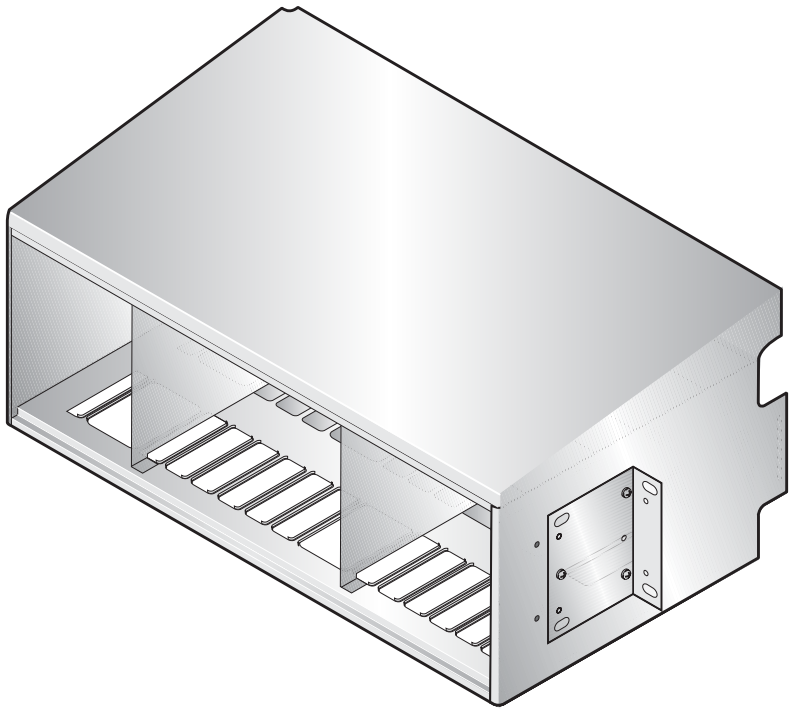
PG-FLEX

TECHNICAL PRACTICE



19" CENTRAL OFFICE TERMINAL SHELF

Model	List	CLEI Code
FCS-718	2B	VAMCKC0A~~

Section SCP-FCS718-022-03H

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

This section describes the ADC® PG-Flex® FCS-718 List 2B, 19-inch Central Office Terminal (COT) shelf description, features, and specifications.

DESCRIPTION AND FEATURES

The FCS-718 List 2B 19-inch COT shelf (Figure 1) supports:

- one alarm unit or Pair Gain Test Controller (PGTC) Interface unit common to all systems
- two PG-Flex subscriber carrier systems where each system comprises one line unit and from one to four channel units (for a shelf maximum of two line units and eight channel units)

Additionally, the shelf provides termination points (on the rear of the shelf) for alarms, power, metallic bypass pairs, auxiliary power pairs when using a doubler, and subscriber circuits. The FCS-718 List 2B COT shelf provides wire-wrap terminations for the subscriber circuits.

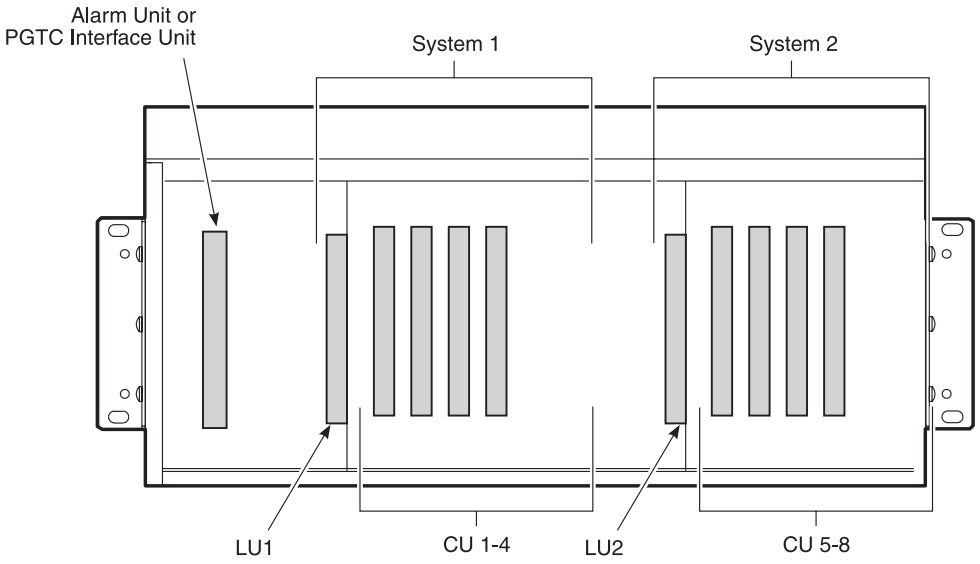


Figure 1. *FCS-718 List 2B COT Shelf (Card-side, Front View)*

Use the FCS-718 List 2B COT 19-inch shelf only with a List 4x (or higher) FRE-765 Remote Terminal (RT) Enclosure.

Features of the PG-FCS-718 List 2B COT shelf are:

- universal mounting brackets for installing into a 19- or 23-inch equipment bay
- .045 in. wire-wrap connections for High-bit-rate Digital Subscriber Line (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 (-48V_A, -48V_B)
- DB-25 connector for Network Management Analysis (NMA) communications
- wire-wrap terminations for CO line connections
- 25-pair Amphenol connector for PGTC test interface

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 4000 m)

Physical

Mounting	19- or 23-inch equipment bay using universal mounting brackets
Dimensions	
Height	8.75 in. (22.2 cm.)
Width	17.25 in. (43.8 cm.)
Depth	11.75 in. (29.8 cm.)
Weight	15.5 lb. (7.0 kg.)

FUNCTIONAL DESCRIPTION

This section describes the FCS-718 List 2B COT shelf operational capabilities, the circuit assignments, and provides a list of connector pinouts for the backplane.

