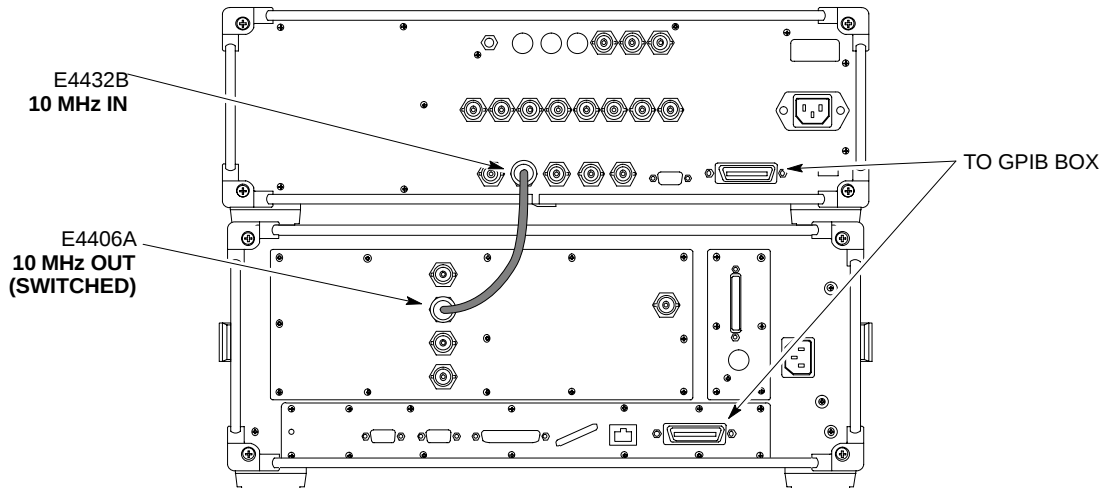


Agilent E4406A/E4432B Test Equipment Interconnection

To provide proper operation during testing when both units are required, the 10 MHz reference signal from the E4406A transmitter test set must be provided to the E4432B signal generator. Connect a BNC (M)–BNC (M) cable from the E4406A **10 MHz OUT (SWITCHED)** connector to the E4432B **10MHz IN** connector as shown in Figure F-5.

Figure F-5: Agilent 10 MHz Reference Connections



Manual Cable Calibration

Calibrating Test Cable Setup using HP PCS Interface (HP83236)

Table F-9 covers the procedure to calibrate the test equipment using the HP8921 Cellular Communications Analyzer equipped with the HP83236 PCS Interface.

NOTE

This calibration method *must be executed with great care*. Some losses are measured close to the minimum limit of the power meter sensor (–30 dBm).

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- Test equipment to be calibrated has been connected correctly for cable calibration.
- Test equipment has been selected and calibrated.

Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)

Step	Action		
	NOTE Verify that GPIB controller is turned off.		
1	Insert HP83236 Manual Control System card into memory card slot.		
2	Press the Preset pushbutton.		
3	Under Screen Controls , press the TESTS pushbutton to display the TESTS (Main Menu) screen.		
4	Position the cursor at Select Procedure Location and select it. In the Choices selection box, select CARD .		
5	Position the cursor at Select Procedure Filename and select it. In the Choices selection box, select MANUAL .		
6	Position the cursor at RUN TEST and select it. HP must be in Control Mode Select YES .		
7	<table><tr><td>If using HP 83236A: Set channel number=<chan#>: – Position cursor at Channel Number and select it. – Enter the <i>chan#</i> using the numeric keypad; press [Enter] and the screen will go blank. – When the screen reappears, the <i>chan#</i> will be displayed on the channel number line. </td><td>If using HP 83236B: Set channel frequency: – Position cursor at Frequency Band and press Enter. – Select User Defined Frequency. – Go Back to Previous Menu. – Position the cursor to 83236 generator frequency and enter actual RX frequency. – Position the cursor to 83236 analyzer frequency and enter actual TX frequency. </td></tr></table>	If using HP 83236A : Set channel number=<chan#>: – Position cursor at Channel Number and select it. – Enter the <i>chan#</i> using the numeric keypad; press [Enter] and the screen will go blank. – When the screen reappears, the <i>chan#</i> will be displayed on the channel number line.	If using HP 83236B : Set channel frequency: – Position cursor at Frequency Band and press Enter. – Select User Defined Frequency. – Go Back to Previous Menu. – Position the cursor to 83236 generator frequency and enter actual RX frequency. – Position the cursor to 83236 analyzer frequency and enter actual TX frequency.
If using HP 83236A : Set channel number=<chan#>: – Position cursor at Channel Number and select it. – Enter the <i>chan#</i> using the numeric keypad; press [Enter] and the screen will go blank. – When the screen reappears, the <i>chan#</i> will be displayed on the channel number line.	If using HP 83236B : Set channel frequency: – Position cursor at Frequency Band and press Enter. – Select User Defined Frequency. – Go Back to Previous Menu. – Position the cursor to 83236 generator frequency and enter actual RX frequency. – Position the cursor to 83236 analyzer frequency and enter actual TX frequency.		

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Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)

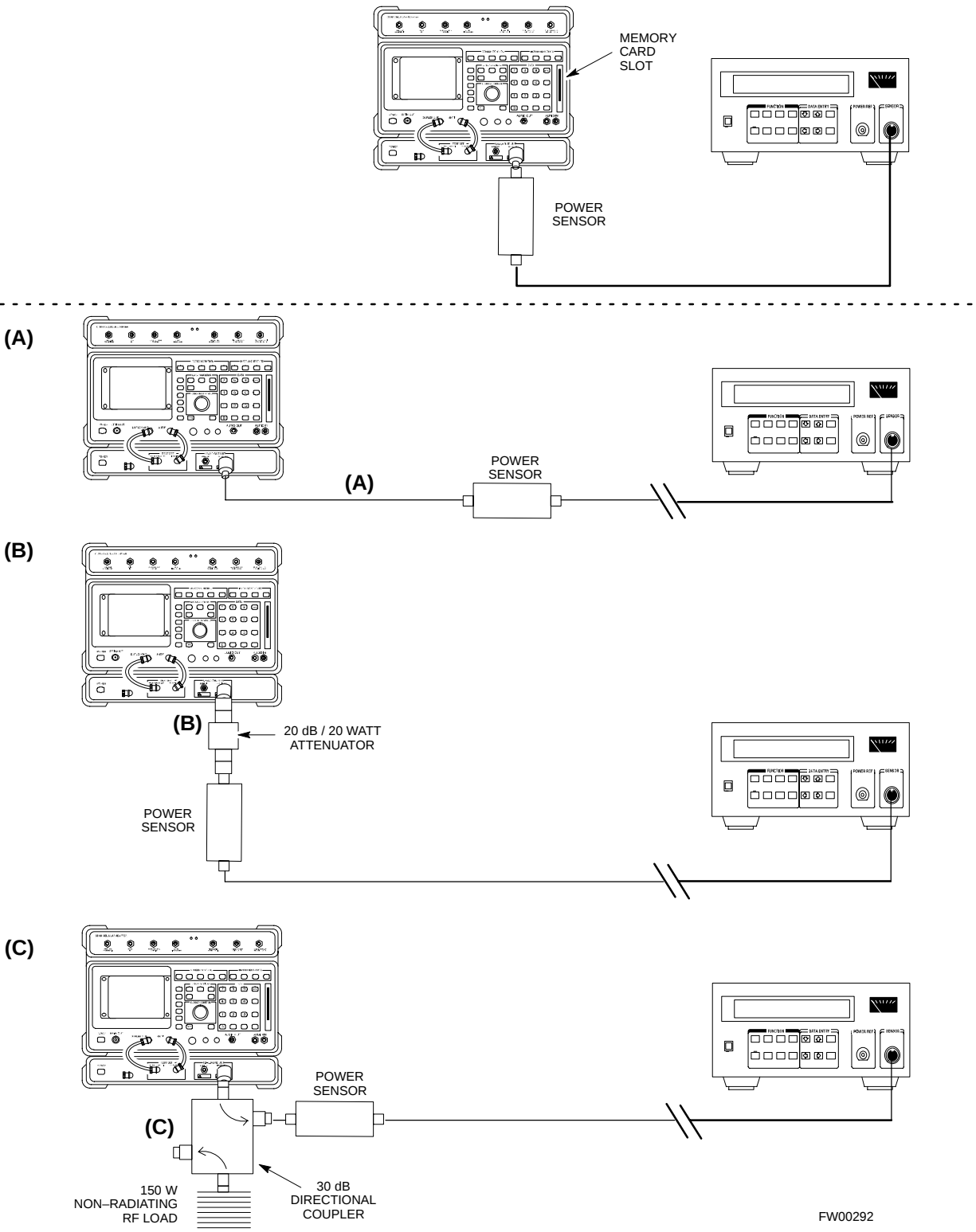
Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)										
Step	Action									
8	Set RF Generator level: – Position the cursor at RF Generator Level and select it. – Enter –10 using the numeric keypad; press [Enter] and the screen will go blank. – When the screen reappears, the value –10 dBm will be displayed on the RF Generator Level line.									
9	Set the user fixed Attenuation Setting to 0 dBm : – Position cursor at Analyzer Attenuation and select it – Position cursor at User Fixed Atten Settings and select it. – Enter 0 (zero) using the numeric keypad and press [Enter].									
10	Select Back to Previous Menu .									
11	Record the HP83236 Generator Frequency Level: Record the HP83236B Generator Frequency Level: – Position cursor at Show Frequency and Level Details and select it. – Under HP83236 Frequencies and Levels, record the Generator Level. – Under HP83236B Frequencies and Levels, record the Generator Frequency Level (1850 – 1910 MHz). – Position cursor at Prev Menu and select it.									
12	Click on Pause for Manual Measurement .									
13	Connect the power sensor directly to the <i>RF OUT ONLY</i> port of the PCS Interface.									
14	On the HP8921A, under To Screen , select CDMA GEN .									
15	Move the cursor to the Amplitude field and click on the Amplitude value.									
16	Increase the Amplitude value until the power meter reads 0 dBm ±0.2 dB . NOTE The Amplitude value can be increased coarsely until 0 dBm is reached; then fine tune the amplitude by adjusting the Increment Set to 0.1 dBm and targeting in on 0 dBm.									
17	Disconnect the power sensor from the <i>RF OUT ONLY</i> port of the PCS Interface. * IMPORTANT The Power Meter sensor’s lower limit is –30 dBm. Thus, only components having losses ≤30 dB should be measured using this method. For further accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated. After connecting the power sensor to the component, record the calibrated loss immediately.									
18	Disconnect all components in the test setup and calibrate each one separately by connecting each component, one-at-a-time, between the <i>RF OUT ONLY PORT</i> and the power sensor. Record the calibrated loss value displayed on the power meter. • Example:<table><tr><td>(A) Test Cable(s)</td><td>=</td><td>–1.4 dB</td></tr><tr><td>(B) 20 dB Attenuator</td><td>=</td><td>–20.1 dB</td></tr><tr><td>(B) Directional Coupler</td><td>=</td><td>–29.8 dB</td></tr></table>	(A) Test Cable(s)	=	–1.4 dB	(B) 20 dB Attenuator	=	–20.1 dB	(B) Directional Coupler	=	–29.8 dB
(A) Test Cable(s)	=	–1.4 dB								
(B) 20 dB Attenuator	=	–20.1 dB								
(B) Directional Coupler	=	–29.8 dB								

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Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)

Step	Action
19	After all components are calibrated, reassemble all components together and calculate the total test setup loss by adding up all the individual losses: • Example: $\text{Total test setup loss} = -1.4 - 29.8 - 20.1 = -51.3 \text{ dB}$. This calculated value will be used in the next series of tests.
20	Under Screen Controls press the TESTS button to display the TESTS (Main Menu) screen.
21	Select Continue (K2) .
22	Select RF Generator Level and set to -119 dBm .
23	Click on Pause for Manual Measurement .
24	Verify the HP8921A Communication Analyzer/83203A CDMA interface setup is as follows (fields not indicated remain at default): • Verify the GPIB (HP-IB) address: – under To Screen, select More – select IO CONFIG – Set HP-IB Adrs to 18 – set Mode to Talk&Lstn • Verify the HP8921A is displaying frequency (instead of RF channel) – Press the blue [SHIFT] button, then press the Screen Control [DUPLEX] button; this switches to the CONFIG (CONFIGURE) screen. – Use the cursor control to set RF Display to Freq
25	Refer to Chapter 3 for assistance in setting the cable loss values into the LMF.

Figure F-6: Cable Calibration Using HP8921 with PCS Interface



Manual Cable Calibration – continued

Calibrating Test Cable Setup using Advantest R3465

NOTE

Be sure the GPIB Interface is OFF for this procedure.

Advantest R3465 Manual Test setup and calibration must be performed at both the TX and RX frequencies.

Table F-10: Procedure for Calibrating Test Cable Setup Using Advantest R3465

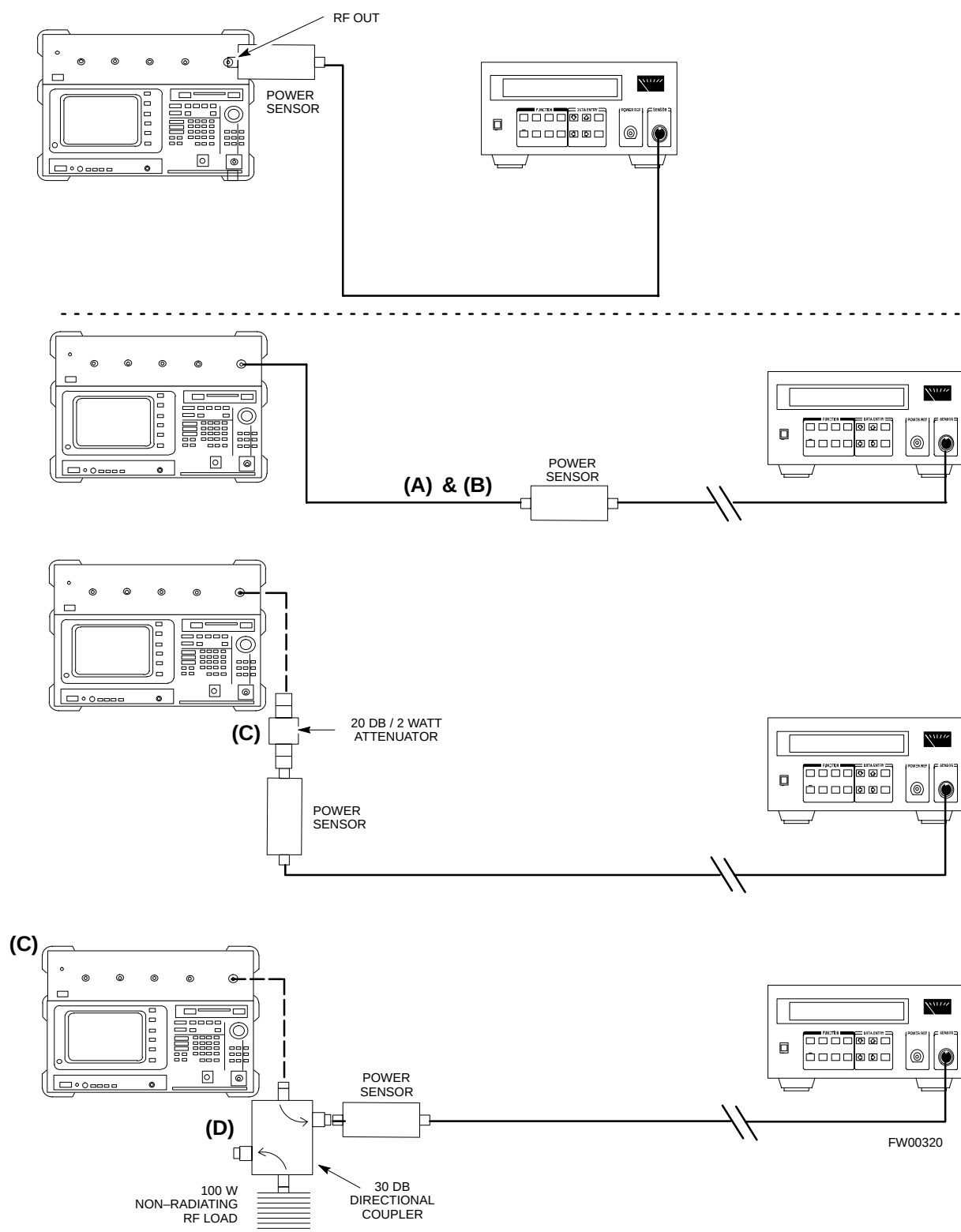
Step	Action
	* IMPORTANT – This procedure can only be performed <i>after</i> test equipment has been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i> .
1	Press the SHIFT and the PRESET keys located below the display
2	Press the ADVANCE key in the MEASUREMENT area of the control panel.
3	Select the CDMA Sig CRT menu key
4	Select the Setup CRT menu key
5	Using the vernier knob and the cursor keys set the following parameters NOTE Fields not listed remain at default Generator Mode: SIGNAL Link: FORWARD Level Unit: dBm CalCorrection: ON Level Offset: OFF
6	Select the return CRT menu key
7	Press FREQ key in the ENTRY area
8	Set the frequency to the desired value using the keypad entry keys
9	Verify that the Mod CRT menu key is highlighting OFF; if not, press the Mod key to toggle it OFF.
10	Verify that the Output CRT menu key is highlighting OFF; if not, press the Output key to toggle it OFF.
11	Press the LEVEL key in the ENTRY area.
12	Set the LEVEL to 0 dBm using the key pad entry keys.
13	Zero power meter. Next connect the power sensor directly to the “RF OUT” port on the R3561L CDMA Test Source Unit.
14	Press the Output CRT menu key to toggle Output to ON.
15	Record the power meter reading _____

