

**OPERATION AND MAINTENANCE
TERMINAL STATION
1×N FREQUENCY DIVERSITY
DR 6/11-135EC
TERMINAL PROCEDURES**

CONTENTS	PAGE
1. GENERAL	1
1.1 UPDATE INFORMATION	1
1.2 ADMONISHMENTS	1
1.3 SERVICE PROTECTION	1
2. POWER UNIT VOLTAGE CHECKS	2
3. IF OUTPUT POWER LEVEL CHECK	3
4. IF INPUT POWER LEVEL CHECK	5
5. FRAME GENERATOR CLOCK FREQUENCY CHECK	7
6. MODULATOR CARRIER FREQUENCY CHECK	8
7. BLUE GENERATOR CLOCK FREQUENCY CHECK	9
8. DS3 PARITY AND FRAME CHECK	10
9. IF LOOPBACK S/I STRESS CHECK	11
10. IF LOOPBACK ERROR CORRECTOR STRESS CHECK	18
11. IF LOOPBACK TRANSVERSAL EQUALIZER PERFORMANCE CHECK	23

Figures

1. "S" (IF Signal) Power Level Measuring Connections	15
2. "I" (Interference) Power Level Setting Connections	16
3. IF Loopback S/I Stress Check Connections	17
4. "S" (IF Signal) Power Level Measuring Connections	21

Published by
The AT&T Document Development Organization

5. IF Loopback Error Corrector Stress Check Connections 22
6. IF Loopback TE Performance Check Connections 26

Tables

A. Power Unit Voltages 2

Published by
The AT&T Document Development Organization

1. GENERAL

This practice is used to test and adjust the line terminal bay. The procedures are normally referred to from the alarm-clearing procedures in the MAINTENANCE tab and the REPAIR VERIFICATION and ANNUAL FCC TESTS tabs. The procedures can also be used on a stand-alone basis.

Each procedure lists the recommended test equipment and accessories. Each piece of equipment is keyed with an item number (that is, Item A1) that corresponds to an item number in Table A, B, or C under the TEST EQUIPMENT AND ACCESSORIES tab. These tables provide the minimum specification for each piece of test equipment, and these specifications allow the technician to select alternate test equipment.

Using other than the recommended test equipment may require a slightly different test setup to perform the following procedures. Follow the manufacturer's setup and/or operation procedures.

1.1 UPDATE INFORMATION

This practice is reissued to revise Parts 9, 10, and 11 and Figures 1 and 2. This practice is used in binders 421-102-090 and 421-102-100.

1.2 ADMONISHMENTS

Admonishments are strategically-placed reminders to assure the safety of personnel (**DANGER**), to minimize service interruptions (**Caution**), and to prevent equipment damage (**Warning**). Read the admonishments in the MAINTENANCE tab.

1.3 SERVICE PROTECTION

Service must be protected before most of the procedures in this practice are performed. The preface information for each procedure contains one of the following:

Note: This is an in-service procedure.

Caution: **THIS IS AN OUT-OF-SERVICE PROCEDURE.**

The **Note** shows that the procedure can be performed on working equipment without performing any service protection operations. The **Caution** shows that manual service protection operations **must** be performed to avoid interrupting service. The appropriate manual operation is referenced at the appropriate step in the procedure.

Service on the regular equipment to be tested **must** be manually switched to the protection equipment to prevent service interruptions. If the protection equipment is to be tested, it **must** be manually locked out to prevent the regular equipment from switching to it during the procedure.

If necessary, refer to the SERVICE PROTECTION tab and/or the OPERATIONS tab to perform or verify proper service protection.

2. POWER UNIT VOLTAGE CHECKS

This procedure is used to check the input and output voltages on the 471- and 474-type power units. The 471-type power unit is used with a -24 V battery supply. The 474-type unit is used with a -48 V battery supply.

This procedure can be performed on any power unit installed in a regular or protection digital terminal shelf, the growth shelf, or the control and service channel shelf.

Note: This is an in-service procedure.

The following test equipment is required to perform this procedure:

- 1 - Digital multimeter (Item A1).

For digital multimeter specifications, see the TEST EQUIPMENT AND ACCESSORIES tab.