OPERATIONAL CAPABILITIES

Each system (one line unit and from one to six channel units) can support either 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 2B 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 on page 4 show how to utilize channels, depending 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	Channel Unit Service Configurations		
	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 the FCS-718 List 2B 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 5 (CU 1)**	**CU 6 (CU 2)**	**CU 7 (CU 3)**	**CU 8 (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 on top (CU 1 through CU 8) show how the channel units are numbered when using a List 1 or List 2 line unit. The CU numbers in parentheses (CU 1 through CU 4) show how the channel units are numbered when using a List 3 or higher line unit, relative to each system.

BACKPLANE CONNECTIONS

Table 4 through Table 9 provides the connector pinouts located on the backplane for an Alarm or PGTC interface unit, line unit, and channel unit connectors.

Table 11 through Table 20 lists the connectors and termination points located on the backplane for:

- CO battery (-48V_A, -48V_B) and CO return (RTN_A, RTN_B)
- frame ground
- Local Area Network (LAN)
- data
- HDSL, test, composite clock, auxiliary power pairs, and external Alarm Cutoff (ACO) switch wire-wrap posts
- alarm or PGTC test interface
- subscriber lines with .045 in. wire-wrap terminations (P1, P2, P3, and P4)

Table 3 lists the FCS-718 List 2B connectors and where each is described in this practice (see Figure 1 on page 1 for connector locations).

Table 3. *FCS-718 List 2B COT Shelf Card Connectors*

Connector/Fuse	Go to	On page
Alarm Unit or PGTC Interface Unit	Table 4	6
Line Unit Connectors (Systems 1 and 2)	Table 5	7
Channel Unit Connectors (System 1)	Table 6 through Table 7	8 through 9
Channel Unit Connectors (System 2)	Table 8 through Table 9	10 through 11

Use the information in Table 4 through Table 9 for diagnostic and troubleshooting procedures under the direction of an authorized ADC technical support representative. User terminations are not required on J1.

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	TESTIN1-T
4	PGTC_RING1	4	SLEEVE2	4	TESTIN1-R
5	PGTC_TIP2	5	SLEEVE3	5	TESTIN2-T
6	PGTC_RING2	6	SLEEVE4	6	TESTIN2-R
7	PGTC_TIP3	7	OH1	7	N/C
8	PGTC_RING3	8	OH2	8	N/C
9	PGTC_TIP4	9	OH3	9	TESTOUT1_T
10	PGTC_RING4	10	OH4	10	TESTOUT1-R
11	(BURN-IN)	11	PROCEED1	11	TESTOUT2-T
12	LOCK1	12	PROCEED2	12	TESTOUT2-R
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_1	17	TSTALM	17	+5
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 Connector Pinouts*

System	Line Unit	Connector
1	1	J2
2	2	J7

Pin	Signal*	Pin	Signal*
1	PROTGND	2	PROTGND
3	N/C	4	N/C
5	HDSLTIP1EX	6	HDSLTIP2EX
7	HDSLRING1EX	8	HDSLRING2EX
9	N/C	10	N/C
11	BATT_RTN	12	BATT_RTN
13	-48	14	-48
15	BATT-_*n*	16	BATT-_*n*
17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC	20	TSIG
21	TCLK	22	TSER
23	GND	24	RSYNC
25	RSIG	26	RCLK
27	RSER	28	GND
29	SDA	30	CSYNC
31	FUSEALARM	32	SCL
33	+5	34	+5
35	GND	36	GND
37	-5	38	-5
39	NMA_BUS_*n*	40	GND (CID3)
41	GND (CID2)	42	GND = System 1 N/C = System 2
43	MAJORALARM	44	MINORALARM
45	TESTIN-T	46	TESTIN-R
47	TESTOUT-T	48	TESTOUT-R
49	N/C	50	N/C
51	BYPASS-T	52	BYPASS-R
53	HDSL_TIP1	54	HDSL_TIP2
55	HDSL_RING1	56	HDSL_RING2
57	N/C	58	N/C
59	PROTGND	60	PROTGND

* Where *n is A on system 1 and B on system 2.*

Table 6. *Channel Unit Connectors J3 and J4 for System 1*

System 1	Channel Unit 1	Connector J3		System 1	Channel Unit 2	Connector J4	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIP05_1	4	RING05_1	3	TIP13_1	4	RING13_1
5	TIP06_1	6	RING06_1	5	TIP14_1	6	RING14_1
7	TIP07_1	8	RING07_1	7	TIP15_1	8	RING15_1
9	TIP08_1	10	RING08_1	9	TIP16_1	10	RING16_1
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN	12	BATT_RTN
13	-48	14	-48	13	-48	14	-48
15	-48V_A (BATT)	16	-48V_A (BATT)	15	-48V_A (BATT)	16	-48V_A (BATT)
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC	20	TSIG	19	TSYNC	20	TSIG
21	TCLK	22	TSER	21	TCLK	22	TSER
23	GND	24	RSYNC	23	GND	24	RSYNC
25	RSIG	26	RCLK	25	RSIG	26	RCLK
27	RSER	28	GND	27	RSER	28	GND
29	SDA	30	CSYNC	29	SDA	30	CSYNC
31	N/C	32	SCL	31	N/C	32	SCL
33	+5	34	+5	33	+5	34	+5
35	GND	36	GND	35	GND	36	GND
37	-5	38	-5	37	-5	38	-5
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	N/C (CID0)	44	N/C
45	TESTIN1-T	46	TESTIN1-R	45	TESTIN1-T	46	TESTIN1-R
47	GND	48	GND	47	GND	48	GND
49	TESTOUT1-T	50	TESTOUT1-R	49	TESTOUT1-T	50	TESTOUT1-R
51	TIP01_1	52	RING01_1	51	TIP09_1	52	RING09_1
53	TIP02_1	54	RING02_1	53	TIP10_1	54	RING10_1
55	TIP03_1	56	RING03_1	55	TIP11_1	56	RING11_1
57	TIP04_1	58	RING04_1	57	TIP12_1	58	RING12_1
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