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Table F-10: Procedure for Calibrating Test Cable Setup Using Advantest R3465

Step	Action								
16	Disconnect the power meter sensor from the R3561L RF OUT jack. * IMPORTANT The Power Meter sensor's lower limit is -30 dBm. Thus, only components having losses ≤ 30 dB should be measured using this method. For best accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated. Then, after connecting the power sensor to the component, record the calibrated loss immediately.								
17	Disconnect all components in the the test setup and calibrate each one separately. Connect each component one-at-a-time between the "RF OUT" port and the power sensor (see Figure F-7, "Setups A, B, and C"). Record the calibrated loss value displayed on the power meter for each connection. Example: <table> <tr> <td>(A) 1st Test Cable</td> <td>= -0.5 dB</td> </tr> <tr> <td>(B) 2nd Test Cable</td> <td>= -1.4 dB</td> </tr> <tr> <td>(C) 20 dB Attenuator</td> <td>= -20.1 dB</td> </tr> <tr> <td>(D) 30 dB Directional Coupler</td> <td>= -29.8 dB</td> </tr> </table>	(A) 1st Test Cable	= -0.5 dB	(B) 2nd Test Cable	= -1.4 dB	(C) 20 dB Attenuator	= -20.1 dB	(D) 30 dB Directional Coupler	= -29.8 dB
(A) 1st Test Cable	= -0.5 dB								
(B) 2nd Test Cable	= -1.4 dB								
(C) 20 dB Attenuator	= -20.1 dB								
(D) 30 dB Directional Coupler	= -29.8 dB								
18	Press the Output CRT menu key to toggle Output OFF.								
19	Calculate the total test setup loss by adding up all the individual losses: Example: Total test setup loss = $0.5 + 1.4 + 20.1 + 29.8 = 51.8$ dB This calculated value will be used in the next series of tests.								
20	Press the FREQ key in the ENTRY area								
21	Using the keypad entry keys, set the test frequency to the RX frequency								
22	Repeat steps 9 through 19 for the RX frequency.								
23	Refer to Chapter 3 for assistance in setting the cable loss values into the LMF.								

Figure F-7: Cable Calibration using Advantest R3465



F

Calibrating HP 437 Power Meter

Precise transmit output power calibration measurements are made using a bolometer-type broadband power meter with a sensitive power sensor. Follow the steps outlined in Table F-11 to enter information unique to the power sensor before calibrating the test setup. Refer to Figure F-8 as required.



IMPORTANT

This procedure must be done *in conjunction with* the automated calibration to enter power sensor specific calibration values.

Figure F-8: Power Meter Detail

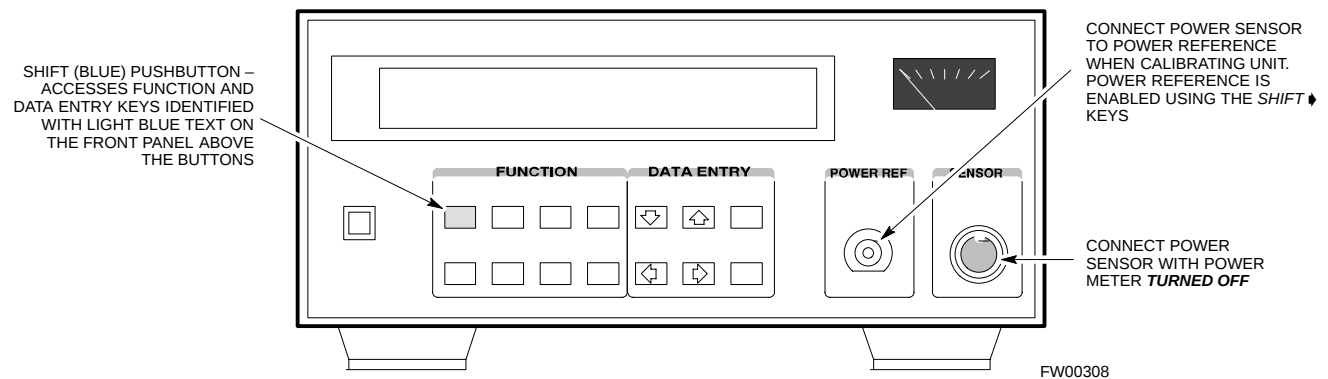
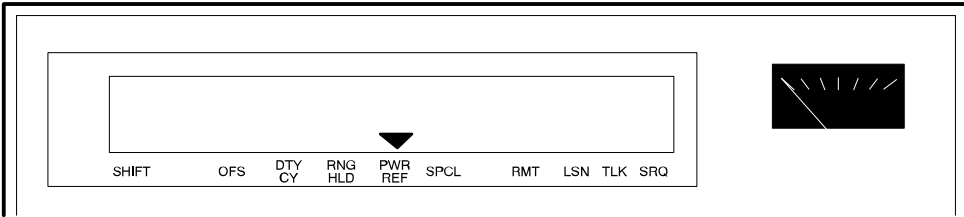


Table F-11: Power Meter Calibration Procedure

Step	Action
	! CAUTION Do not connect/disconnect the power meter sensor cable with ac power applied to the meter. Disconnection could result in destruction of the sensing element or mis-calibration.
1	– Make sure the power meter AC LINE pushbutton is OFF. – Connect the power sensor cable to the SENSOR input.
2	Set the AC LINE pushbutton to ON . NOTE The calibration should be performed only after the power meter and sensor have been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i> .
3	Perform the following to set or verify the GPIB address: – To enter the SPECIAL data entry function, press [SHIFT] then [PRESET]. – Use the [▲] or [▼] button to select HP-IB ADRS; then press [ENTER]. – Use the [▲] or [▼] button to select HP-IB ADRS 13; then press [ENTER]. – To EXIT the SPECIAL data entry function press [SHIFT] then [ENTER].

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Table F-11: Power Meter Calibration Procedure

Step	Action
4	Perform the following to set or verify the correct power sensor model: – Press [SHIFT] then [4] to select SENSOR. – Identify the power sensor model number from the sensor label. Use the [▲] or [▼] button to select the appropriate model; then press [ENTER]. NOTE Be sure the PWR REF (power reference) output is OFF (observe that the triangular indicator is NOT displayed as shown in Step 7). If on, press [SHIFT] then [4] to turn it off.
5	Press [ZERO] . Display will show “Zeroing *****.” Wait for process to complete.
6	Connect the power sensor to the POWER REF output.
7	To turn on the PWR REF, perform the following: – Press [SHIFT] then [4]. – Verify that the triangular indicator (below) appears in the display above “PWR REF”.  The diagram shows a rectangular display area with a triangular indicator pointing downwards in the center. Below the display area, there are labels for various functions: SHIFT, OFS, DTY CY, RNG HLD, PWR REF, SPCL, RMT, LSN, TLK, and SRQ. To the right of the display area, there is a small inset showing a series of diagonal lines, likely representing a signal or a specific display mode.
8	Perform the following to set the REF CF %: – Press ([SHIFT] then [ZERO]) for CAL. – Enter the sensor’s REF CF % from the sensor’s decal using the arrow keys and press [ENTER]. (The power meter will display “CAL *****” for a few seconds.) NOTE If the REF CAL FACTOR (REF CF) is not shown on the power sensor, assume it to be 100%.
9	Perform the following to set the CAL FAC %: – Press [SHIFT] then [FREQ] for CAL FAC. – On the sensor’s decal, locate an approximate calibration percentage factor (CF%) at 2 GHz. Enter the sensor’s calibration % (CF%) using the arrow keys and press [ENTER]. When complete, the power meter will typically display 0.05 dBm. (Any reading between 0.00 and 0.10 is normal.)
10	To turn off the PWR REF, perform the following: – Press [SHIFT] then [4]. – Disconnect the power sensor from the POWER REF output.

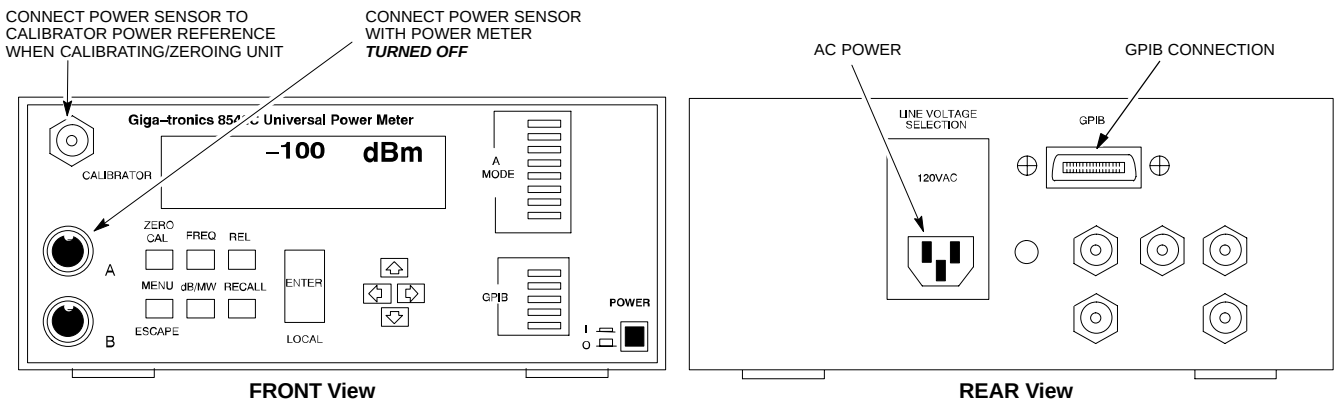
Calibrating Gigatronics 8541C power meter

Precise transmit output power calibration measurements are made using a bolometer-type broadband power meter with a sensitive power sensor. Follow the steps in Table F-12 to enter information unique to the power sensor.

Table F-12: Calibrate Gigatronics 8541C Power Meter

Step	Action
	! CAUTION Do not connect/disconnect the power meter sensor cable with AC power applied to the meter. Disconnection could result in destruction of the sensing element or miscalibration.
	NOTE Allow the power meter and sensor to warm up and stabilize for a <i>minimum of 60 minutes</i> before performing the calibration procedure.
1	• Make sure the power meter POWER pushbutton is OFF. • Connect the power sensor cable to the SENSOR input. • Set the POWER pushbutton to ON.
2	Verify the Power GPIB mode and address: • Press MENU. Use the ▼ arrow key to select CONFIG MENU, and press ENTER. • Use the ▼ arrow key to select GPIB, and press ENTER. • Use the ▼▲ arrow keys to set MODE to 8541C. • Press ▶ and use the ▼▲ arrow keys as required to set ADDRESS to 13. • Press ENTER.
3	• Connect the power sensor to the CALIBRATOR output connector. • Press ZERO. • Wait for the process to complete. Sensor factory calibration data is read to power meter during this process. • Disconnect the power sensor from the CALIBRATOR output.

Figure F-9: Gigatronics 8541C Power Meter Detail



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Manual Cable Calibration – continued

Notes

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Appendix G: In-Service Calibration

Appendix Content

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Notes

[illegible]

Introduction

Purpose

This procedure is a guide to expanding your system with multiple carriers while the system remains in service. This procedure also allows you to perform on site maintenance (replace defective boards and recalibrate) while the remainder of the site stays in service.

Motorola recommends that you perform this procedure during a maintenance window.

This procedure cannot be performed on BTSs with 4-to-1 combiners. The procedure can only be performed on one side of the BTS at one time. That is, LPAs 1, 2, 3, 7, 8, 9 (feed antennas 1, 2, 3) can be calibrated while LPAs 6, 7, 8, 10, 11, 12 (feed antennas 4, 5, 6) remain in service and vice versa.

Equipment Warm up



IMPORTANT

Calibration of the communications test set (or equivalent test equipment) **must be** performed at the site before calibrating the overall test set. Calibrate the test equipment *after* it has been allowed to warm-up and stabilize for a *minimum of 60 minutes*.



CAUTION

If any piece of test equipment (i.e., test cable, RF adapter) has been replaced, re-calibration must be performed. Failure to do so could introduce measurement errors, causing incorrect measurements and degradation to system performance.

Power Delta Calibration

Power Delta Calibration Introduction

The In-service calibration procedure has several differences from a normal calibration procedure. One of these is the use of a spectrum analyzer instead of a power meter to measure power. Power meters are broadband measurement devices and cannot be used to measure power during In-service Calibration since other carriers are operating. A spectrum analyzer can be used because it measures power at a given frequency. However, measuring power using a spectrum analyzer is less accurate than using a power meter. Therefore, you must compensate for the difference (delta) between the power meter and the spectrum analyzer.

HP8921A Power Delta Calibration

Use the HP8921A Spectrum Analyzer to measure power during In-Service Calibration for 800 MHz systems. After the offset value has been calculated, add it to the TX cable loss value.

Follow the procedure in Table G-1 to perform the HP8921A Power Delta Calibration procedure.

NOTE

This procedure requires two HP8921As.

Table G-1: HP8921A Power Delta Calibration Procedure

Step	Action
	* IMPORTANT Perform this procedure <i>after</i> test equipment has been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i> .
1	Connect a short RF cable between the HP8921A Duplex Out port and the HP437B power sensor (see Figure G-1).
2	Set the HP8921A signal source as follows: – Measure mode to CDMA Generator – Frequency to the CDMA Calibration target frequency – CW RF Path to IQ – Output Port to Dupl – Data Source to Random – Amplitude to 0 dBm
3	Measure and record the power value reading on the HP437B Power Meter.
4	Record the Power Meter reading as result A _____.