DANGER: To prevent electrical shock, follow office safety requirements when measuring DC voltage.

PROCEDURE

1. Using a digital multimeter, verify the requirements at the specified test points listed in Table A.
2. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

END OF PROCEDURE

TABLE A			
POWER UNIT VOLTAGES (NOTE)			
VOLTAGE TO BE CHECKED	VOLTAGE VALUE	TEST POINTS	REQUIREMENTS (V DC)
INPUT	-24 V	V _{in} + and -	-20.0 to -28.5
	-48 V		-42.0 to -60.0
OUTPUT	+5 V	V1 + and RTN*	+4.8 to +5.2
	-5 V	V1 - and RTN*	-5.0 to -5.4
	+15 V	V2 + and RTN*	+14.0 to +19.0
	-15 V	V2 - and RTN*	-14.0 to -19.0
<p>Note: The expected output voltage(s) is identified on the shelf label below each power unit.</p> <p>*Use V2 RTN test point on ± 15 volt power unit.</p>			

3. IF OUTPUT POWER LEVEL CHECK

This procedure is used to measure the IF signal level out of a regular or protection digital terminal shelf.

The IF output signal (going to the radio transmitter) is measured at the TRMT IF OUT jack located on the patch panel on the left side of the shelf.

Caution: *THIS IS AN OUT-OF-SERVICE PROCEDURE.*

The following test equipment is required to perform this procedure:

- 1 - Power meter (Item A4)
- 1 - IF power sensor (Item A6)
- 1 - Adapter, 75-ohm, N jack to 477D jack (Item B14)
- 1 - Adapter, 358 plug to 440 plug (Item B11)
- 1 - 4-inch screwdriver (Item C8).

Note: A test cable, if necessary, should not be longer than 5 feet.

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. **Caution:** *This is an out-of-service procedure.*

Protect service as follows:

- If testing the regular equipment, perform a manual line switch.
- If testing the protection equipment, perform a protection channel lockout.

2. Remove the left side bay cover, if equipped.
3. On the patch panel, remove the IF cable from the associated TRMT IF OUT jack for the digital transmitter under test.
4. Connect the IF power meter to the TRMT IF OUT jack.
5. Observe the power meter indication.

Requirement:

Standard IF interconnect cable (less than or equal to 50 feet), -6.1 to -8.1 dBm.

Long IF interconnect cable (greater than 50 feet), -1.0 to $+1.0$ dBm.

6. If further tests require access to the terminal patch panel, return to the instruction that referenced this procedure.

If no further tests require access to the terminal patch panel, disconnect all test equipment and reinstall all cables removed.

7. Remount side cover.

8. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

END OF PROCEDURE

4. IF INPUT POWER LEVEL CHECK

This procedure is used to measure the IF signal level into a regular or protection digital terminal shelf.

The IF input signal (coming from the radio receiver) is measured at the plug end of the IF cable connected to the RCV IF IN jack. The RCV IF IN jack is on the patch panel located on the right side of the shelf.

Caution: *THIS IS AN OUT-OF-SERVICE PROCEDURE.*

The following test equipment is required to perform this procedure:

- 1 - Power meter (Item A4)
- 1 - IF power sensor (Item A6)
- 1 - Adapter, 75-ohm, N jack to 477D jack (Item B14)
- 1 - Adapter, 358 plug to 558 jack (Item B9)
- 1 - 4-inch screwdriver (Item C8).

Note: A test cable, if necessary, should not be longer than 5 feet.

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. **Caution:** *This is an out-of-service procedure.*

Protect service as follows:

- If testing regular equipment, perform a manual line switch.
- If testing protection equipment, perform a protection channel lockout.

2. Remove the right side bay cover, if equipped.
3. On the patch panel, remove the IF cable from the associated RCV IF IN jack for the digital receiver under test.
4. Connect the IF power meter to the plug end of the IF cable removed in the previous step.
5. Observe the power meter indication.

Requirement:

Standard IF interconnect cable (less than or equal to 50 feet), -7.2 to -9.2 dBm.

Long IF interconnect cable (greater than 50 feet), -10.5 to -12.9 dBm.