Table 7. *Channel Unit Connectors J5 and J6 for System 1*

System 1	Channel Unit 3	Connector J5		System 1	Channel Unit 4	Connector J6	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIP21_1	4	RING21_1	3	TIP29_1	4	RING29_1
5	TIP22_1	6	RING22_1	5	TIP30_1	6	RING30_1
7	TIP23_1	8	RING23_1	7	TIP31_1	8	RING31_1
9	TIP24_1	10	RING24_1	9	TIP32_1	10	RING32_1
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN	12	BATT_RTN
13	-48	14	-48	13	-48	14	-48
15	-48V_A (BATT)	16	-48V_A (BATT)	15	-48V_A (BATT)	16	-48V_A (BATT)
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC	20	TSIG	19	TSYNC	20	TSIG
21	TCLK	22	TSER	21	TCLK	22	TSER
23	GND	24	RSYNC	23	GND	24	RSYNC
25	RSIG	26	RCLK	25	RSIG	26	RCLK
27	RSER	28	GND	27	RSER	28	GND
29	SDA	30	CSYNC	29	SDA	30	CSYNC
31	N/C	32	SCL	31	N/C	32	SCL
33	+5	34	+5	33	+5	34	+5
35	GND	36	GND	35	GND	36	GND
37	-5	38	-5	37	-5	38	-5
39	N/C	40	GND (CID3)	39	N/C	40	GND (CID3)
41	GND (CID2)	42	N/C (CID1)	41	GND (CID2)	42	N/C (CID1)
43	GND (CID0)	44	N/C	43	N/C (CID0)	44	N/C
45	TESTIN1-T	46	TESTIN1-R	45	TESTIN1-T	46	TESTIN1-R
47	GND	48	GND	47	GND	48	GND
49	TESTOUT1-T	50	TESTOUT1-R	49	TESTOUT1-T	50	TESTOUT1-R
51	TIP17_1	52	RING17_1	51	TIP25_1	52	RING25_1
53	TIP18_1	54	RING18_1	53	TIP26_1	54	RING26_1
55	TIP19_1	56	RING19_1	55	TIP27_1	56	RING27_1
57	TIP20_1	58	RING20_1	57	TIP28_1	58	RING28_1
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

Table 8. *Channel Unit Connectors J8 and J9 for System 2*

System 2	Channel Unit 5 (1)*	Connector J8		System 2	Channel Unit 6 (2)*	Connector J9	
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIP05_2	4	RING05_2	3	TIP13_2	4	RING13_2
5	TIP06_2	6	RING06_2	5	TIP14_2	6	RING14_2
7	TIP07_2	8	RING07_2	7	TIP15_2	8	RING15_2
9	TIP08_2	10	RING08_2	9	TIP16_2	10	RING16_2
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN	12	BATT_RTN
13	-48_1	14	-48_1	13	-48_1	14	-48_1
15	-48V_B (BATT)	16	-48V_B (BATT)	15	-48V_B (BATT)	16	-48V_B (BATT)
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC_1	20	TSIG_1	19	TSYNC_1	20	TSIG_1
21	TCLK_1	22	TSER_1	21	TCLK_1	22	TSER_1
23	GND	24	RSYNC_1	23	GND	24	RSYNC_1
25	RSIG_1	26	RCLK_1	25	RSIG_1	26	RCLK_1
27	RSER_1	28	GND	27	RSER_1	28	GND
29	SDA_1	30	CSYNC_1	29	SDA_1	30	CSYNC_1
31	N/C	32	SCL_1	31	N/C	32	SCL_1
33	+5_1	34	+5_1	33	+5_1	34	+5_1
35	GND	36	GND	35	GND	36	GND
37	-5_1	38	-5_1	37	-5_1	38	-5_1
39	N/C	40	N/C (CID3)	39	N/C	40	N/C (CID3)
41	GND (CID2)	42	GND (CID1)	41	GND (CID2)	42	GND (CID0)
43	GND (CID0)	44	N/C	43	N/C (CID0)	44	N/C
45	TESTIN2-T	46	TESTIN2-R	45	TESTIN2-T	46	TESTIN2-R
47	GND	48	GND	47	GND	48	GND
49	TESTOUT2-T	50	TESTOUT2-R	49	TESTOUT2-T	50	TESTOUT2-R
51	TIP01_2	52	RING01_2	51	TIP09_2	52	RING09_2
53	TIP02_2	54	RING02_2	53	TIP10_2	54	RING10_2
55	TIP03_2	56	RING03_2	55	TIP11_2	56	RING11_2
57	TIP04_2	58	RING04_2	57	TIP12_2	58	RING12_2
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

* Channel Unit (CU) numbers 5 through 8 are for List 1 of 2 line unit. CU numbers shown in parenthesis are for a List 3 or higher line unit.