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Table G-1: HP8921A Power Delta Calibration Procedure	
Step	Action
5	Turn off the source HP8921A signal output, and disconnect the HP437B. NOTE Leave the settings on the source HP8921A for convenience in the following steps.
6	Connect the short RF cable between the source HP8921A Duplex Out port and the measuring HP8921A RF-IN port (see Figure G-2).
7	Ensure that the source HP8921A settings are the same as in Step 2.
8	Set the measuring HP8921A as follows: – Measure mode to CDMA Anl – Frequency to the CDMA calibration target frequency – Input Attenuation to 0 dB – Input port to RF-IN – Gain to Auto – Analyzer Direction to Fwd
9	Turn on the source HP8921A signal output.
10	Measure and record the channel power reading on the measuring HP8921A as result B _____.
11	Turn off the source HP8921A signal output and disconnect the equipment.
12	Compute the delta between HP437B and HP8921A using the following formula: Delta = A – B Example: Delta = –0.70 dBm – (–1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm – 0.55 dBm = –0.29 dBm These examples are included to show the mathematics and do not represent actual readings. NOTE Add this delta value to the TX Cable Loss value during In-Service Calibration.

Power Delta Calibration – continued

Figure G-1: Delta Calibration Setup – HP8921A to HP437B

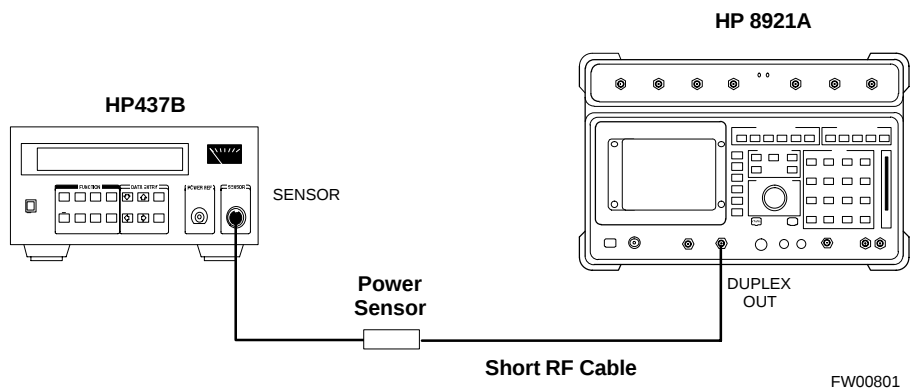
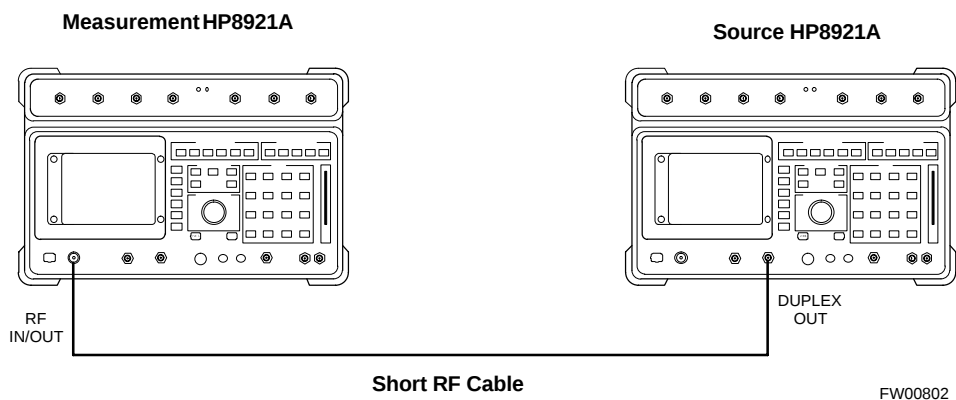


Figure G-2: Delta Calibration Setup – HP8921A to HP8921A



G

Advantest R3465 Power Delta Calibration

Follow the procedure in Table G-2 to perform the Advantest 3465 Power Delta Calibration procedure.

Table G-2: Advantest Power Delta Calibration Procedure	
Step	Action
	* IMPORTANT Perform this procedure <i>after</i> test equipment has been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i> .
On the Advantest R3465:	
1	Press the SHIFT and the PRESET keys located below the CRT display.
2	Press the ADVANCE key in the Measurement area of the control panel.
3	Press the CDMA Sig CRT menu key.
4	Press the FREQ key in the Entry area of the control panel.

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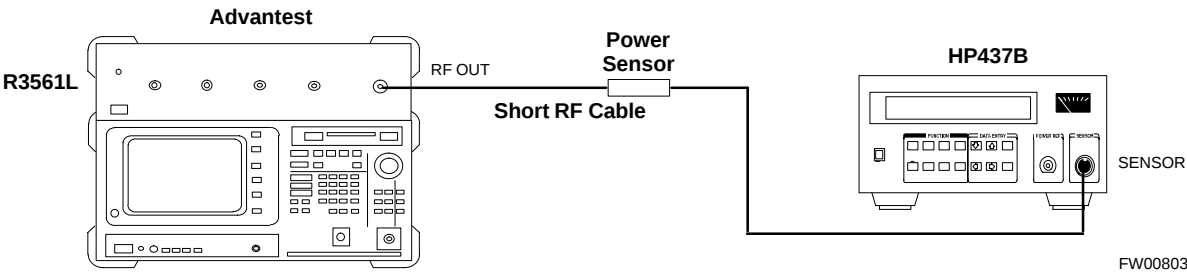
Table G-2: Advantest Power Delta Calibration Procedure

Step	Action
5	Set the frequency to the desired value using the keypad entry keys.
6	Press the LEVEL key in the Entry area of the control panel.
7	Set the LEVEL to 0 dBm using the keypad entry keys.
8	Verify the Mod CRT menu key is highlighting OFF , if not press the Mod key to toggle it OFF .
9	Verify the Output CRT menu key is highlighting OFF , if not press the Output key to toggle it OFF .
On the HP 437 Power Meter:	
10	Zero the Power Meter prior to connecting the power sensor to the RF cable from the signal generator. * IMPORTANT For best accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated.
11	Connect the RF cable from the R3561L CDMA Test Source Unit RF OUT port to the power sensor, refer to Figure G-3.
12	Press the Output CRT menu key to toggle the Output to ON .
13	Record the Power Meter reading as result A _____.
14	Press the Output CRT menu key to toggle the Output to OFF .
15	Connect the RF cable from the R3561L CDMA Test Source Unit RF OUT port to the Spectrum Analyzer INPUT Port, refer to Figure G-4.
16	Press the Output CRT menu key to change the Output to ON .
17	Press the CW key in the Measurement area of the control panel.
18	Press the LEVEL key in the Entry area of the control panel.
19	Set the REF LEVEL to 10 dBm using the keypad entry keys.
20	Press the dB/div CRT menu key.
21	Press the 10 dB/div CRT menu key.
22	Press the FREQ key in Entry area of the control panel.
23	Set the frequency to the desired value using the keypad entry keys.
24	Press the more 1/2 CRT menu key.
25	Press the Preselector CRT menu key to highlight 3.0G .
26	Press the FORMAT key in the Display Control area of the control panel.
27	Press the TRACE CRT menu key.
28	Press the AVG A CRT menu key.
29	Set AVG to 20 using keypad entry keys.

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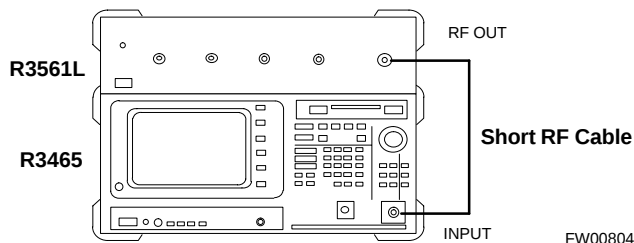
Table G-2: Advantest Power Delta Calibration Procedure	
Step	Action
30	Press the return CRT menu key.
31	Press the SPAN key in the Entry area of the control panel.
32	Press the Zero Span CRT menu key.
33	Press the BW key in the Entry area of the control panel.
34	Press the RBW CRT menu key to highlight MNL. using keypad entry keys enter 30 kHz.
35	Set RBW to 30 kHz using keypad entry keys.
36	Press the VBW CRT menu key to highlight MNL.
37	Set VBW to 1 MHz using keypad entry keys.
38	Press the Marker ON key in the Display Control area of the control panel.
39	Record the Marker Level reading as result B _____.
40	Calculate the Power Calibration Delta value. The delta value is the power meter measurement minus the Advantest measurement. Delta = A – B Example: Delta = –0.70 dBm – (–1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm – 0.55 dBm = –0.29 dBm These examples are included to show the mathematics and do not represent actual readings. NOTE Add this delta value to the TX Cable Loss value during In–Service Calibration.

Figure G-3: Delta Calibration Setup – R3561L to HP437B



Power Delta Calibration – continued

Figure G-4: Delta Calibration Setup – R3561L to R3465



HP8935 Power Delta Calibration

Follow the procedure in Table G-3 to perform the HP8935 Power Delta Calibration procedure.

Table G-3: HP8935 Power Delta Calibration Procedure

Step	Action
	* IMPORTANT Perform this procedure <i>after</i> test equipment has been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i>.
1	Connect a short RF cable between the HP8935 Duplex Out port and the HP437B power sensor (see Figure G-5).
2	Set the HP8935 signal source as follows: – Measure mode to CDMA Gen – Frequency to the CDMA Calibration target frequency – CW RF Path to IQ – Output Port to Dupl – Data Source to Random – Amplitude to 0 dBm
3	Measure and record the power value reading on the HP437B Power Meter.
4	Record the Power Meter reading as result A _____.
5	Turn off the source HP8935 signal output, and disconnect the HP437B. NOTE Leave the settings on the source HP8935 for convenience in the following steps.
6	Connect the short RF cable between the source HP8935 Duplex Out port and the RF-IN/OUT port (see Figure G-6).
7	Ensure that the source HP8935 settings are the same as in Step 2.

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Table G-3: HP8935 Power Delta Calibration Procedure	
Step	Action
8	Set the measuring HP8935 as follows: – Measure mode to CDMA Anl – Frequency to the CDMA calibration target frequency – Input Attenuation to 0 dB – Input port to RF-IN – Gain to Auto – Anl Dir to Fwd
9	Turn on the source HP8935 signal output.
10	Set the Chn Pwr Cal to Calibrate and select to calibrate.
11	Measure and record the channel power reading on the measuring HP8935 as result B _____.
12	Turn off the source HP8935 signal output and disconnect the equipment.
13	Calculate the Power Calibration Delta value. The delta value is the power meter measurement minus the Advantest measurement. $\text{Delta} = A - B$ Example: $\text{Delta} = -0.70 \text{ dBm} - (-1.25 \text{ dBm}) = 0.55 \text{ dBm}$ Example: $\text{Delta} = 0.26 \text{ dBm} - 0.55 \text{ dBm} = -0.29 \text{ dBm}$ These examples are included to show the mathematics and do not represent actual readings. NOTE Add this delta value to the TX Cable Loss value during In-Service Calibration.

Figure G-5: Delta Calibration Setup – HP8935 to HP437B

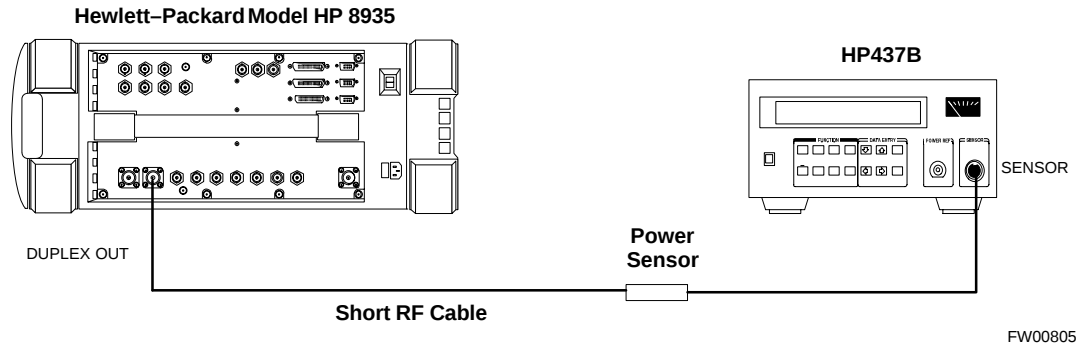
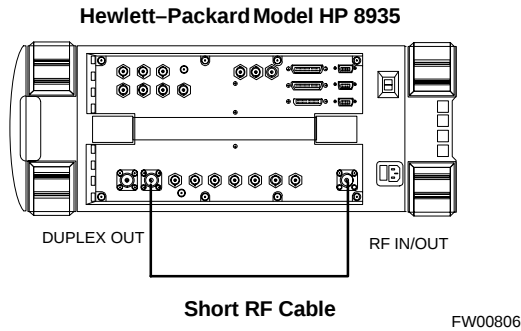


Figure G-6: Delta Calibration Setup – HP8935 to HP8935



Agilent E4406A Power Delta Calibration

The Agilent E4406A transmitter tester and E4432B signal generator test equipment combination can be used for CDMA 2000 as well as IS-95A/B operation modes. The power delta calibration is performed on the E4406A, but the E4432B is required to generate the reference signal used to calculate the power delta offset. After the offset value has been calculated, add it to the TX cable loss value in the LMF.

Follow the procedure in Table G-4 to perform the Agilent E4406A Power Delta Calibration procedure.

Table G-4: Agilent E4406A Power Delta Calibration Procedure	
Step	Action
	* IMPORTANT Perform this procedure <i>after</i> test equipment has been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i>. After it is warmed up and stabilized, calibrate the test equipment as described in the “Test Set Calibration” section of the Optimization/Calibration chapter in the <i>SC 4812ET Optimization/ATP manual</i>.
1	Zero the Power Meter prior to connecting the power sensor to the RF cable from the signal generator. * IMPORTANT For best accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated.
2	Connect a short RF cable from the E4432B RF OUTPUT connector the HP437 power meter power sensor (see Figure G-7).
3	Set the E4432B signal generator as follows: – Press Preset to exit any modes for which the signal generator is configured. – Press Frequency and enter the <i>frequency</i> of the channel to be calibrated on the numeric keypad. – Using the soft keys to the right of the screen, select the frequency range to be measured; for example MHz. – Press Amplitude and, using the numeric keypad, set signal amplitude to 0 (zero). – Using the soft keys, set the measurement type to dBm.