6. If further tests require access to the terminal patch panel, return to the instruction that referenced this procedure.
If no further tests require access to the terminal patch panel, disconnect all test equipment and reinstall all cables removed.
7. Remount the side cover.

8. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

END OF PROCEDURE

5. FRAME GENERATOR CLOCK FREQUENCY CHECK

This procedure is used to check the frequency of the oscillator on the FRAME GEN unit in the digital transmitter of a regular or protection digital terminal shelf. The frequency of the oscillator is measured at the FRAME CLK jack.

Note: This is an in-service procedure.

The following test equipment, adapters, cables, and tools are required to perform this procedure:

- 1 - Counter/timer (Item A2)
- 1 - Adapter, SMB snap-on plug to BNC plug (Item B12)
- 1 - 5-foot test cable equipped with SMB jacks (Item B20).

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. Connect the frequency counter to the FRAME CLK jack on the FRAME GEN unit.
2. Observe frequency counter indication.

Requirement:

24,031,300 Hz to 24,033,700 Hz for a regular channel.

24,033,950 Hz to 24,036,350 Hz for the protection channel.

If the requirement is not met, remove the terminal from service and replace the FRAME GEN unit. Repeat this procedure.

3. Disconnect all test equipment.
4. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

END OF PROCEDURE

6. MODULATOR CARRIER FREQUENCY CHECK

This procedure is used to check the frequency of the internal oscillator that provides the 70-MHz carrier frequency. This measurement is made at the CARRIER FREQ jack on the faceplate of the 64QAM MOD unit in the digital transmitter of a regular or protection digital terminal shelf.

Note: This is an in-service procedure.

The following test equipment, adapters, and cables are required to perform this procedure:

- 1 - Counter/timer (Item A2)
- 1 - Adapter, SMB snap-on plug to BNC plug (Item B12)
- 1 - 5-foot test cable equipped with SMB jacks (Item B20).

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. Connect the frequency counter to the CARRIER FREQ jack on the 64QAM MOD unit.
2. Observe the frequency counter indication.

Requirement: 69,993,000 Hz to 70,007,000 Hz.

If the requirement is not met, remove the terminal from service, replace the 64QAM MOD unit, and repeat this procedure.

3. Disconnect all test equipment.
4. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

END OF PROCEDURE

7. BLUE GENERATOR CLOCK FREQUENCY CHECK

This procedure is used to check the blue signal clock frequency of the BLUE GEN unit located in the digital receiver shelf. The measurement is done at the MONITOR jack on the faceplate of the BLUE GEN unit using a frequency counter.

Note: This is an in-service procedure.

The following test equipment is required to perform this procedure:

- 1 - Counter/timer (Item A2)
- 1 - Adapter, SMB (m) to BNC (m) (Item B12)
- 1 - 5-foot test cable equipped with SMB (f) connectors (Item B20).

If other test equipment is used, ensure the specifications match those that are recommended. See the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. Condition the frequency counter to measure MHz.
2. Connect the frequency counter to the MONITOR jack on the BLUE GEN unit.
3. Observe the frequency counter indication.

Requirement: 44,735,105 Hz to 44,736,895 Hz.

If the requirement is not met, remove the terminal from service, replace the BLUE GEN unit, and repeat this procedure.

4. Disconnect all test equipment.

END OF PROCEDURE

8. DS3 PARITY AND FRAME CHECK

This procedure is used to monitor and count single parity error and frame loss events on the IF signal as it passes through the digital terminal receivers. Monitoring events is done at the DS3 PTY and FR jacks on the VMR & CODER unit for each DS3 tributary on the system (that is, A, B, C). This procedure is used after replacing a DS3-affecting unit or when called for by other procedures to verify that no excessive parity errors and no frame loss events are occurring.

This procedure can be performed on regular or protection digital terminal receivers.

Note: This is an in-service procedure.

The following test equipment, adapters, and cables are required to perform this procedure.

- 1 - Counter/timer (Item A2)
- 1 - Adapter, SMB snap-on plug to BNC plug (Item B12)
- 1 - 5-foot test cable equipped with SMB jacks (Item B20).

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. Using the manufacturer's instruction manual, condition the frequency counter/timer to measure TTL-type events.