Table 9. *Channel Unit Connectors J10 and J11 for System 2*

System 2	Channel Unit 7 (3)*		Connector J10	System 2	Channel Unit 8 (4)*		Connector J11
Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
1	PROTGND	2	PROTGND	1	PROTGND	2	PROTGND
3	TIP21_2	4	RING21_2	3	TIP29_2	4	RING29_2
5	TIP22_2	6	RING22_2	5	TIP30_2	6	RING30_2
7	TIP23_2	8	RING23_2	7	TIP31_2	8	RING31_2
9	TIP24_2	10	RING24_2	9	TIP32_2	10	RING32_2
11	BATT_RTN	12	BATT_RTN	11	BATT_RTN	12	BATT_RTN
13	-48_1	14	-48_1	13	-48_1	14	-48_1
15	-48V_B (BATT)	16	-48V_B (BATT)	15	-48V_B (BATT)	16	-48V_B (BATT)
17	8KHZ_CC	18	N/C (BURN-IN)	17	8KHZ_CC	18	N/C (BURN-IN)
19	TSYNC_1	20	TSIG_1	19	TSYNC_1	20	TSIG_1
21	TCLK_1	22	TSER_1	21	TCLK_1	22	TSER_1
23	GND	24	RSYNC_1	23	GND	24	RSYNC_1
25	RSIG_1	26	RCLK_1	25	RSIG_1	26	RCLK_1
27	RSER_1	28	GND	27	RSER_1	28	GND
29	SDA_1	30	CSYNC_1	29	SDA_1	30	CSYNC_1
31	N/C	32	SCL_1	31	N/C	32	SCL_1
33	+5_1	34	+5_1	33	+5_1	34	+5_1
35	GND	36	GND	35	GND	36	GND
37	-5_1	38	-5_1	37	-5_1	38	-5_1
39	N/C	40	N/C (CID3)	39	N/C	40	N/C (CID3)
41	GND (CID2)	42	N/C (CID1)	41	GND (CID2)	42	N/C (CID1)
43	GND (CID0)	44	N/C	43	N/C (CID0)	44	N/C
45	TESTIN2-T	46	TESTIN2-R	45	TESTIN2-T	46	TESTIN2-R
47	GND	48	GND	47	GND	48	GND
49	TESTOUT2-T	50	TESTOUT2-R	49	TESTOUT2-T	50	TESTOUT2-R
51	TIP17_2	52	RING17_2	51	TIP25_2	52	RING25_2
53	TIP18_2	54	RING18_2	53	TIP26_2	54	RING26_2
55	TIP19_2	56	RING19_2	55	TIP27_2	56	RING27_2
57	TIP20_2	58	RING20_2	57	TIP28_2	58	RING28_2
59	PROTGND	60	PROTGND	59	PROTGND	60	PROTGND

* Channel Unit (CU) numbers 5 through 8 are for List 1 of 2 line unit. CU numbers shown in parenthesis are for a List 3 or higher line unit.

Table 10 lists the FCS-718 List 2B COT shelf backplane connectors and where each is described in this practice. (Refer to Figure 2 for connector locations and refer to Figure 8 on page 22 for alarm terminations.)

Table 10. *FCS-718 List 2B Backplane Connectors*

Connector and Fuse	Go to	On
CO Battery TB1 (-48V_A) and TB2 (-48V_B), CO Battery Return TB3 (RTN_B) and TB4 (RTN_A) and Frame Ground (G1)	Table 11	page 13
LAN (J21)	Table 12	page 13
Data (J18)	Table 13	page 13
HDSL, Auxiliary Power Pairs, Bypass Pair, Channel Unit Test, Composite Clock, Frame Ground, External ACO (not shown in Figure 2)	Table 16	page 19
Alarm Terminations	Table 17	page 23
System 1 Subscriber Wire-wrap Terminations (P1, P3)	Table 18	page 24
System 2 Subscriber Wire-wrap Terminations (P2, P4)	Table 19	page 25
PGTC (P12)	Table 20	page 27

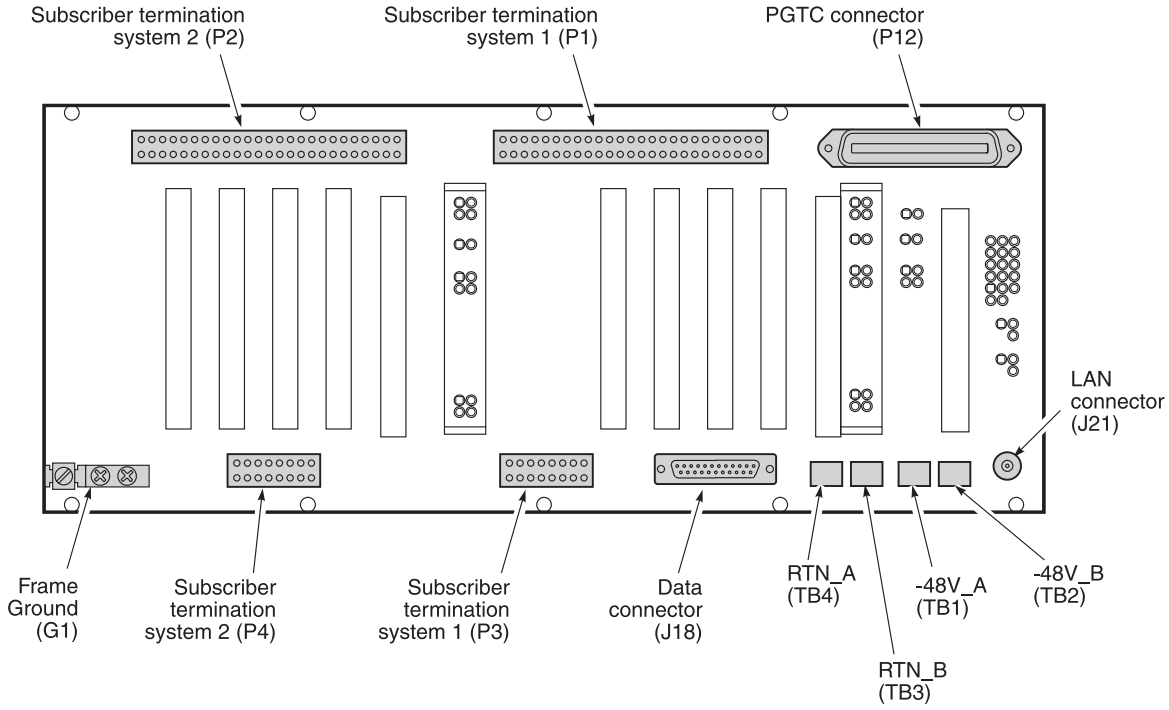


Figure 2. *COT Shelf Backplane*

CO battery return (RTN_A, RTN_B) is separate from frame ground (G1) in PG-Flex. CKT GND and CO battery return are connected inside the PG-Flex line unit but are not connected on the backplane.

Table 11. *Battery, CO Battery Ground, 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 (RTN_A)
G1	Screw	Frame ground (Protection Ground)

Table 12. *LAN Connector*

Connector	Type	Function
J21	BNC	(Not currently used)

Table 13. *DTE Data Connector (J18) Pinouts*

DB-25 (F) Pins	Signal
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	Data Terminal Ready

INSTALLATION AND TEST

This section provides procedures for unpacking, selecting HDSL lines, mounting, and wiring for the FCS-718 List 2B COT shelf.

