplexed on this line for powering the Remote Terminal.
A_PWR_OUT_T1 A_PWR_OUT_R1	0.45 mm Wire Wrap	System #1 Power Pair #1
A_PWR_OUT_T2 A_PWR_OUT_R2	0.45 mm Wire Wrap	System #1 Power Pair #2
B_PWR_OUT_T1 B_PWR_OUT_R1	0.45 mm Wire Wrap	System #2 Power Pair #1
B_PWR_OUT_T2 B_PWR_OUT_R2	0.45 mm Wire Wrap	System #2 Power Pair #2
A_BYPASS_T A_BYPASS_R	0.45 mm Wire Wrap	Termination for the metallic bypass pair into COT System #1 from RT #1.

Table continued on next page

TABLE 4. COT SHELF CONNECTORS (CONTINUED)

Connector	*Type*	*Function*
B_BYPASS_T B_BYPASS_R	0.45 mm Wire Wrap	Termination for the metallic bypass pair into COT System #2 from RT #2.
CC1_IN_T CC1_IN_R	0.45 mm Wire Wrap	Composite Clock #1. Used for 64 kbps DDS Composite Clock for synchronization to central office switch.
CC2_IN_T CC2_IN_R	0.45 mm Wire Wrap	Composite Clock #2. Used for 64 kbps DDS Composite Clock for synchronization to central office switch.
FRAME_GND	0.45 mm Wire Wrap	Frame ground. This is isolated from central office battery ground in PG-Flex.
EXT_ACO CKT_GND	0.45 mm Wire Wrap	External Alarm Cutoff. A momentary connection between EXT_ACO and circuit ground will reset PG-Flex audible alarm relays.
GND	0.45 mm Wire Wrap	Central office battery ground. This is isolated from frame ground in PG-Flex.
A_TEST_IN_T A_TEST_IN_R	0.45 mm Wire Wrap	Test connection looking into the COT channel unit for the selected subscriber for System #1. This connection must be set up through the PG-Flex RS-232 maintenance port.
A_TEST_OUT_T A_TEST_OUT_R	0.45 mm Wire Wrap	Test connection looking into the central office equipment of the selected subscriber for System #1. 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 #1.
B_TEST_IN_T B_TEST_IN_R	0.45 mm Wire Wrap	Test connection looking into the COT channel unit for the selected subscriber for System #2. This connection must be set up through the PG-Flex RS-232 maintenance port.
B_TEST_OUT_T B_TEST_OUT_R	0.45 mm Wire Wrap	Test connection looking into the central office equipment for the selected subscriber for System #2. 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 #2.

TABLE 5. COT SHELF CONNECTORS (ALARM)

Posts	*Contact Post*			*Function*
	NO	*COM*	*NC*	
SYS_ID	1	2	3	System ID. A single form “C” relay is utilized to indicate a major or minor shelf alarm is active.
MAJ_AUD	4	5	6	A single form “C” relay is utilized to indicate a carrier loss alarm. The alarm cannot be disabled.
MAJ_VIS	7	8	9	A single form “C” relay is utilized to indicate a carrier loss alarm. The alarm cannot be disabled.
MIN_AUD	10	11	12	A single form “C” relay is utilized to indicate loss of carrier. The loss of carrier alarm is present whenever the HDSL line is out of service. After being out of service for 60 seconds, a Major Alarm is generated in addition to the Minor Alarm, which remains enabled.
MIN_VIS	13	14	15	A single form “C” relay is utilized to indicate loss of carrier. The loss of carrier alarm is present whenever the HDSL line is out of service. After being out of service for 60 seconds, a Major Alarm is generated in addition to the Minor Alarm, which remains enabled.