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Table G-4: Agilent E4406A Power Delta Calibration Procedure

Step	Action
4	On the E4432B, press RF On/Off to toggle the RF output to RF ON . – Note that the RF On/Off status in the screen display changes.
5	Measure and record the value reading on the HP437 power meter as result A _____.
6	On the E4432B, press RF On/Off to toggle the RF output to RF OFF . – Note that the RF On/Off status in the screen display changes.
7	Disconnect the short RF cable from the HP437 power meter power sensor, and connect it to the RF INPUT connector on the E4406A transmitter tester (see Figure G-8).
8	* IMPORTANT Do not change the frequency and amplitude settings on the E4432B when performing the following steps. Set the E4406A as follows: – Press Preset to exit any modes for which the transmitter tester is configured – Press MODE and, using the soft keys to the right of the screen, select cdmaOne – Press MEASURE and, using the soft keys, select spectrum – Press Frequency and, using the soft keys, select Center Frequency – Enter the <i>frequency</i> of the channel to be calibrated using the numeric keypad – Using the soft keys, select the frequency range to be measured; for example, MHz – Press Input/Output and, using the soft keys, select Input Atten – Using the numeric keypad, set Input Atten to 0 (zero) and, using the soft keys, select dB – Using the soft keys, select External Atten and then select Mobile – Using the numeric keypad, set Mobile to 0 (zero) and, using the soft keys, select dB – Using the soft keys, select Base – Using the numeric keypad, set Base to 0 (zero) and, using the soft keys, select dB – Press MEASURE and, using the soft keys, select Channel Power
9	On the E4432B signal generator, press RF On/Off to toggle the RF output to RF ON . – Note that the RF On/Off status in the screen display changes.
10	Read the measured Channel Power from the E4406A screen display and record it as result B _____.
11	On the E4432B, press RF On/Off to toggle the RF output to RF OFF . – Note that the RF On/Off status in the screen display changes.

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Table G-4: Agilent E4406A Power Delta Calibration Procedure	
Step	Action
12	Calculate the Power Calibration Delta value. The delta value is the power meter measurement minus the Agilent measurement. Delta = A – B Example: Delta = –0.70 dBm – (–1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm – 0.55 dBm = –0.29 dBm These examples are included to show the mathematics and do not represent actual readings. NOTE Add this delta value to the TX Cable Loss value during In–Service Calibration.

Figure G-7: Delta Calibration Setup – Agilent E4432B to HP437

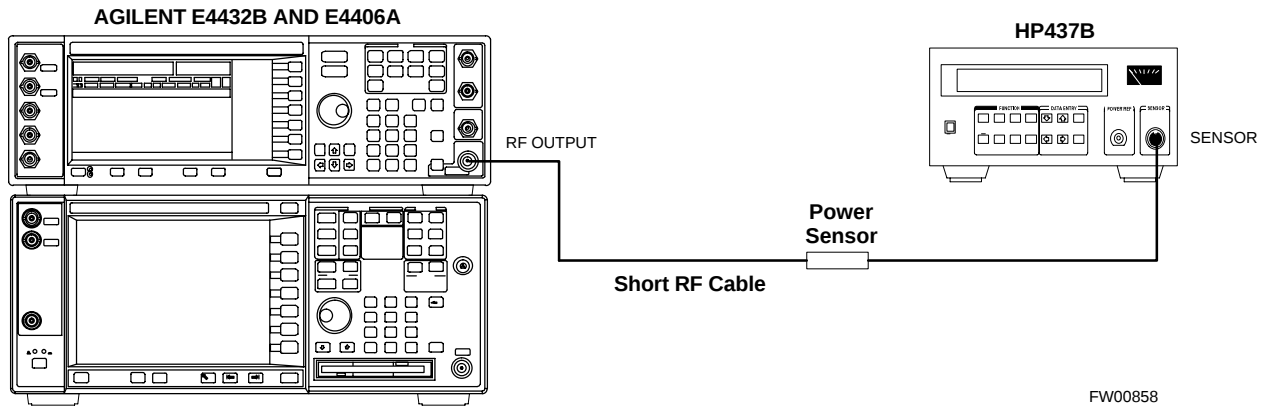
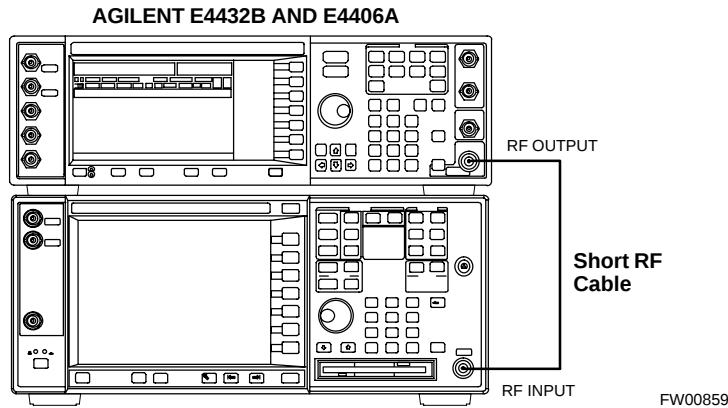


Figure G-8: Delta Calibration Setup – Agilent E4432B to Agilent E4406A



In-Service Calibration



IMPORTANT

This feature does NOT have fault tolerance at this time. The system has no safe-guards to stop you from doing something that will take the BTS out of service. If possible, perform this procedure during a maintenance window.

Follow the procedures in this section precisely, otherwise the entire BTS will most likely go OUT OF SERVICE.

At the CBSC, only perform operations on expansion hardware when it is in the OOS_MANUAL state.

The operator must be trained in the LMF operation prior to performing this procedure.

Prerequisites

- Expansion hardware has been added in the CBSC database, and the CDF file has been generated.
- The expansion devices have been inserted into the C-CCP cage and are in the OOS_MANUAL state at the CBSC.
- The site specific cdf (with the expansion hardware) and cal files have been loaded onto the LMF.
- The LMF has the same code and dds files as the CBSC to download.



IMPORTANT

Do not download code or data to any cards other than those you are working on. Downloading code or data to other cards will take the site OUT OF SERVICE.

The code file version numbers must match the version numbers on the other cards in the frame. If the numbers do not match, the site may go OUT OF SERVICE.

The BTS-#.cdf, CBSC-#.cdf, and CAL files for this BTS must have come from the CBSC.

- Test equipment has been configured per Figure G-9 or Figure G-10.
- An RFDS (or at a minimum a directional coupler), whose loss is already known, must be in line to perform the in-service calibration.
- Test equipment has been calibrated after 1 hour warm up.
- A short RF cable and two BNC-N adapters are available to perform Cable Calibration.

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- The Power Delta Calibration has been performed (see Table G-1, Table G-2, or Table G-3).

Figure G-9: Optimization/ATP Test Setup Using RFDS

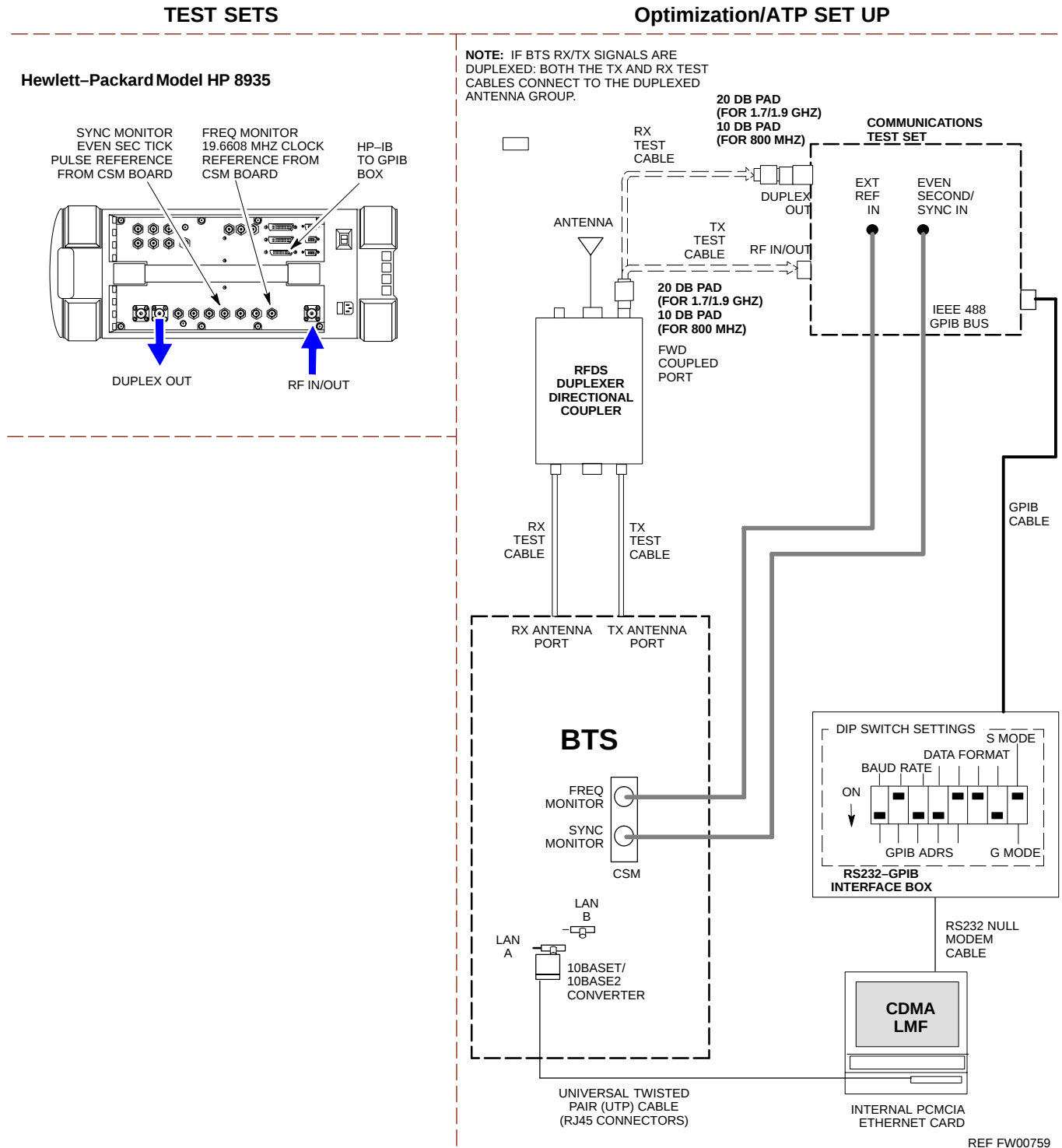
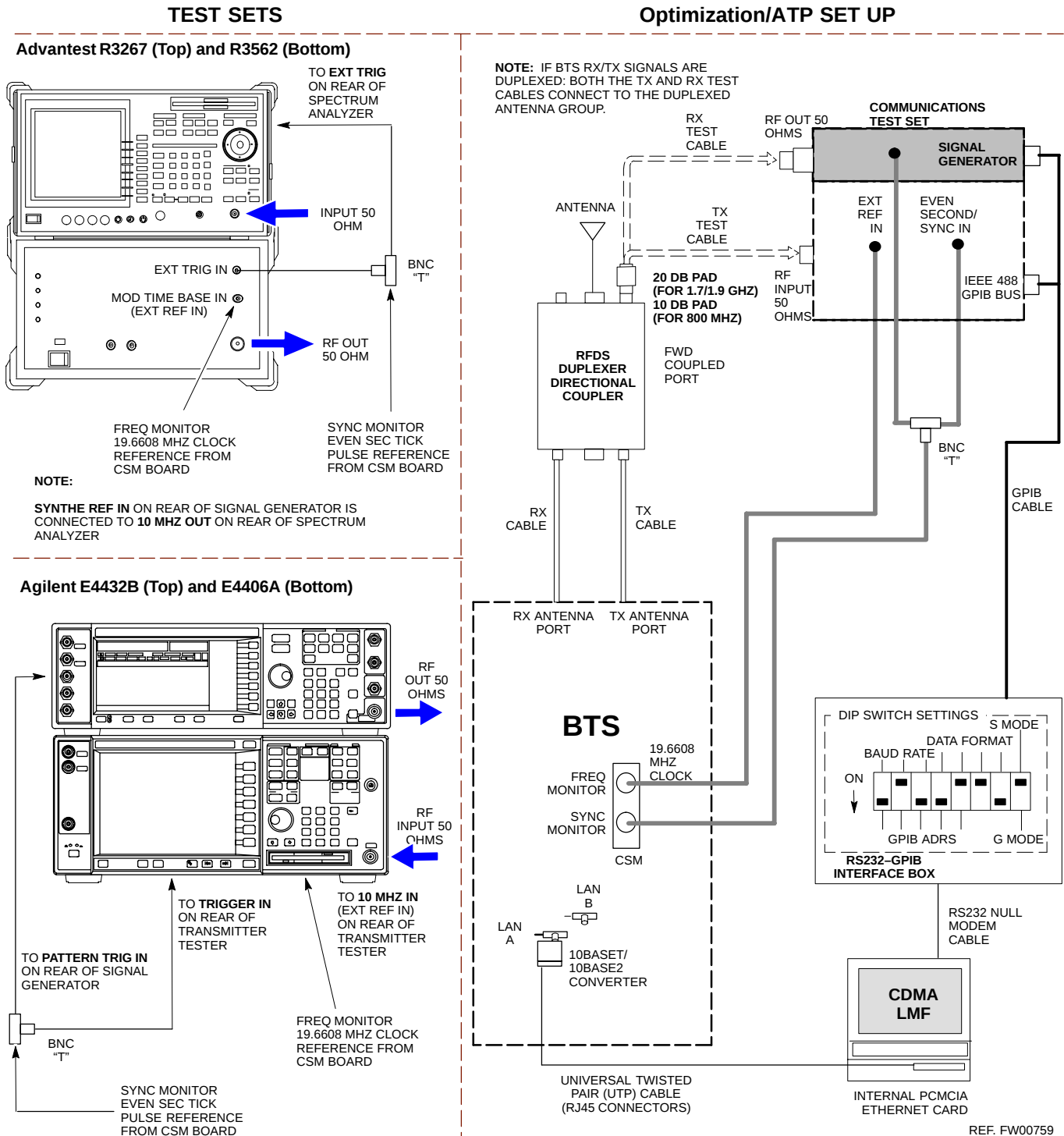


Figure G-10: IS-95 A/B/C Optimization/ATP Test Setup Using RFDS



Follow the procedure in Table G-5 to perform the In-Service Calibration.

Table G-5: In-Service Calibration	
Step	Action
	* IMPORTANT Perform this procedure <i>after</i> test equipment has been allowed to warm-up and stabilize for a <i>minimum of 60 minutes</i>.
1	Set up the LMF for In-Service Calibration: – Start the LMF by double-clicking the LMF icon on the Windows desktop. – Click Tools>Options from the menu bar at the login screen. – Check the applicable spectrum analyzer check box and the signal generator check box on the Test Equipment tab. Ensure that the GPIB address is 18 for the CDMA analyzer and 1 for the signal generator. – Uncheck any other other equipment that is selected. – Click the Apply button. – Select the BTS Options tab in the LMF Option window. – Check the In-Service Calibration check box. – Click the Apply button. – Click the Dismiss button to close the LMF Option window.
2	Login to the target BTS: – Select the target BTS icon. – Click the Login button at the login screen.
3	Measure the Cable Loss using the Cable Calibration function: – Click Util>Cable Calibration from the menu bar at the main window. – Set the desired channel(s) and select TX and RX CABLE CAL at the cable calibration pop up window. – Click the OK button to perform cable calibration. – Follow the on-screen instructions to complete the cable loss measurement. NOTE – The measured value is input automatically to the cable loss file. – To view the cable loss file, click Util>Examine>Cable Loss>TX or RX.