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 "Product Support" on page 30. If you must store the equipment for a prolonged period, store the equipment in its original container.

SELECTING HDSL LINES

HDSL transmission uses two 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 can not 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 gauge (19 AWG vs. 26 AWG), the greater the distance between the COT and the RT. Table 14 and Table 15 identify these distances (at a cable temperature of 68°F).

Table 14. *12 and 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 15. *16 and 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

MOUNTING

The FCS-718 List 2B COT shelf mounts in a standard 19- or 23-inch CO equipment bay. Use universal mounting brackets when installing the FCS-718 List 2B COT shelf onto a 23-inch frame or remove the two mounting brackets and reverse them. 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.

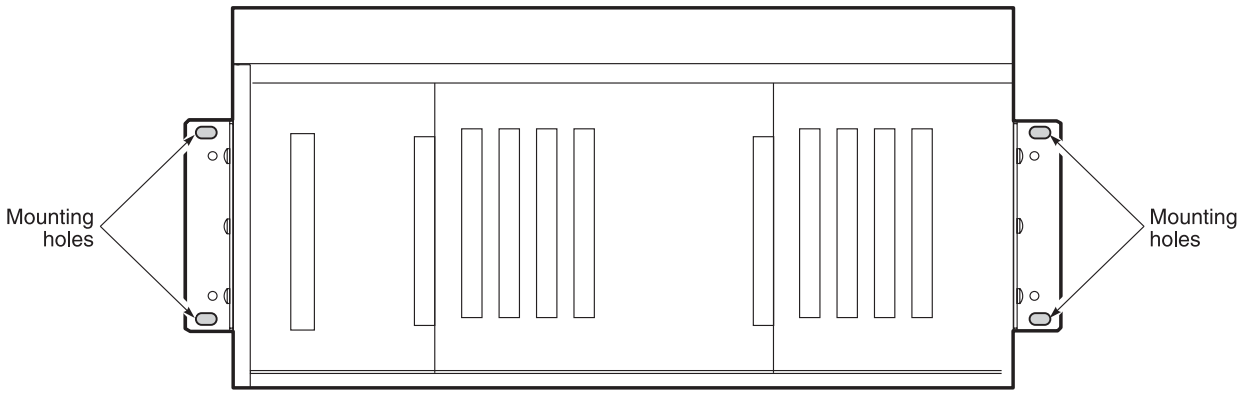


Figure 3. *Mounting the FCS-718 List 2B COT Shelf*

WIRING

Connect the appropriate wiring to the FCS-718 COT shelf as described in the following sections. Perform all wiring to the COT shelf on the back side of the shelf (see Figure 2 on page 12).

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

Before You Begin

1. Remove the clear Plexiglas™ from the backplane.
2. Remove the fuse in the equipment bay fuse panel for the circuit where the PG-Flex CO battery wire will be terminated.

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

Connect the Frame Ground

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

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.

The minimum frame ground wire size is 6 AWG.

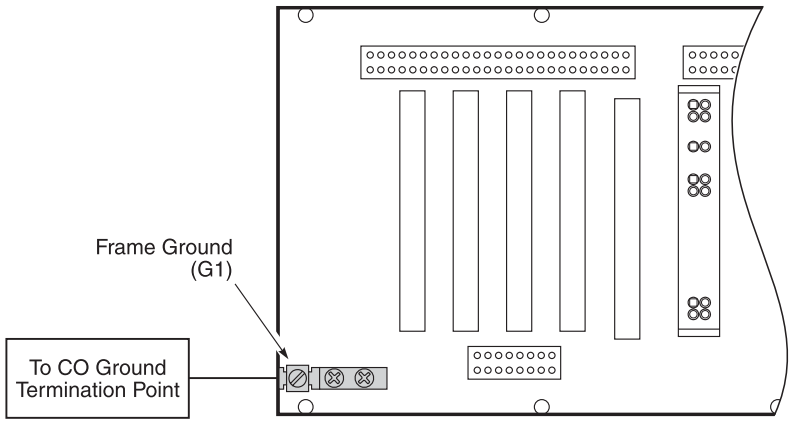


Figure 4. *Connecting the Frame Ground*

Connect the CO Battery

The FCS-718 List 2B COT shelf can be powered from a single battery feed or from a split battery feed. Refer to Figure 5 for battery termination points.

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

Single Battery Feed

For a single battery feed do the following:

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

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

3 Connect the CO battery wires from TB1 (-48V_A) on the FCS-718 List 2B COT shelf to the equipment bay fuse panel termination points.

Split Battery Feed

For a split battery feed do the following:

1 Remove and discard the jumper between TB1 and TB2.

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

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

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

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

6 Connect the CO battery return wire from TB4 on the FCS-718 List 2B COT shelf to the CO battery return termination point.

7 Connect the CO battery return wire from TB3 on the FCS-718 List 2B COT shelf to the CO battery return termination point.

8 Connect the CO battery wires from TB1 (-48V_A) and TB2 (-48V_B) on the FCS-718 List 2B COT shelf to the equipment bay fuse panel termination points.

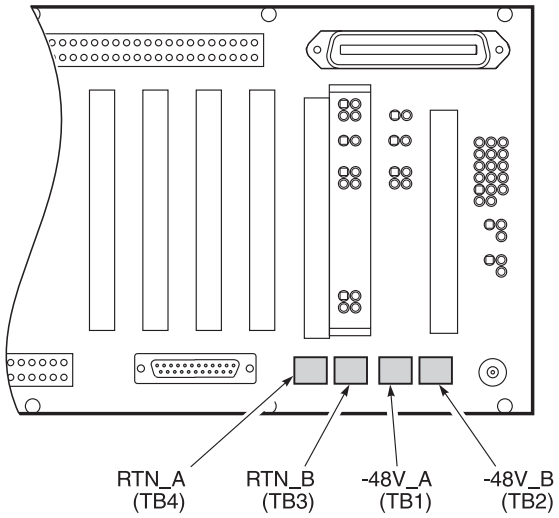


Figure 5. *Connecting the CO Battery*

HDSL Pairs

Connect the HDSL pairs as shown in Figure 6. Refer to Table 16 on page 19 for HDSL terminations and functions.