Check DS3 Parity Events

2. Connect the frequency counter/timer to the DS3 PTY jack on the appropriate VMR & CODER unit (A, B, or C tributary). Observe counter for a 15-minute period.

Requirement: Four or fewer parity events times the number of hops in a 15-minute period.

Example 1: If switching section contains two regenerator stations (3-hops), the requirement is 12 or fewer parity events in 15 minutes.

Example 2: If switching section contains no regenerator stations (1-hop), the requirement is 4 or fewer parity events in 15 minutes.

Check DS3 Frame Events

3. Connect the frequency counter/timer to the DS3 FR jack on the VMR & CODER unit. Observe the counter for a 15-minute period.

Requirement: If switching occurred, disregard it or repeat test.

4. Disconnect all test connections.
5. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

END OF PROCEDURE

9. IF LOOPBACK S/I STRESS CHECK

This procedure is used to check the performance of the digital terminal equipment while it is isolated from the radio equipment. The IF output signal from the transmitter is looped back to provide the IF input signal to the receiver of the same channel. This procedure is also used to isolate problems between the terminal and radio equipment and to evaluate a repaired terminal after replacing performance-affecting circuits.

Performance quality is determined by measuring the tolerance of the looped digital terminal pair to a 74-MHz interference tone injected into the IF signal path at the receiver input. Performance evaluation is made on the bit-error-rate (BER) performance at a specified signal-to-interference (S/I) ratio.

The test configuration for the looped back S/I test is shown in Figure 3. The IF output signal "S" from the terminal transmitter is looped back, through the low-loss (less than 1 dB) path of the unequal loss combining network, to the terminal receiver IF input. The adjustable level 74-MHz interference signal "I" is injected into the receiver IF input signal through the high-loss path of the combining network.

Once the loopback network is established, the testing process consists of the following:

1. Measuring the looped back 64-QAM IF signal "S" without the interference "I" present.
2. Measuring and setting the level of "I" to establish the required S/I ratio without "S" present.
3. Observing and evaluating the cyclic redundancy check (CRC) error performance with both S and I present at the required S/I ratio.

Caution: *THIS IS AN OUT-OF-SERVICE PROCEDURE FOR BOTH DIRECTIONS OF TRANSMISSION.*

Warning: *To prevent electrostatic discharge (ESD) damage to plug-in units, ensure that all ESD precautions are followed.*

TEST EQUIPMENT

- Refer to Figure 1.

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

Note: This procedure applies to regular or protection terminal equipment for receivers with or without the transversal equalizer unit. However, if the terminal transmitter portion of a terminal-to-terminal or terminal-to-regenerator hop is being evaluated using a terminal receiver that is equipped with a TE, the transversal equalizer function *must be bypassed or disabled* for proper evaluation. This is necessary since the TE can mask or compensate for some transmitter degradations.

1. Remove the two front side covers of the terminal bay.
2. If testing a regular channel, protect service by performing a manual line switch for *both* directions.

If testing the protection channel, protect service by performing a protection channel lockout for *both* directions.

Establish the Loopback and Measure the "S" (IF signal) Power Level

3. Remove the bay cables from the RCV IF IN jack and the TRMT IF OUT jack for the channel being tested.
4. Establish the test connections shown in Figure 1.
Note: For the terminal pair to be tested, determine the test cables to make the connections shown in the figure and use the same cables for all tests in this procedure.
5. Measure the power at the end of the 5-foot test cable, and record the reading as "S."

Requirement:

Standard IF interconnect cable (equal to or less than 50 feet), -6.9 to -8.9 dBm.

Long IF interconnect cable (greater than 50 feet), -11.3 to -13.7 dBm.

If the requirement is not met, check the test connections and equipment setup. If it is still not met, go to Step 26.

Set the "I" (Interference) Power Level

6. Condition the 74-MHz "I" source to send 74 MHz at about $+10.0$ dBm.
Note: If a microwave system analyzer is used as the 74-MHz "I" source, ensure that all transmitter sweep and deviation signals are off.
7. Establish the test connections shown in Figure 2. Use the same cables used in Step 4.
8. Measure the power level at the end of the 5-foot test cable, and adjust the "I" power level to 29 dB below the "S" power level recorded in Step 5.
Note: To do this, set the "I" power level to 19 dB below the recorded "S" power and then decrease the IF level by 10 dB in the "I" source path using IF pads.