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Table G-5: In-Service Calibration

Step	Action
4	Add the spectrum analyzer power delta to the Cable Loss. – To view the cable loss file, click Util>Examine>Cable Loss>TX or RX. – Add the value computed in Table G-1, Table G-2, or Table G-3 to the TX Cable Loss. NOTE Be sure to include the sign of the value. The following examples are included to show the mathematics and do not represent actual readings: – Example: 5.65 dBm + 0.55 dBm = 6.20 dBm – Example: 5.65 dBm + (–0.29 dBm) = 5.36 dBm – Example: –5.65 dBm + 0.55 dBm = –5.10 dBm – Example: –5.65 dBm + (–0.29 dBm) = –5.94 dBm
5	Input the Coupler Loss for the TX and RX tests: – Click Util>Edit>Coupler Loss>TX or RX from the menu bar at the main window. – Input the appropriate coupler loss for the target carrier(s) by referring to the information taken at the time of BTS installation. – Click the Save button. – Click the Dismiss button to close the window. – To view the coupler loss file, click Util>Examine>Coupler Loss>TX or RX.
6	Have the CBSC operator put the redundant BBX OOS_MANUAL.
	! CAUTION Be sure to download OOS devices only. Loading in-service devices takes them OUT OF SERVICE and can result in dropped calls. The code file version numbers must match the version numbers on the other cards in the frame. If the numbers do not match, the site may go OUT OF SERVICE. NOTE Be sure to include the redundant BBX in steps 9, 10, and 11.
7	Download code and data to the target devices: – Click Tools>Update NextLoad>CDMA to set the code version that will be downloaded. – Select the BTS(s) you need, check the appropriate code version in the pop up window, and click the Save button to close. – Select the target BBX(s) on the C-CCP cage picture. – Click Device>Download>Code/Data to start downloading code. – Select the target BBX(s) on the C-CCP cage picture. – Click Device>Download>Data to start downloading data.

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Table G-5: In-Service Calibration

Step	Action
8	! CAUTION Perform the In-service Calibration procedure on OOS devices only. Select the desired test: – Select the target BBX(s) on the C-CCP cage picture. – Click Tests>[desired test] from the menu bar at the main window. – Select the target carrier and confirm the channel number in the pop up window. – Leave the Verify BLO check box checked. – From the Test Pattern pick list, select a test pattern. – Click the OK button to start calibration. – Follow the on-screen instructions, except, do not connect to the BTS antenna port, connect to the directional coupler (fwd) port associated with the on screen prompt antenna port. NOTE • Selecting Pilot (default) performs tests using a pilot signal only. • Selecting Standard performs tests using pilot, synch, paging and six traffic channels. This requires an MCC to be selected. • Selecting CDFPilot performs tests using the CDF value for pilot gain and IS-97 gain values for all the other channels included in the Standard pattern setting (paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC. • Selecting CDF performs tests using pilot, synch, paging and six traffic channels, however, the gain for the channel elements is specified in the CDF file.
9	Save the result and download the BLO data to the target BBX(s): – Click the Save Result button on the result screen. The window closes automatically.
10	Logout from the BTS and close the LMF session: – Click BTS>Logout to close the BTS connection. – Close the LMF window.
11	Restore the new “bts-*.cal” file to the CBSC.
12	Enable the target device(s) from the CBSC.

In-Service Calibration – continued

Notes

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Appendix H: RF Cabinet Interconnect Cables

Appendix Content

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Notes

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

RF Cabinet Interconnect Cables

SC 4812ET Intra-Cabinet Cabling

This appendix provides the identification and location of the cables connecting the components which make up the SC 4812ET RF cabinet. The number of cables and components incorporated in the RF cabinet will vary depending on the the manner in which the cabinet is equipped. For example, a 3 sector, 2 carrier system will require less components and less cables than a 6 sector 2 carrier system.

Refer to Table H-1 and Figure H-1 through Figure H-19 for the cable you wish to research.



IMPORTANT

In some cases cables with the same number are used to connect two different signalling paths. These cables are designated A & B and the point they connect to and from is also designated A & B. Ensure the correct cable (A or B) is connected to the correct designation (A or B) connector or plug.

Table H-1 : 4812ET RF CABINET INTER-CONNECT CABLES

DRDC, Combiner, Trunking Backplane Cables			
CABLE #	FROM	NOTE's	TO
3064795A05	TX CIO	Figure H-6	Trunking BP
3064735A10	TX Trunking BP	Figure H-5	Combiner Connector Pnl
3064735A07	TX Combiner	See Figure H-1, Figure H-11, Figure H-12, Figure H-13, and Figure H-14	DRDC
3064735A11	TX Combiner	(See Above)	DRDC
3064735A12	TX Combiner	(See Above)	DRDC
3064795A07	TX CIO	Figure H-11	Trunking BP
3086435H01	TX Combiner QDS		PkZ Adptr
3086435H02	TX Combiner QDS		PkZ Adptr
3086435H03	TX Combiner QDS		PkZ Adptr
3086168H01	Power LPA PDA	Figure H-5	Trunk BP
C-CCP Cables			
CABLE #	FROM	NOTE's	TO
3064809A01	Power CCCP/PDA	See Figure H-1 & Figure H-5	C-CCP Backplane
3064899A04	LAN I/O A in	See Figure H-1 & Figure H-5	C-CCP LAN I/O A In

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Table H-1 : 4812ET RF CABINET INTER-CONNECT CABLES

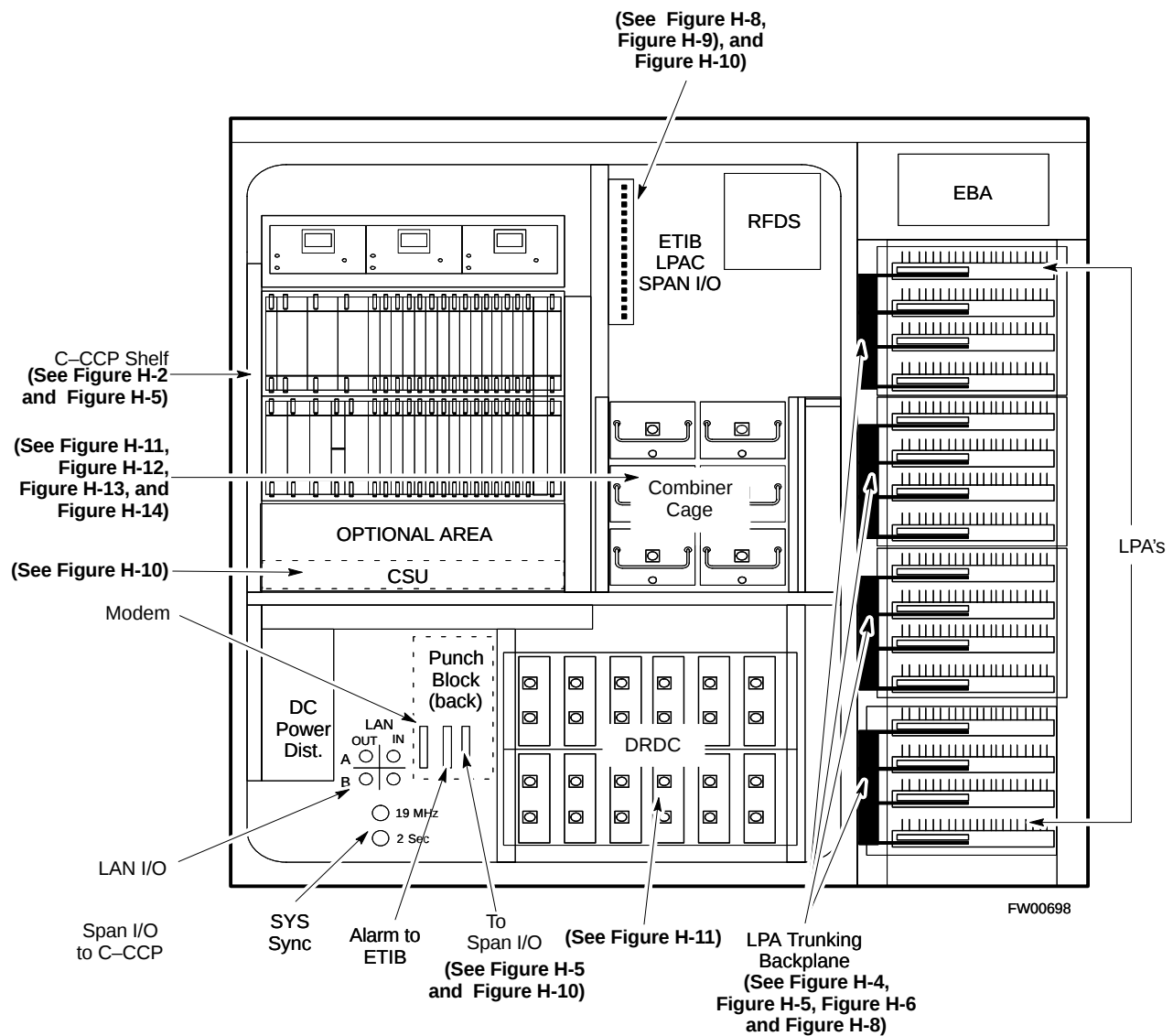
C-CCP Cables (cont)			
CABLE #	FROM	NOTES	TO
3064899A04	LAN I/O B in	See Figure H-1 & Figure H-5	C-CCP LAN I/O B In
3086033H03	GPS Surge Arrestor	See Figure H-1 & Figure H-5	C-CCP Backplane
3064899A04	LAN I/O B in	See Figure H-1 & Figure H-5	C-CCP LAN I/O B In
3064899A03	C-CCP LAN I/O A Out	See Figure H-1 & Figure H-5	LAN I/O A Out
3064899A03	C-CCP LAN I/O B Out	See Figure H-1 & Figure H-5	LAN I/O B Out
3064899A07	Sync CSM	See Figure H-1	I/O
3086000H02	Site I/O C-CCP	See Figure H-9	J2 on ETIB
3086001H02	A SPAN I/O BlkHd	See Figure H-1 & Figure H-5	C-CCP/A SPAN I/O
3086001H02	B SPAN I/O BlkHd	See Figure H-1 & Figure H-5	C-CCP/B SPAN I/O
3086086H02	Alarm C-CCP	See Figure H-1 & Figure H-9	J1 on ETIB
3086366H02	HSO/LFR	See Figure H-1 & Figure H-5	C-CCP HSO/LFR
4886044H01	LBD	See Figure H-1 & Figure H-5	C-CCP Backplane
Span I/O Board Cables			
CABLE #	FROM	NOTES	TO
3086601H01	SPAN I/O Pblock	See Figure H-1 & Figure H-10	CSU
3086601H02	SPAN CSU	See Figure H-1 & Figure H-10	A & B SPAN I/O BRD
3086001H02	SPAN CSU	See Figure H-1 & Figure H-10	A & B SPAN Connector on C-CCP Backplane
RFDS Cables			
CABLE #	FROM	NOTE's	TO
3064238A17	RFDS/ASU-1	Figure H-16 & Figure H-17	DRDC
3064238A18	RFDS/ASU-2	Figure H-16 & Figure H-17	DRDC
3064238A19	RFDS/ASU-1	Figure H-16 & Figure H-17	DRDC
3064238A20	RFDS/ASU-2	Figure H-16 & Figure H-17	DRDC
ETIB/LPAC Cables			
CABLE #	FROM	NOTE's	TO
3064794A03	LPAC	See Figure H-8	C-CCP Bkpln
3064794A05	ETIB	See Figure H-9 & Figure H-16	RFDS
3086433H04	RGPS I/O	See Figure H-1 & Figure H-9	ETIB (15 position)
3086169H01	Power, Heat Exchanger, PDA	See Figure H-1 & Figure H-9	ETIB, OPT, HX, EBA
3086500H01	Alm/Ctrl ETIB	See Figure H-1 & Figure H-9	HX/LPA

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RF Cabinet Interconnect Cables – continued

Table H-1 : 4812ET RF CABINET INTER-CONNECT CABLES			
3086505H01	DC Cable (DC Power Dist)	See Figure H-1 & Figure H-19	EBA Blower Assembly
3086566H01	LPAC	See Figure H-1 & Figure H-8	1 Cable to each LPA Bk Pln
3086569H01	Door Intrusion Alarm	See Figure H-5 & Figure H-19	Door Switch
3086655H02	LPAC	See Figure H-8, Figure H-5 & Figure H-19	ETIB

Figure H-1: 4812ET RF Cabinet Internal FRU Locations



C-CCP Cables and Cable Connectors

The C-CCP Shelf assembly consists of the C-CCP Shelf and the attached backplane with cables and connectors (see Figure H-2 and Figure H-3).

The C-CCP shelf contains all of the CDMA unique functions within the SC 4812ET RF frame. The C-CCP shelf contains the following components:

- Broadband Transceiver (BBX) cards
- Multi-Channel CDMA (MCC) cards
- Combiner Input/Output (CIO) card
- Power Supply cards
- Group Line Interface (GLI2) cards
- Alarm Monitor Reporting (AMR) cards
- Clock Synchronization Modules (CSM)
- High Stability Oscillator/Low frequency Receiver (HSO/LFR)
- Multicoupler Preselector Cards (MPC)
- CDMA Clock Distribution (CCD) card
- Integrated Frame Modem (IFM) card
- Switch card
- C-CCP Fan Modules