1 For System 1 installation:

a Connect HDSL Pair #1 on System 1 onto wire-wrap pins HDSL_T1 (Tip1) and HDSL_R1 (Ring1) on the FCS-718 List 2B COT shelf.

b Connect HDSL Pair #2 on System 1 onto wire-wrap pins HDSL_T2 (Tip2) and HDSL_R2 (Ring2) on the FCS-718 List 2B COT shelf.

2 For System 2 installation:

a Connect HDSL Pair #1 on System 2 onto wire-wrap pins HDSL_T1 (Tip1) and HDSL_R1 (Ring1) on the FCS-718 List 2B COT shelf.

b Connect HDSL Pair #2 on System 2 onto wire-wrap pins HDSL_T2 (Tip2) and HDSL_R2 (Ring2) on the FCS-718 List 2B COT shelf.

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

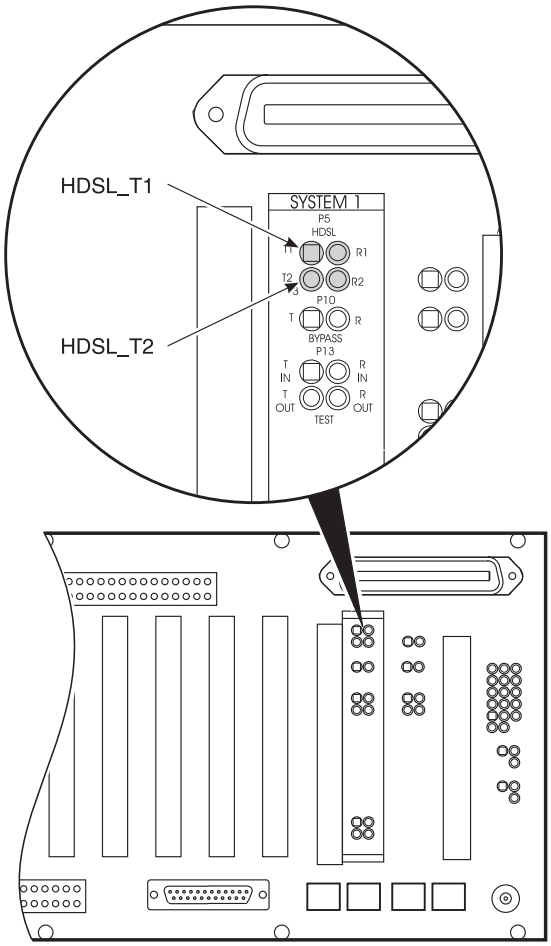


Figure 6. *Connecting the HDSL Lines*

Table 16. *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_1_T1 PWR_1_R1	.045 in. Wire-wrap	System ***n*** auxiliary Power Pair #1. Used for auxiliary power to the RT when using a PG-Flex doubler unit.
System ***n***	PWR_2_T2 PWR_2_R2	.045 in. Wire-wrap	System ***n*** auxiliary Power Pair #2. Used for auxiliary power to the RT when using a PG-Flex doubler unit.
System ***n***	BYPASS_***n***_T BYPASS_***n***_R	.045 in. Wire-wrap	Termination (P10 for system 1 and P20 for system 2) for the metallic bypass pair into COT System ***n*** from RT ***n***.
System ***n***	TEST_***n***_T_IN TEST_***n***_R_IN	.045 in. Wire-wrap	Test connection looking into the CO switch (P13 for system 1 and P14 for system 2) for the selected subscriber for System ***n***. This connection must be set up through the PG-Flex RS-232 Craft port.
System ***n***	TEST_***n***_T_OUT TEST_***n***_R_OUT	.045 in. Wire-wrap	Test connection looking toward the subscriber (P13 for system 1 and P14 for system 2) for the selected circuit for System ***n***. This connection must be set up through the PG-Flex RS-232 Craft port. In some applications, this pair is jumpered to the BYPASS pair from RT ***n***.
	CC1_TIP CC1_RING CC1_TERM	.045 in. Wire-wrap	Composite Clock #1 (P18). Used for synchronization to CO timing. When cascaded, terminate only on the last shelf in the cascade. A 133Ω 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 (P19). Used for synchronization to CO timing. When cascaded, terminate only on the last shelf in the cascade. A 133Ω 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 CKT 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 (P16). 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 used by another system.
	BATT RTN CKT GND	.045 in. Wire-wrap	CO battery return. This is isolated from frame ground in PG-Flex. The BAT RTN and CKT GND wire-wrap posts are jumpered together on the FCS-718 List 2B COT shelf backplane.

***** 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 is inactive.

Bypass Pairs

If subscriber drop testing is required, connect the metallic bypass pairs from the RT enclosure to the FCS-718 List 2B COT shelf backplane wire-wrap pins as shown in Figure 7 (refer to Table 16 on page 19 for bypass pair terminations and functions). Bypass pairs can be connected directly to each PG-Flex system, or shared between other PG-Flex FCS-718 List 2B COT shelves.

Directly Connected Bypass Pairs

To connect the bypass pairs directly to each system do the following:

1 For System 1, connect the metallic bypass pair from the Main Distribution Frame (MDF) to wire-wrap posts BYPASS_1_T (Tip) and BYPASS_1_R (Ring) on the FCS-718 List 2B COT shelf.

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

Shared Bypass Pairs

To share bypass pairs between PG-Flex systems, do the following:

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

1 For System ***n***, connect the metallic bypass pair from the MDF to wire-wrap posts BYPASS_***n***_T (Tip) and BYPASS_***n***_R (Ring) on the backplane of the first FCS-718 List 2B COT shelf sharing the bypass pair.

2 Connect the metallic bypass pair BYPASS_***n***_T and BYPASS_***n***_R on the first FCS-718 List 2B COT shelf 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 2B COT shelf sharing the metallic bypass pair.