Establish the IF Loopback "S+I" Test Connections

9. Establish the test connections shown in Figure 3.
10. Remove the termination, and connect the test cable with the "S" signal and the "I" interference in the unequal loss combining network as shown in Figure 3. Connect the "S+I" combined signal to the RCV IF IN jack.
11. Condition the digital transmitter/receiver as indicated by the appropriate case below.

Case 1 If a receiver is being evaluated or a transmitter is being evaluated through a receiver without a TE, perform S/I Performance Measurement—Case 1.

Case 2 If a transmitter is being evaluated through a receiver with an analog TE, perform S/I Performance Measurement—Case 2.

Case 3 If a transmitter is being evaluated through a receiver with a digital TE, perform S/I Performance Measurement—Case 3.

S/I Performance Measurement—Case 1

12. Observe the ERR RATE (bar graph) display on the associated CHAN CONTR unit. Allow at least 10 seconds before determining if the requirement is met.

Requirement: The bar-graph display shall not be lighted above the line between the 8 and the 7 segments ($BER \leq 5 \times 10^{-8}$).

If the requirement is met, go to step 22.

If the requirement is *not* met, go to Step 26.

S/I Performance Measurement—Case 2

Warning: To prevent ESD damage to plug-in units, ensure that ESD precautions are followed, including connecting wrist strap to ground and placing removed plug-in units in ESD protective containers before disconnecting from ground and transporting units.

13. Replace the two TRNSV FLT units with two TE PATCH units. If necessary, refer to the plug-in unit replacement procedures.
14. Observe the ERR RATE (bar graph) display on the associated CHAN CONTR unit. Allow at least 1 minute before determining if the requirement is met.

Requirement: The bar-graph display shall not be lighted above the line between the 8 and the 7 segments ($BER \leq 5 \times 10^{-8}$).

If the requirement is met, go to Step 22.

If the requirement is not met, go to Step 26.

15. Remove the TE PATCH units, reinstall the original TRNSV FLT units, and go to Step 22.

S/I Performance Measurement—Case 3

16. With the digital TE on NORM, observe the ERR RATE bar graph on the associated CHAN CONTR unit. Allow at least 1 minute before determining if the requirement is met.

Requirement: The bar-graph display shall not be lighted above the line between the 8 and 7 segments ($BER \leq 5 \times 10^{-8}$).

If the requirement is not met, go to Step 26.

17. If necessary, increase the 74-MHz "I" signal to show 5×10^{-8} on the bar graph and note the S/I ratio for the error rate.
18. Using a universal counter, measure the "I" pseudo error rate at the 5×10^{-8} CRC rate and note for future reference.

19. Turn the digital TE OFF, but leave the counter connected to continually measure the pseudo errors.
20. If necessary, reduce the 74-MHz "I" level (increase the S/I ratio) to reduce the pseudo error rate to about 5×10^{-8} . Note the reduction necessary to achieve the same error rate.

Requirement: The difference between the increase and reduction shall be less than or equal to 3 dB.

If the requirement is not met, go to Step 26.

21. Turn the digital TE to NORM.

Restore the Equipment For Normal Operation

22. Disconnect all test connections at the terminal bay.
23. Reinstall the IF cables to the RCV IF IN and TRMT IF OUT jacks.
24. If no further access to the terminal IF jacks is required, replace the side covers.
25. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

Evaluate a Failure to Meet Requirements

26. If any requirements are not met and this procedure was referenced from another procedure, return to that procedure to see if there are instructions about a failure to meet these requirements. If there are no instructions or the given instructions are inadequate or this procedure was not referenced from another procedure, go to the next step.
27. The failure of a terminal receiver or transmitter to meet any requirements in this performance check is probably because of a defective terminal circuit pack. Do a one-at-a-time replacement/retest procedure with the terminal still in the looped configuration to determine if this is the case.

If unit replacement does not correct the problem, check for a defective spare, a wiring problem, or a defect on the terminal shelf. Use the applicable shelf SDs, circuit pack input/output information in the O&M maintenance support manual, and a circuit pack extender card to isolate and eliminate the problem.