Figure H-2: C-CCP Shelf Cable Numbers and Connectors

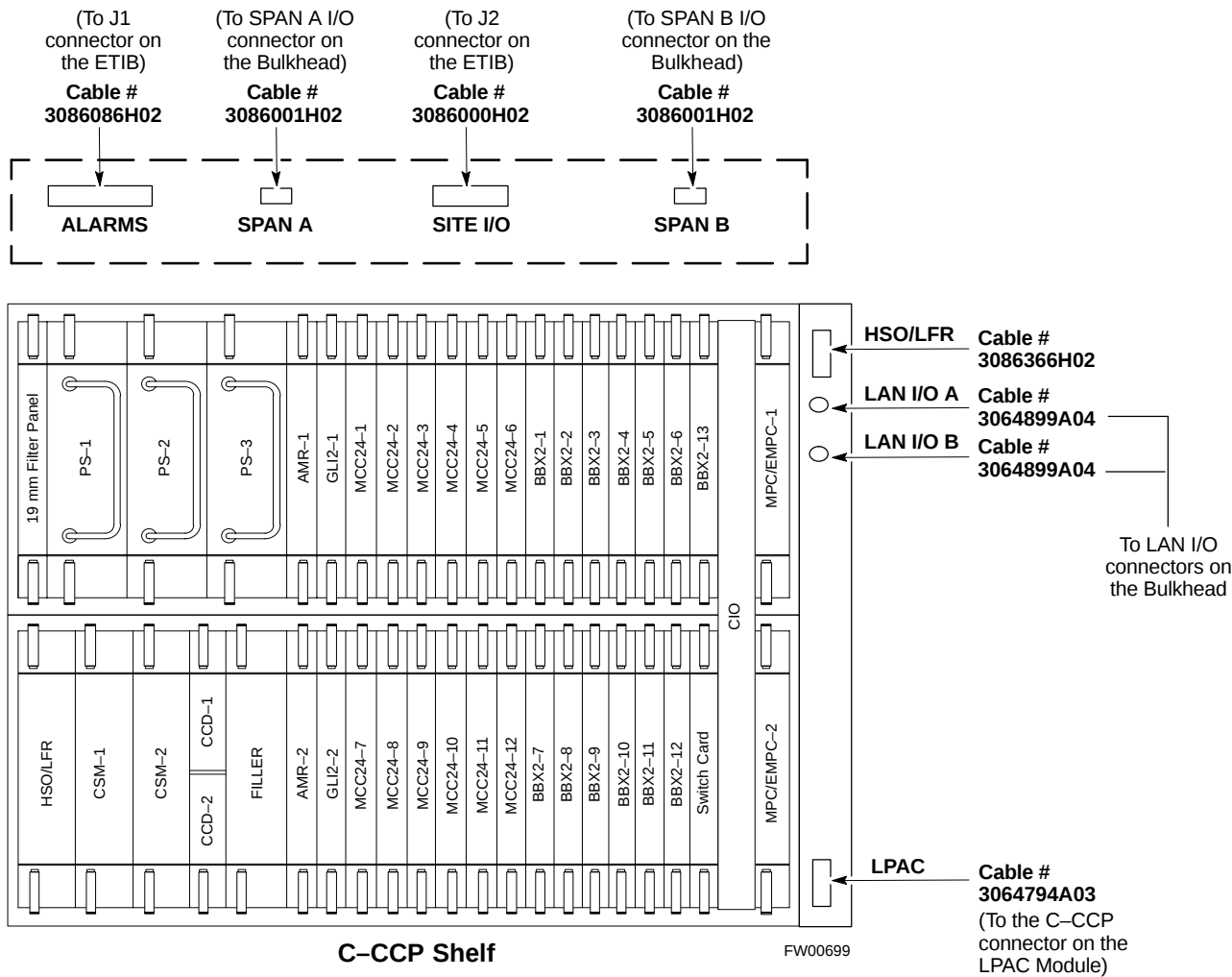
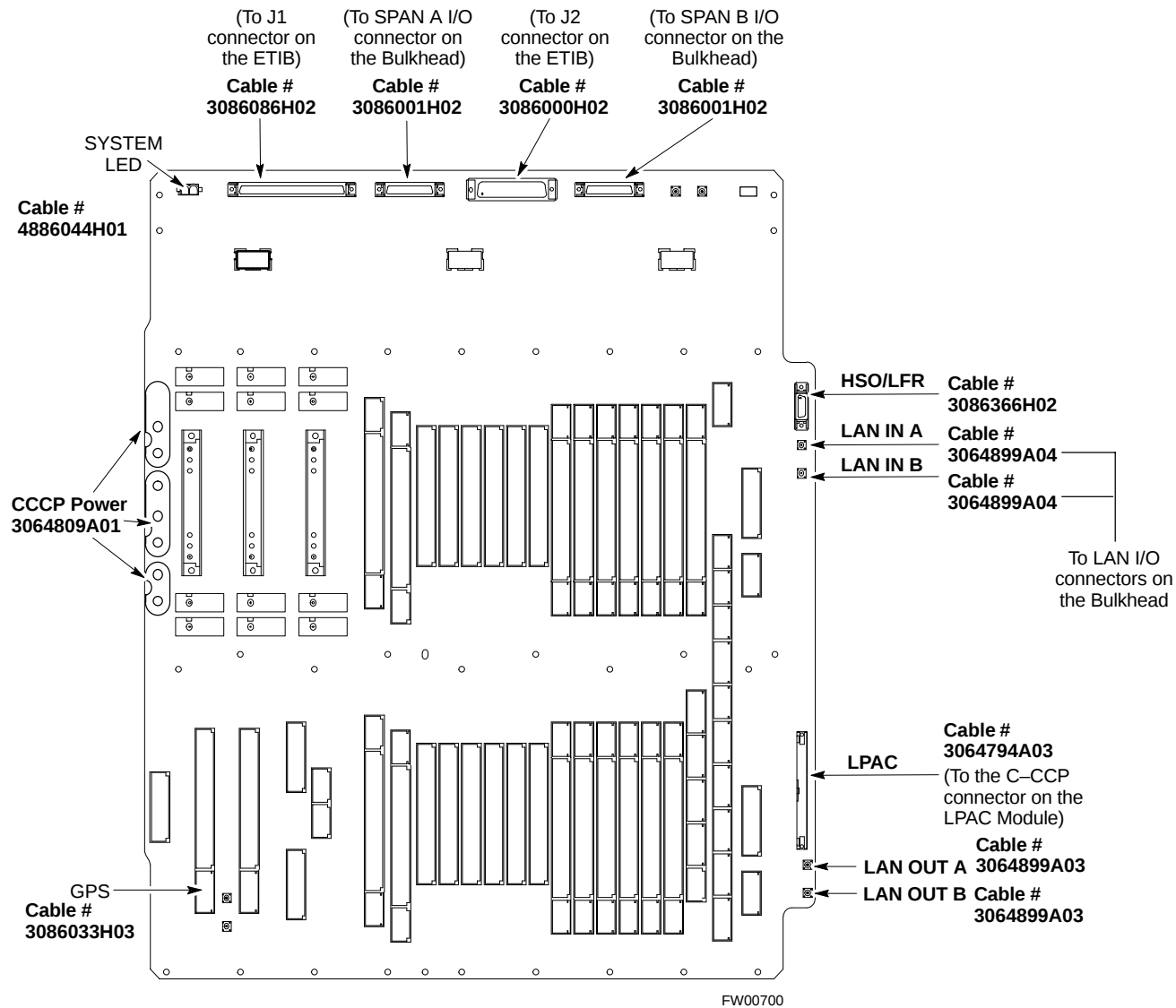


Figure H-3: C-CCP Backplane



RF Cabinet LPA Cables

There can be a maximum of 16 LPAs in an RF cabinet. The connections shown are for one LPA backplane which controls four LPAs. The remaining LPAs are connected in the same manner. Refer to Figure H-4, through Figure H-8 for the cables connected to the LPAs in the 4812ET RF cabinet.

Figure H-4: LPAs for the SC 4812ET

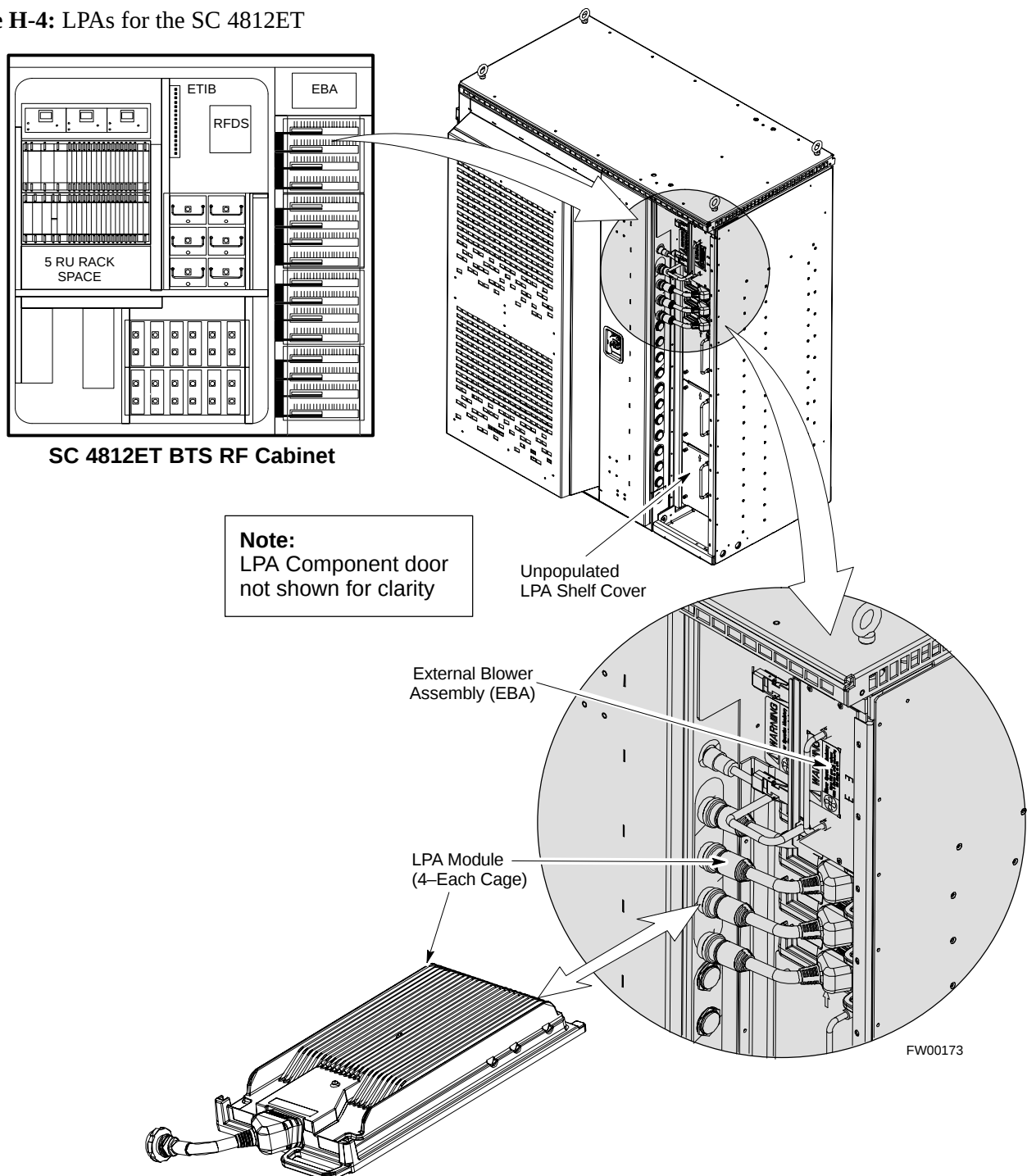
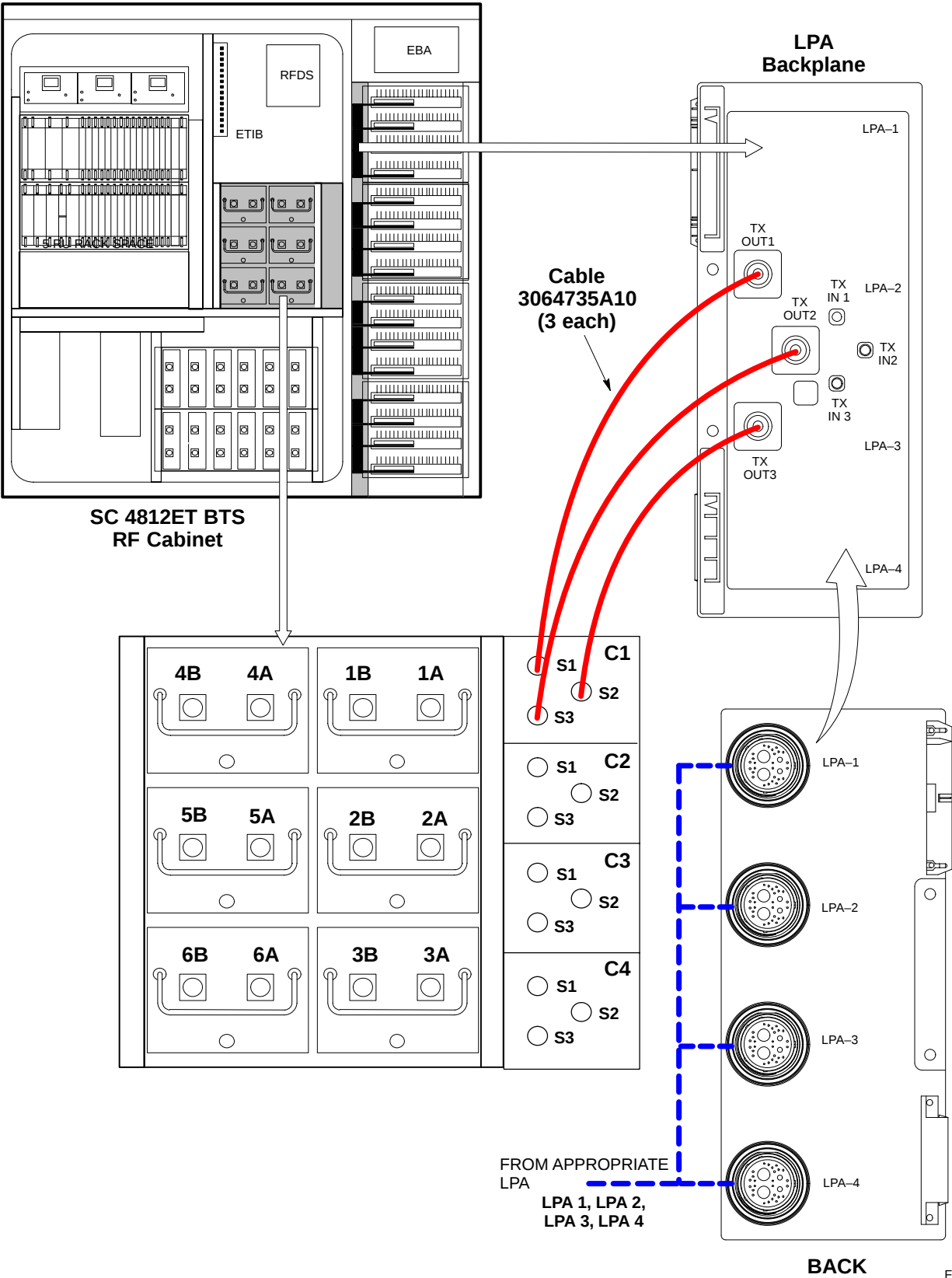