4 Repeat Step 2 and Step 3 for each PG-Flex shelf sharing the bypass pairs.

The INHIBIT lead is used only when the metallic bypass pair is shared between two, or more, systems that are installed in more than one shelf.

An FPI-729 PGTC interface unit or FAU-728 List 2 alarm unit must be installed in each FCS-718 List 2B shelf where the INHIBIT lead is used.

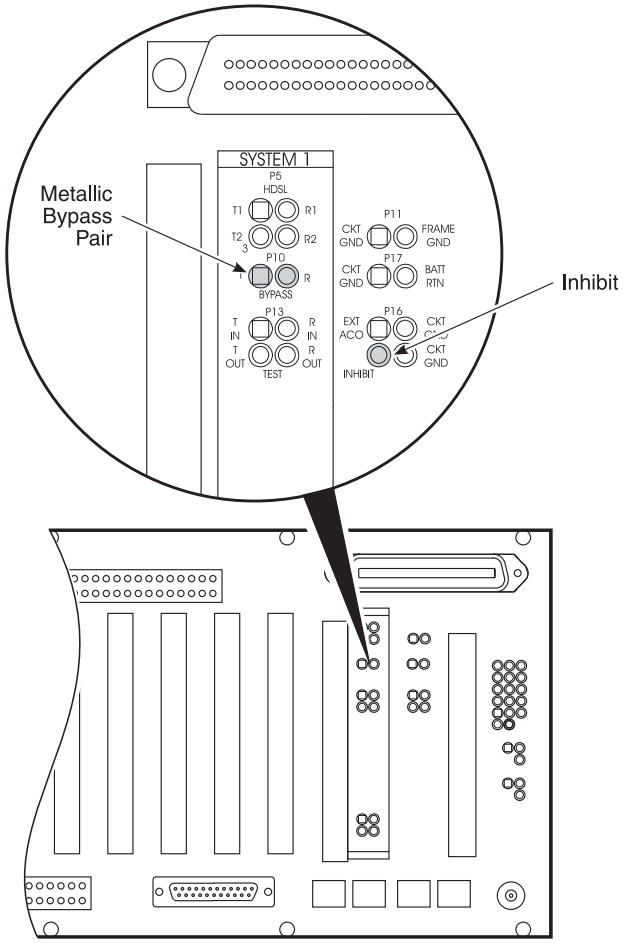


Figure 7. *Connecting the Metallic Bypass Pair*

Composite Clock

When required for digital services, connect the composite clock (CC1, CC2) as shown in Figure 8 (refer to Table 16 on page 19 for composite clock terminations and functions). You can cascade the composite clock to other PG-Flex shelves. When sharing the composite clock with other PG-Flex shelves, terminate only on the last shelf in the cascade.

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.

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

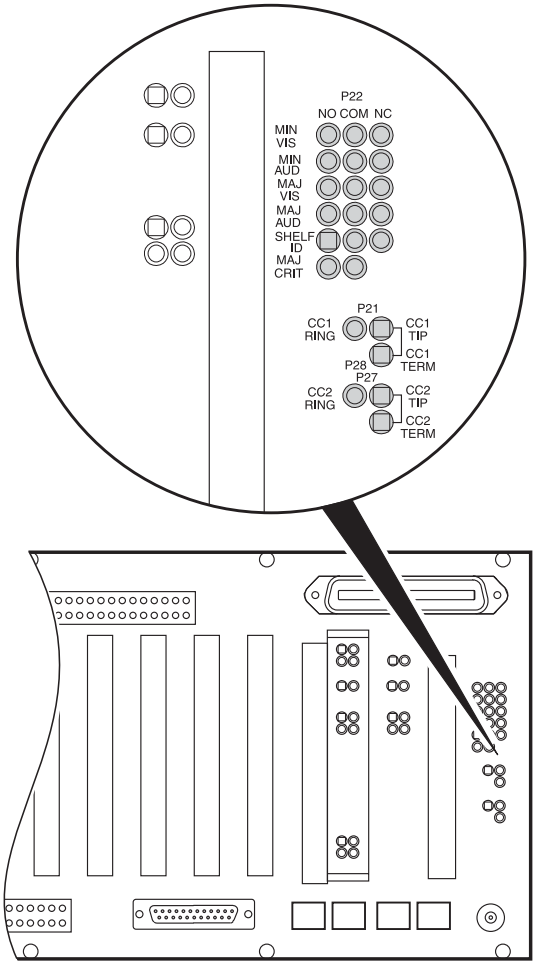


Figure 8. *Connecting the Composite Clock and Alarms*

Alarms

If external audible and visual alarm indicators are required, connect the audible and visual alarm leads from the CO alarm panel to the FCS-718 List 2B COT shelf according to Figure 8 on page 22 and Table 17 on page 23, and local practices.

Table 17. *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.
MAJ_CRIT		17	18	Not currently support.

* 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 to the wire-wrap terminations (see Figure 9), as follows:

1. Wire-wrap the CO switch subscriber line circuits to P1 and P3 termination points for system 1. Refer to Table 18 on page 24 for subscriber terminations.
2. Wire-wrap the CO switch subscriber line circuits to P2 and P4 termination points for system 2. Refer to Table 19 on page 25 for subscriber terminations.

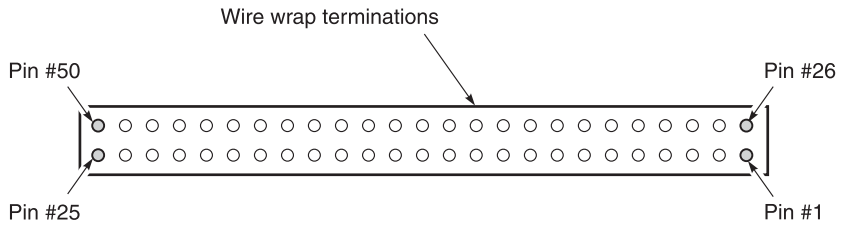


Figure 9. *Installing the Subscriber Lines*

Table 18. *System 1 Subscriber Wire-Wrap Connections**

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

* Shaded terminations are used only with 8 channel POTS CUs.