TABLE 6 COT SHELF CIRCUIT ASSIGNMENTS

Alarm Unit	Line Unit 1	CU 1	CU 2	CU 3	CU 4	CU 5	CU 6	Line Unit 2	CU 7	CU 8	CU 9	CU 10	CU 11	CU 12
Refer	*Refer*	Ckt 1	Ckt 1	Ckt 1	Ckt 1	Ckt 1	Ckt 1	*Refer*	Ckt 1	Ckt 1	Ckt 1	Ckt 1	Ckt 1	Ckt 1
to	*to*	Ckt 2	Ckt 2	Ckt 2	Ckt 2	Ckt 2	Ckt 2	*to*	Ckt 2	Ckt 2	Ckt 2	Ckt 2	Ckt 2	Ckt 2
Table 5	*Table 4*	Ckt 3	Ckt 3	Ckt 3	Ckt 3	Ckt 3	Ckt 3	*Table 4*	Ckt 3	Ckt 3	Ckt 3	Ckt 3	Ckt 3	Ckt 3
for	*for*	Ckt 4	Ckt 4	Ckt 4	Ckt 4	Ckt 4	Ckt 4	*for*	Ckt 4	Ckt 4	Ckt 4	Ckt 4	Ckt 4	Ckt 4
Alarm	*Line*	Ckt 5	Ckt 5	Ckt 5	Ckt 5	Ckt 5	Ckt 5	*Line*	Ckt 5	Ckt 5	Ckt 5	Ckt 5	Ckt 5	Ckt 5
Unit	*Unit*	Ckt 6	Ckt 6	Ckt 6	Ckt 6	Ckt 6	Ckt 6	*Unit*	Ckt 6	Ckt 6	Ckt 6	Ckt 6	Ckt 6	Ckt 6
Termina	*Termina*	Ckt 7	Ckt 7	Ckt 7	Ckt 7	Ckt 7	Ckt 7	*Termina*	Ckt 7	Ckt 7	Ckt 7	Ckt 7	Ckt 7	Ckt 7
tion	*tion*	Ckt 8	Ckt 8	Ckt 8	Ckt 8	Ckt 8	Ckt 8	*tion*	Ckt 8	Ckt 8	Ckt 8	Ckt 8	Ckt 8	Ckt 8

Notes: 1. Each PG-Flex channel unit provides four (4) or eight (8) circuits, depending on the service offering (i.e. POTS, ISDN, DDS, etc.) of the channel unit – refer to Table 7.

2. For channel units providing four (4) circuits, circuits Ckt 1 through Ckt 4 are used for tip and ring terminations. For channel units providing eight (8) circuits, circuits Ckt 1 through Ckt 8 are used for tip and ring terminations.

3. For a 24-channel system, a maximum of 24 circuits may be provisioned.

TABLE 7 CHANNEL UNIT CIRCUIT UTILIZATION

Channel	**Channel Unit Service Configurations**			
Unit	**4-Ch. POTS**	**8-Ch. POTS**	**4-Ch. ISDN**	**4-Ch. DDS**
Ckt 1	●	●	●	●
Ckt 2	●	●	●	●
Ckt 3	●	●	●	●
Ckt 4	●	●	●	●
Ckt 5		●		●
Ckt 6		●		●
Ckt 7		●		●
Ckt 8		●		●

TABLE 8 COT SHELF CONNECTIONS - SYSTEM 1

Channel Unit	Circuit	Connector P1		Connector P3	
		Ring	Tip	Ring	Tip
1	1	26	1		
	2	27	2		
	3	28	3		
	4	29	4		
	5			26	1
	6			27	2
	7			28	3
	8			29	4
2	1	30	5		
	2	31	6		
	3	32	7		
	4	33	8		
	5			30	5
	6			31	6
	7			32	7
	8			33	8
3	1	9	34		
	2	10	35		
	3	11	36		
	4	12	37		
	5			34	9
	6			35	10
	7			36	11
	8			37	12

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TABLE 8 (CONTINUED)

Channel Unit	Circuit	Connector P1		Connector P3	
		Ring	Tip	Ring	Tip
4	1	38	13		
	2	39	14		
	3	40	15		
	4	41	16		
	5			38	13
	6			39	14
	7			40	15
	8			41	16
5	1	42	17		
	2	43	18		
	3	44	19		
	4	45	20		
	5			42	17
	6			43	18
	7			44	19
	8			45	20
6	1	46	21		
	2	47	22		
	3	48	23		
	4	49	24		
	5			46	21
	6			47	22
	7			48	23
	8			49	24
Bypass #1		50	25		

Note: Shaded terminations are used only with 8 Channel POTS and DDS Units.