Figure H-5: BTS Combiner to LPA Backplane Cables



FW00708-REF

Figure H-6: Combiner to LPA Backplane/LPA Backplane To CIO Board Cables

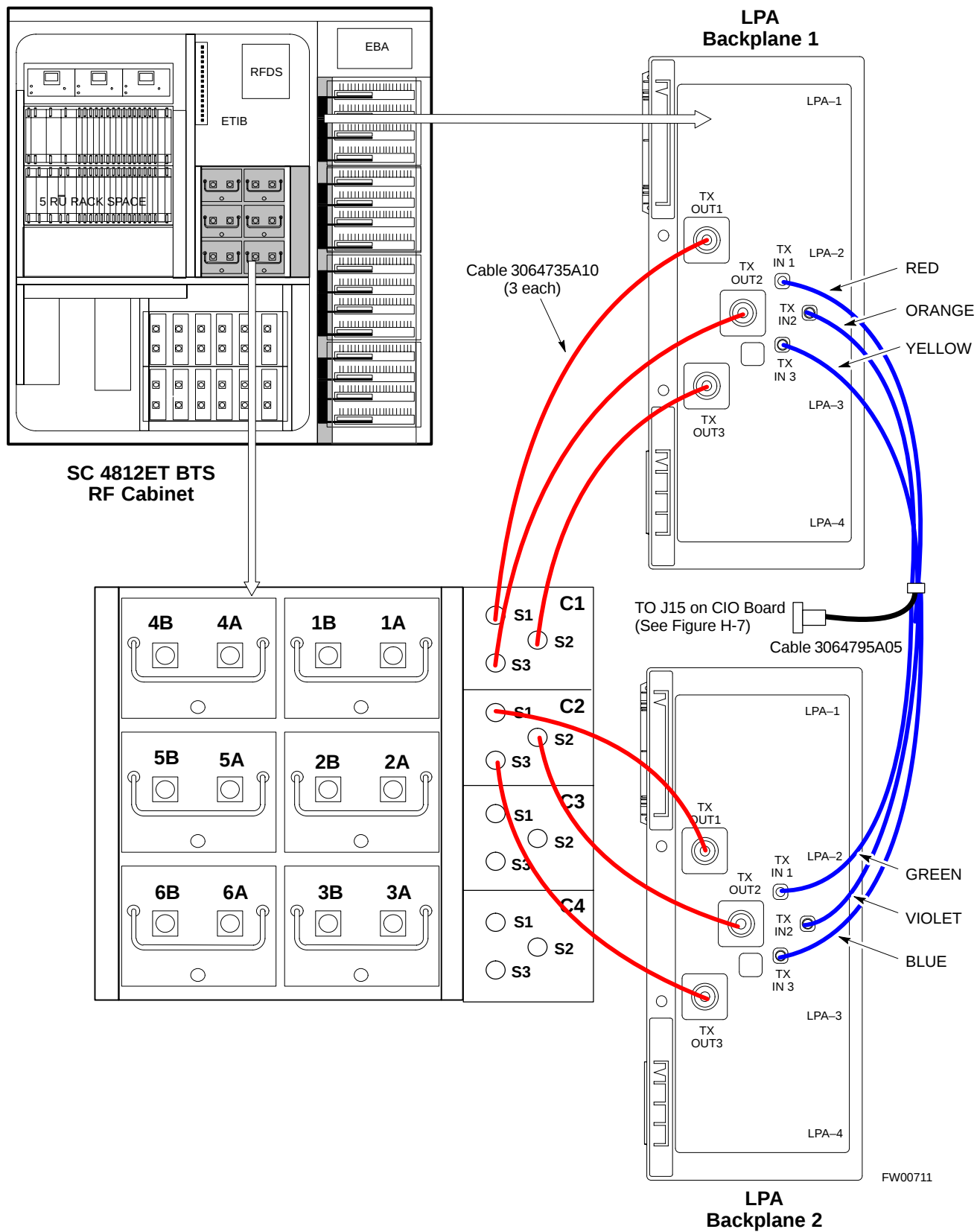
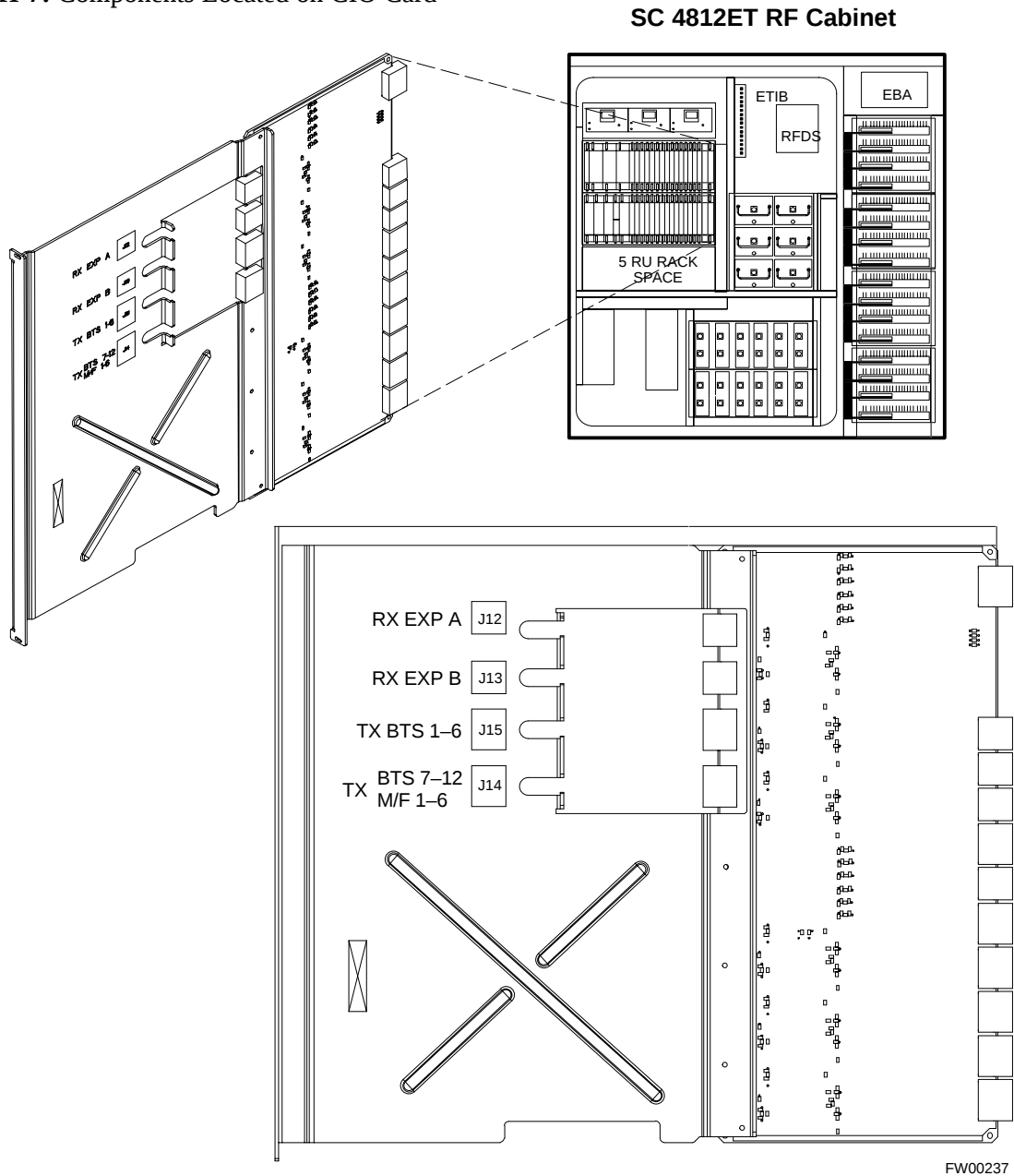


Figure H-7: Components Located on CIO Card

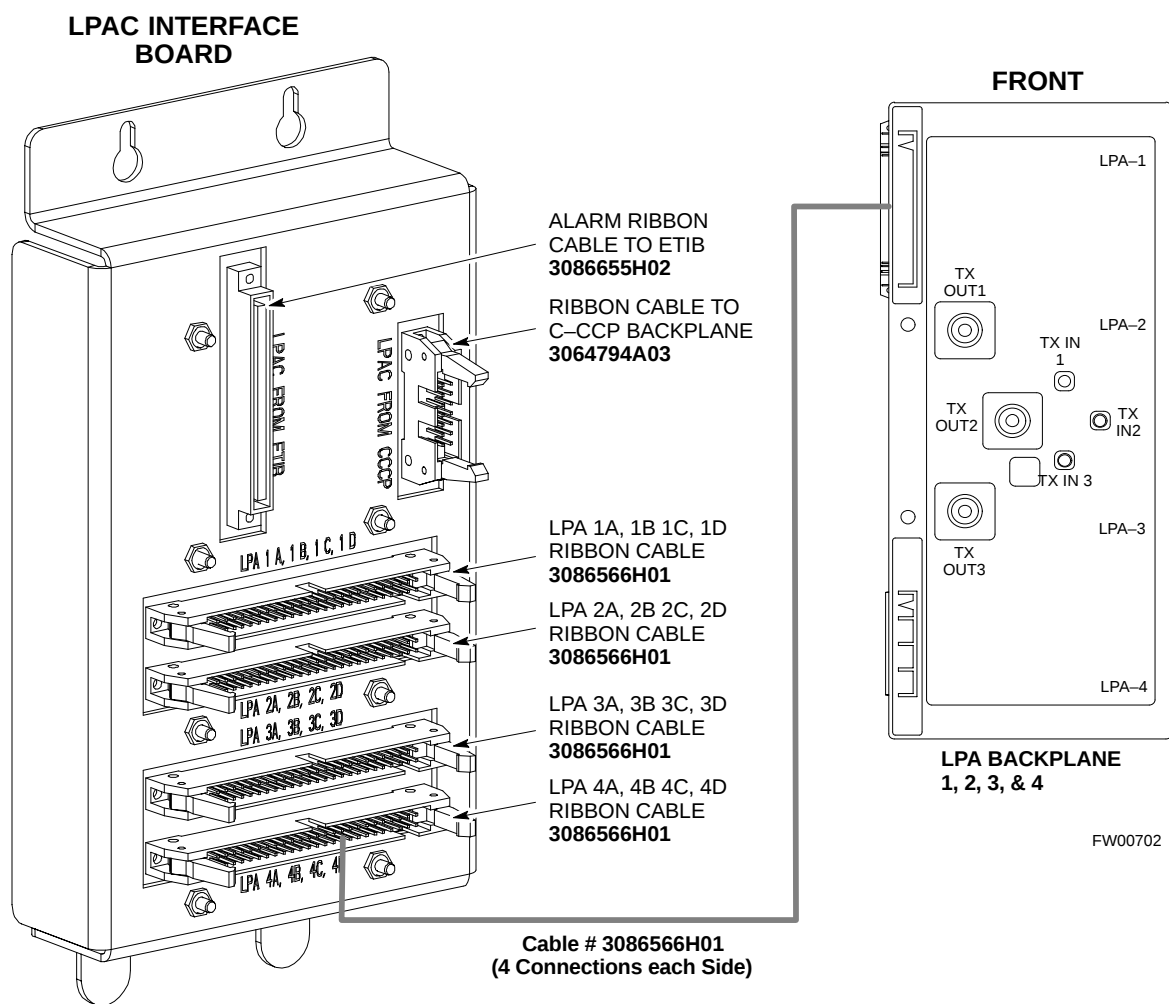


LPAC Cabling

The LPAC module provides the communication interface from the ETIB and C-CCP to the LPA through the trunking backplane. The LPAC interface board is contained in a protective housing which is mounted on the RF cabinet frame behind the ETIB module. See Figure H-3, Figure H-8 and Figure H-9 for connecting cables and connector locations.

The LPAC is located internally to the frame as shown in Figure H-1.

Figure H-8: LPAC Interface Board Connectors and Attaching Cable Numbers



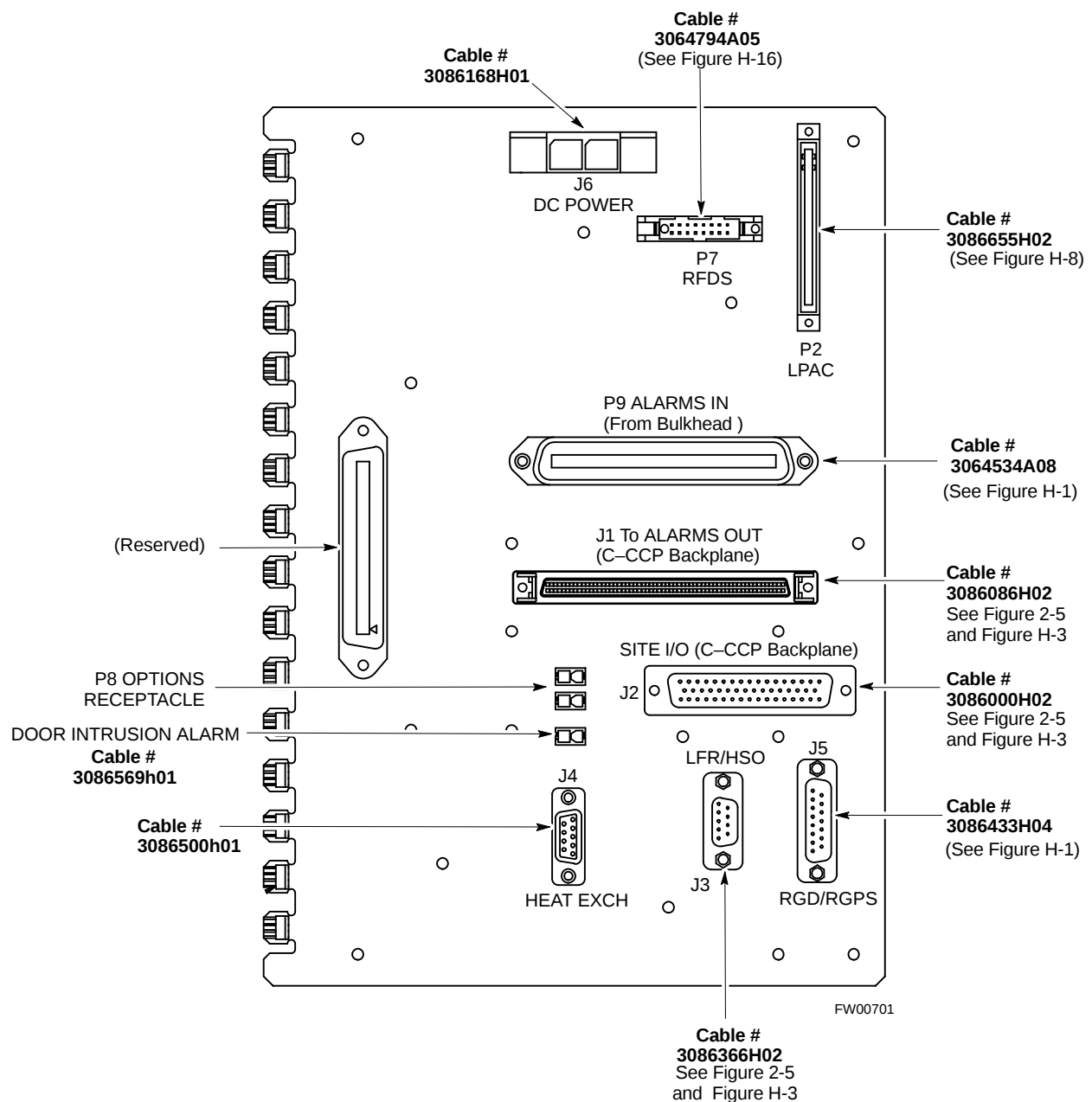
NOTE: The LPAC is Located Behind the ETIB Module

ETIB Cables and Cable Connectors

The ETIB module (see Figure H-9) provides the interface for the LPA's through the LPAC, punchblock, heat exchanger and alarms to the C-CCP backplane. The ETIB interface board is contained in a protective housing which is mounted on the RF cabinet frame.

The ETIB is located internally to the frame as shown in Figure H-1.

Figure H-9: ETIB I/O Connectors and Attaching Cable Numbers



SPAN I/O Cable Connection Diagram

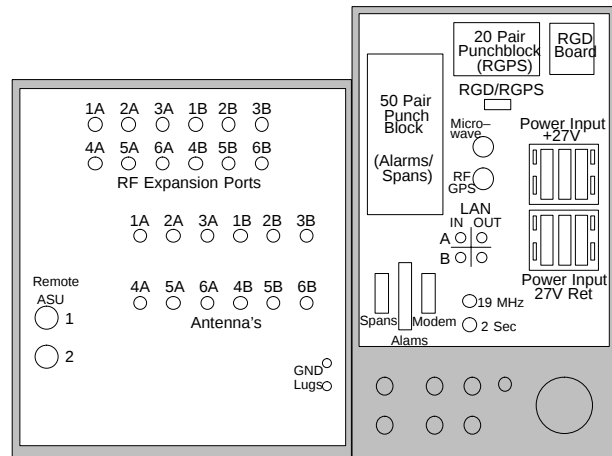
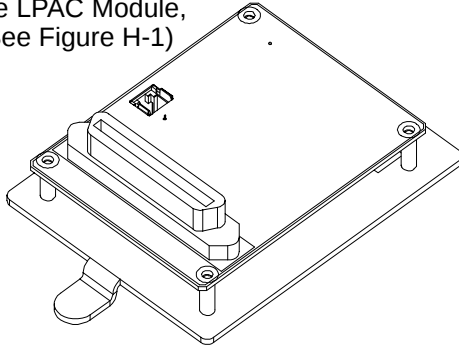
The SPAN I/O card provides the frame interface and secondary surge protection for the T1 lines. There are two span cards in an RF cabinet. SPAN I/O A supports spans A, C, and E. SPAN I/O B supports span B, D, and F. See Figure H-10 for SPAN cables and cable connections.

The SPAN I/O is located internally to the frame as shown in Figure H-1.