Table 19. *System 2 Subscriber Wire-wrap Connections†*

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

* 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 CUs.

PGTC Connection

Connect the PGTC test interface cable to connector P12 (see Figure 10). Refer to Table 20 on page 27 for the PGTC connector pinouts.

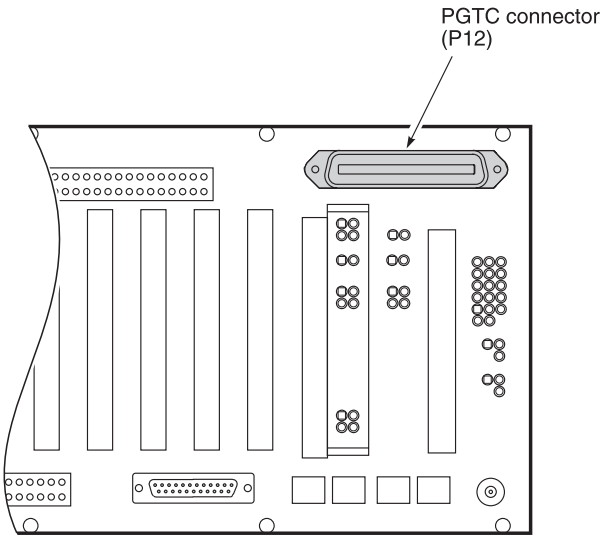


Figure 10. *Connecting the PGTC Test Interface Cable*

Table 20. *PGTC Connector (P12) 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

Auxiliary Power Pairs

When a PG-Flex system is used with a doubler, wire the auxiliary power pairs to the FCS-718 List 2B COT shelf (see Figure 11) as follows:

1 Wire-wrap power pair #1 to PWR_OUT T1 (Tip1) and PWR_OUT R1 (Ring1) for system 1.

2 Wire-wrap power pair #2 to PWR_OUT T2 (Tip2) and PWR_OUT R2 (Ring2) for system 1.

3 Repeat steps 1 and 2 for system 2 (when used with a doubler).

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

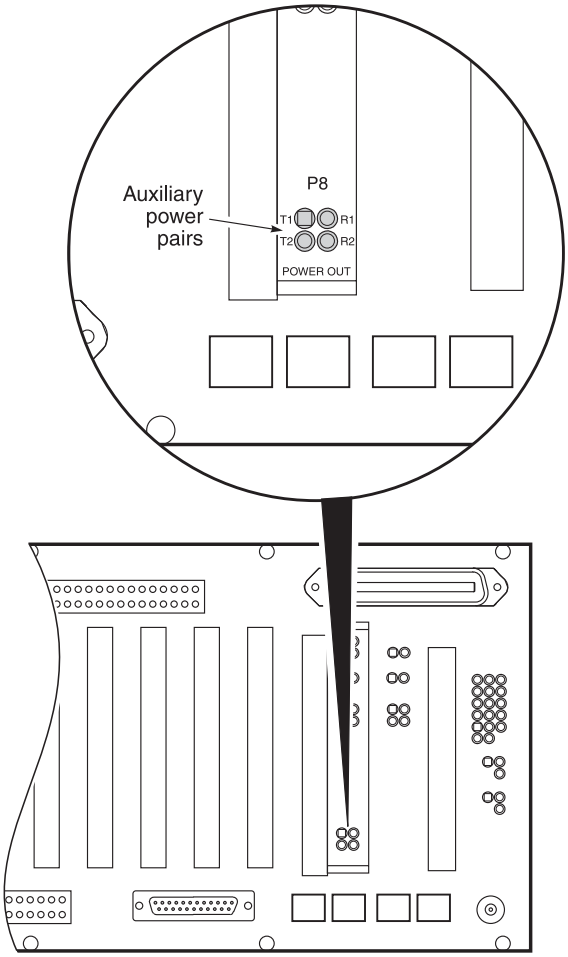


Figure 11. *Wiring the Auxiliary Power Pairs*

FUSE

Insert the appropriate fuse for the single battery feed or the split battery feed as described below:

Single Battery Feed Fuse

When the FCS-718 List 2B COT shelf is configured for a single battery feed, insert a 5 amp fuse into the equipment bay fuse panel where the PG-Flex CO battery wire is terminated.

Split Battery Feed Fuse

When the FCS-718 List 2B COT shelf is configured for a split battery feed, insert a 3 amp fuse into the equipment bay fuse panel for each circuit (two circuits) where the PG-Flex CO battery wires are terminated.

CABLING VERIFICATION

Verify the following voltage checks before inserting any cards into the FCS-718 List 2B COT shelf:

1 Verify a minimum of -42 Vdc and a maximum of -56 Vdc between:

a TB1 (–48V_A) and TB4 (RTN_A) screw terminals on the FCS-718 List 2B COT shelf.

b TB2 (–48V_B) and TB3 (RTN_B) screw terminals on the FCS-718 List 2B COT shelf.

2 Verify the following for the HDSL lines:

a Visually verify the HDSL lines are terminated properly and with the correct polarity.

b Verify that the HDSL lines are "dry."

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

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

3 Replace the clear Plexiglas cover on the rear of the FCS-718 List 2B COT shelf.

TURN-UP AND TESTING

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

TROUBLESHOOTING

Refer to the COT or RT line unit technical practices for complete COT and RT 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 Base:	http://adc.com/Knowledge_Base/index.jsp
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: 800.3663891
- 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	Composite Clock #1
CC2	Composite Clock #2
COT	Central Office Terminal
CU	Channel Unit
DLC	Digital Loop Carrier
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
POTS	Plain Old Telephone Service
RT	Remote Terminal

World Headquarters:
ADC Telecommunications, Inc.
12501 Whitewater Drive
Minnetonka, Minnesota USA 55343

For Technical Assistance:
800.366.3891

ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

1251750