TABLE 9 COT SHELF CONNECTIONS SYSTEM 2

Channel Unit	Circuit	Connector P2		Connector P4	
		Ring	Tip	Ring	Tip
7	1	26	1		
	2	27	2		
	3	28	3		
	4	29	4		
	5			26	1
	6			27	2
	7			28	3
	8			29	4
8	1	30	5		
	2	31	6		
	3	32	7		
	4	33	8		
	5			30	5
	6			31	6
	7			32	7
	8			33	8
9	1	34	9		
	2	35	10		
	3	36	11		
	4	37	12		
	5			34	9
	6			35	10
	7			36	11
	8			37	12

Table continued on next column

TABLE 9 (CONTINUED)

Channel Unit	Circuit	Connector P2		Connector P4	
		Ring	Tip	Ring	Tip
10	1	38	13		
	2	39	14		
	3	40	15		
	4	41	16		
	5			38	13
	6			39	14
	7			40	15
	8			41	16
11	1	42	17		
	2	43	18		
	3	44	19		
	4	45	20		
	5			42	17
	6			43	18
	7			44	19
	8			45	20
12	1	46	21		
	2	47	22		
	3	48	23		
	4	49	24		
	5			46	21
	6			47	22
	7			48	23
	8			49	24
Bypass #2		50	25		

Note: Shaded terminations are used only with 8 Channel POTS and DDS Units.

Table 10 FCS-718, List 1 - PGTC CONNECTOR

Pin	Assignment	Pin	Assignment
1	Ring (1)	26	Tip (1)
2	Ring (2)	27	Tip (2)
3	Ring (3)	28	Tip (3)
4	Ring (4)	29	Tip (4)
5	Sleeve (2)	30	Sleeve (1)
6	Sleeve (4)	31	Sleeve (3)
7	OH (2)	32	OH (1)
8	OH (4)	33	OH (3)
9	Proceed (2)	34	Proceed (1)
10	Proceed (4)	35	Proceed (3)
11	Lock (2)	36	Lock (1)
12	Lock (4)	37	Lock (3)
13		38	
14		39	
15		40	
16		41	
17	TMAJ	42	TSTALM
18		43	
19		44	
20		45	
21		46	
22	SEZBY	47	SEIZE
23		48	
24		49	
25		50	

Notes:
1. Pins not specified are unassigned (open).
2. The connector is a male 25-pair Amphenol.

C. INSTALLATION AND TEST

7. UNPACKING

7.01 Upon receipt of the equipment, proceed as follows:

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 versus the packing list to ensure complete and accurate shipment. If the shipment is short or irregular, contact PairGain as described in Section 4. If you must store the equipment for a prolonged period, store the equipment in its original container.

8. PRE-PROVISIONING—HDSL LINES

8.01 The HDSL transmission scheme uses two pairs between the COT and RT. For convenience, 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.

8.02 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.

8.03 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 length. Tables 11 and 12 identify these distances (at a cable temperature of 68°F):

Table 11. 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

Table 12. 16/32 Channel HDSL Transmission Distance

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

9. INSTALLATION REQUIREMENTS

9.01 The following installation requirements apply:

1. **Environmental Considerations.** The COT is designed to operate in a central office environment. It can operate in a temperature range of -40°C to +65°C and a humidity range of 5% to 95% (non-condensing).
2. **Mounting.** The COT mounts in standard central office 19-inch or 23-inch frames and includes mounting hardware.
3. **Power.** The COT uses –48V dc central office battery. This voltage must be fused with a 8-amp fuse at a fuse point on a fuse panel in the central office. This fuse should be removed until the COT is wired and ready for turn-up. This battery line and its matching return line shall be run from the fuse panel to the COT mounting frame using 12 AWG wire. This cable should be run down the left side of the frame.
4. **Alarm Leads.** Audible and visual alarm leads from the central office alarm panel to the COT need to be provided. Alarm leads should be run down the left side of the COT mounting frame.
5. **HDSL Lines.** Two pair of leads from the COT shelf to the HDSL pair tips and rings at the Main Distribution Frame (MDF) must be provided. These leads should be run down the left side of the frame.

   Note: If the COT is to support two systems on a single shelf, then a second set of HDSL leads must be provided (one set to each RT).
6. **Subscriber Lines.** Two 25-pair Amphenol-ended (female) cables need to be provided for connecting the COT to the central office switch subscriber line circuits at the MDF. These cables should be run down the right side of the frame.