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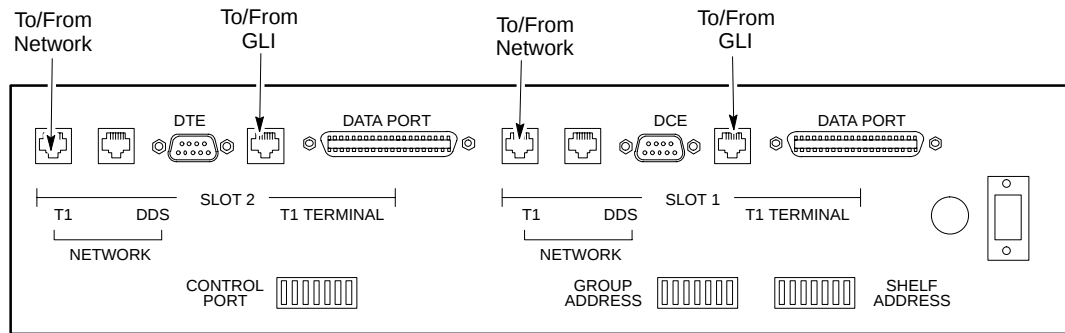
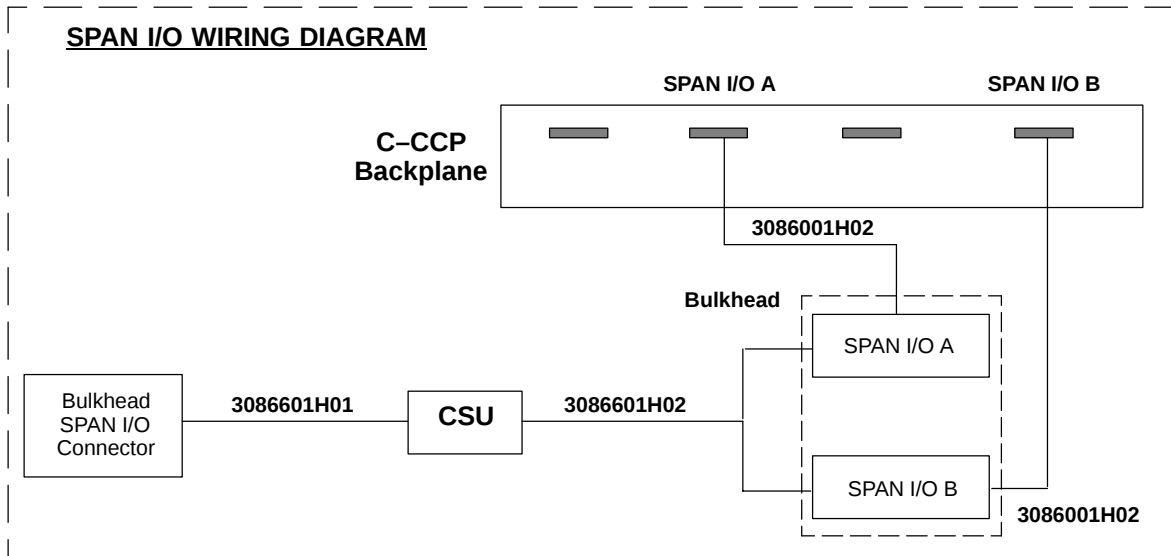
Figure H-10: SPAN I/O Cables and Connectors

**SPAN I/O (A & B)
Interface Module**
(Located Behind
the LPAC Module,
See Figure H-1)



4812ET Rear Connector Panel

SPAN I/O WIRING DIAGRAM



CSU Back View

FW00703

H

DRDC/TRDC Cables and Cable Connections

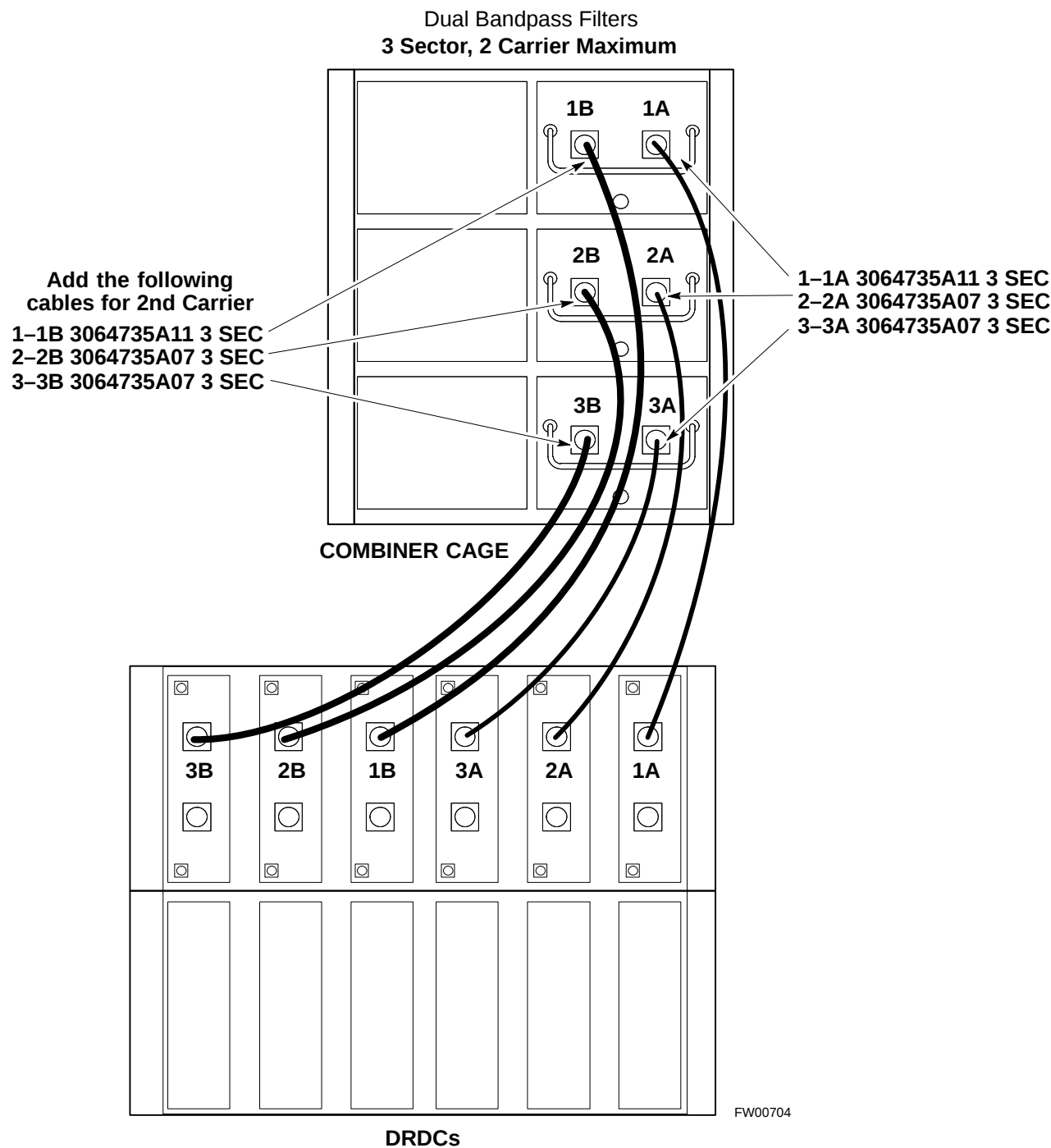
The DRDC is a Duplexer, RX Filter, and Directional Coupler which provides the RF interface at the rear of the cabinet. The connections are the antenna connection (outside rear), transmit into the DRDC TX filter. Receive out of DRDC (RX filter), and Directional coupler.

The TRDC is a TX filter/RX filter/Directional Coupler that is the same as the DRDC except the TRDC has two antenna outputs (TX only and RX only) The TRDC is not available in the 1.9 GHz band.

See Figure H-11, Figure H-12, Figure H-13, and Figure H-14 for the cable diagram that fits the configuration of your BTS site.

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Figure H-11: 3 Sector, 2 Carrier BTS Combiner DRDC/TRDC Cable Connection



H

RF Cabinet Interconnect Cables – continued

Figure H-12: BTS 2 to 1, 3 or 6 Sector Combiner DRDC/TRDC Cable Connection

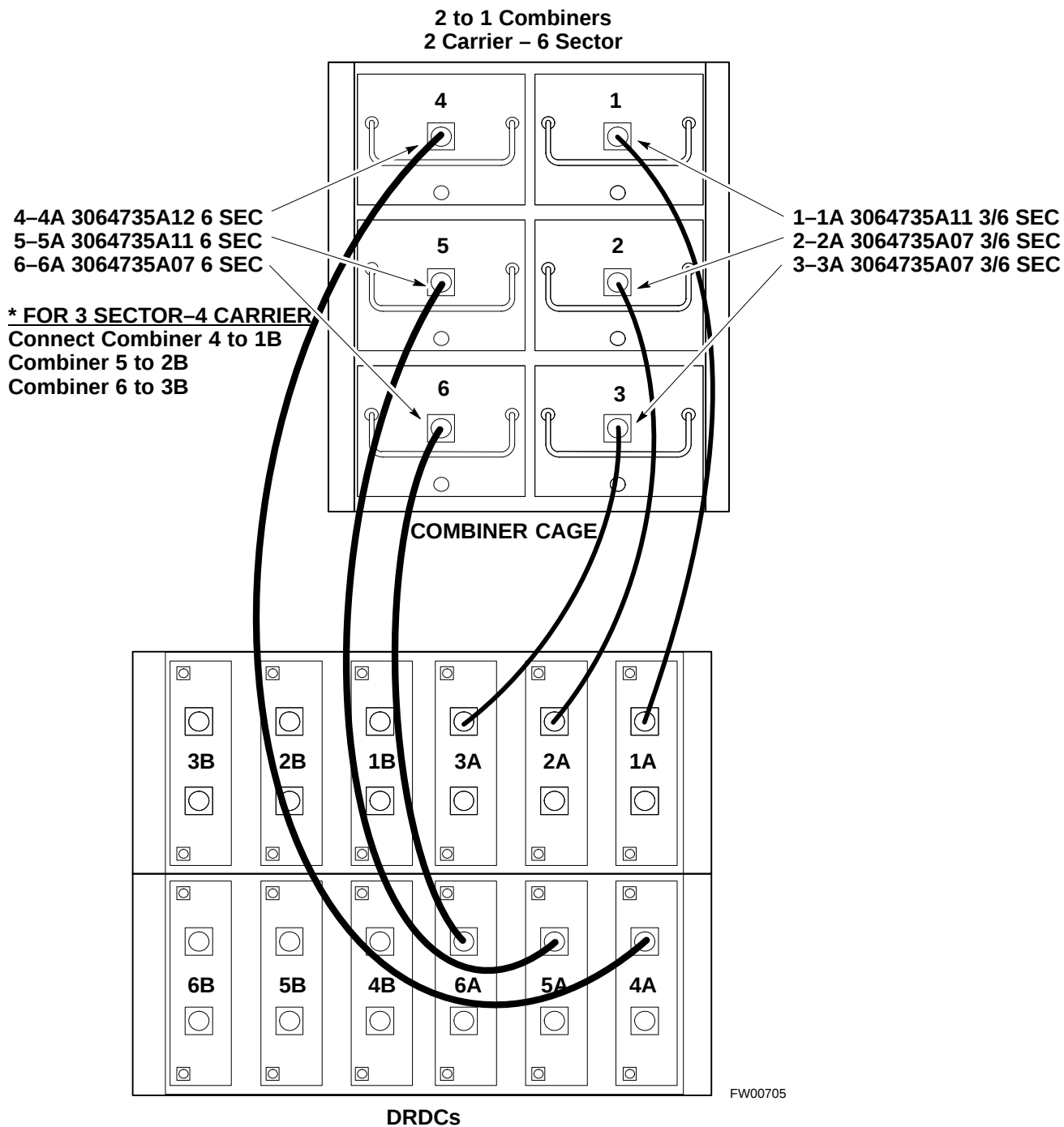
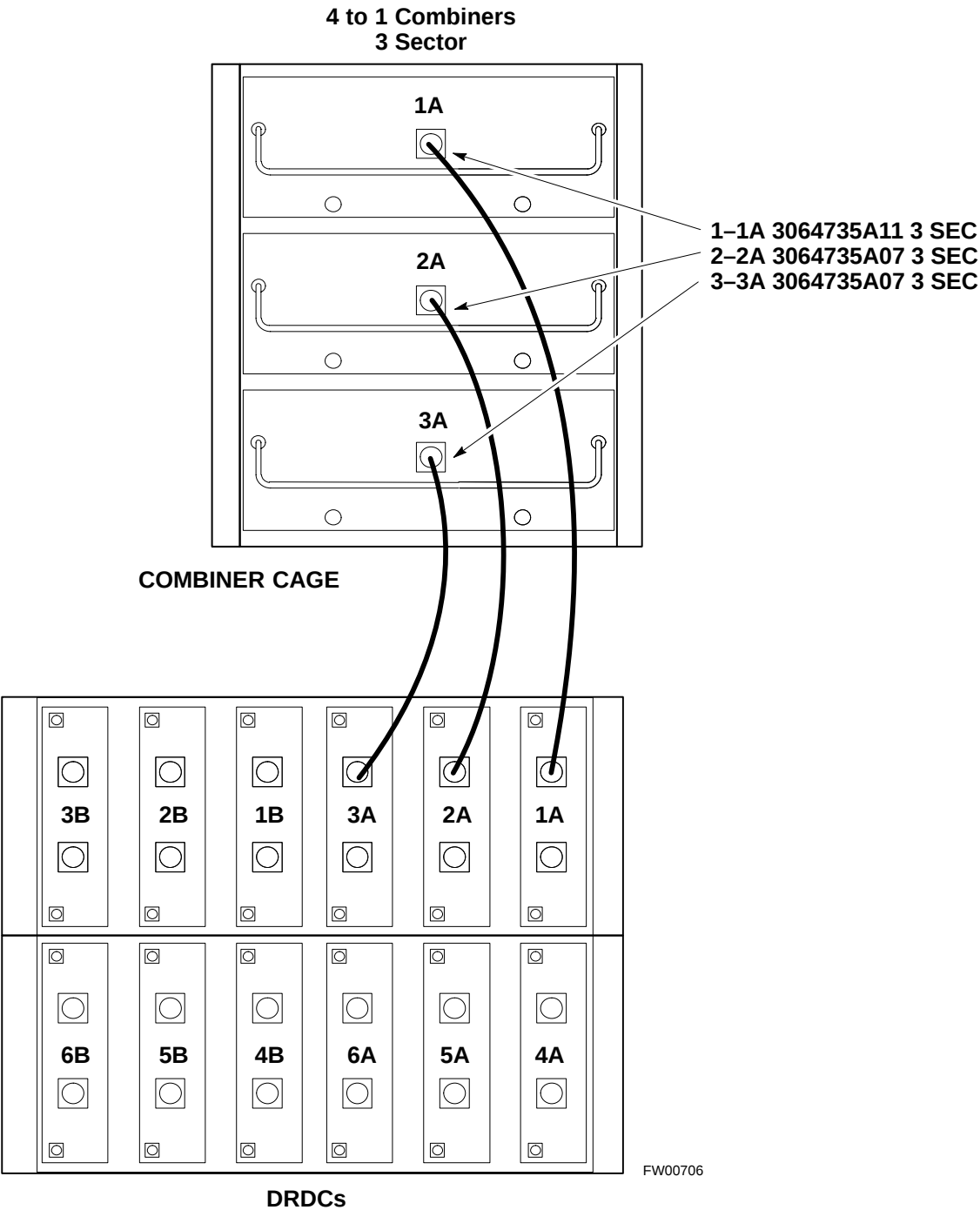


Figure H-13: BTS Combiner DRDC/TRDC Cable Connection



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