   Note: If the COT is to support two systems on a single shelf, then four cables must be provided.
7. **Metallic Bypass Pair.** A metallic bypass pair is required for subscriber drop testing. This pair should be run down the left side of the frame.

   Note: If the COT is to support two systems on a single shelf, then two bypass pairs must be provided (one to each RT).

10. MOUNTING

10.01 The COT shelf mounts in a standard 19-inch or 23-inch central office frame and requires four standard vertical mounting spaces. Shipped with the COT shelf are universal mounting brackets and mounting screws.

11. WIRING

11.01 All wiring and connections to the COT shelf are done on the backplane. Temporarily remove the clear Plexiglas cover while performing the procedures described in Table 12.

12. TURN-UP AND TESTING

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

13. TROUBLESHOOTING

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

TABLE 13. FCS-718 WIRING PROCEDURES

Step	*Operation*	*Action*
1	Remove CO Fuse	a. Remove the fuse at the central office fuse panel for the circuit where the PG-Flex central office battery wire will be terminated.
2	Connect Frame ground	***Note:*** Follow local grounding practices to ensure a good frame ground connection to PG-Flex. a. At the COT shelf, connect one end of the frame ground wire to grounding lug FRAME GROUND. b. Connect the other end of the frame ground wire to the central office ground termination point.
3	Connect CO Battery	***Note:*** Use 12 AWG or larger wire to ensure good power connections to PG-Flex. a. At the COT shelf, connect the wires used for central office battery and central office battery return to the -48 V (TB1) and GND (TB2) screw terminals. b. Connect the central office battery return wire to the central office battery ground termination point. c. Connect the central office battery wire to the selected central office fuse panel termination point.
4	Connect HDSL Lines	a. Terminate HDSL Pair #1 onto wire-wrap pins A_HDSL_T1 (Tip) and A_HDSL_R1 (Ring) on the COT shelf. b. Terminate HDSL Pair #2 onto wire wrap pins A_HDSL_T2 (Tip) and A_HDSL_R2 (Ring) on the COT shelf. ***Note:*** The following steps may not be required if only System “A” is being installed. c. Terminate HDSL Pair #1 onto wire wrap pins B_HDSL_T1 (Tip) and B_HDSL_R1 (Ring) on the COT shelf. d. Terminate HDSL Pair #2 onto wire wrap pins B_HDSL_T2 (Tip) and B_HDSL_R2 (Ring) on the COT shelf.
5	Connect Metallic Bypass Pair	***Note:*** If subscriber drop testing is not required, skip this section. a. Connect the metallic bypass pair for System “A” from the MDF to wire wrap posts A_BYPASS_T and A_BYPASS_R on the COT shelf. These bypass pairs are also available on P1, see Table 8. ***Note:*** The following step may not be required if only System “A” is being installed. b. Connect the metallic bypass pair for System “B” from the MDF to wire wrap posts B_BYPASS_T and B_BYPASS_R on the COT shelf. These bypass pairs are also available on P2, see Table 9.
6	Connect Alarm Lines	***Note:*** If external audible and/or visual alarm indications are not required, skip this section. a. Refer to Table 5 for information on connecting alarm leads to the central office alarm panel.

Table continued on next page

TABLE 13. FCS-718 WIRING PROCEDURES (CONTINUED)

Step	*Operation*	*Action*
7	Connect Subscriber Lines	a. Refer to Tables 6 through 9 for information on cross-connecting subscriber lines to the central office switch.
8	Replace CO Fuse	a. Replace the fuse at the central office fuse panel for the circuit where the PG-Flex central office battery wire is terminated.
9	Verify Connections	***Note:*** The following verifications should be done before any cards are inserted in the COT shelf. a. Verify that there is between -42 V dc and -56 V dc between the –48 V dc and GND screw terminals on the COT shelf. b. Visually verify the HDSL lines are terminated properly and with the correct orientation. ***Note:*** If the HDSL lines are not connected properly, the COT will not communicate with the RT. c. Verify that the HDSL lines are “dry”: 1) There should be 0 V dc between the tip and ring, tip and ground, and ring and ground of each of the HDSL circuits terminated on the shelf. 2) 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. d. Replace the clear Plexiglas cover on the rear of the COT shelf.