When the problem has been corrected, go to Step 3.

END OF PROCEDURE

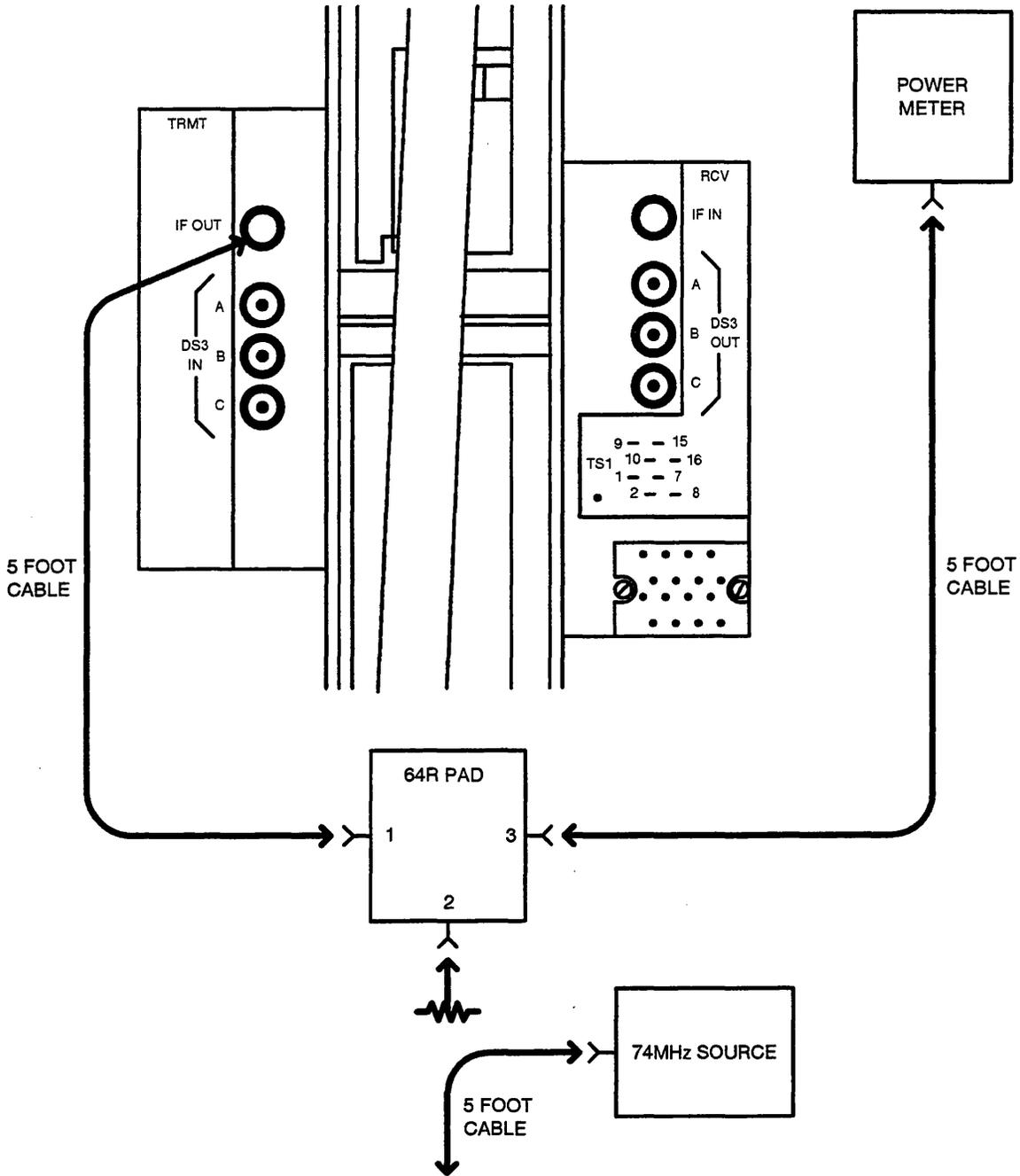


Figure 1- "S" (IF Signal) Power Level Measuring Connections

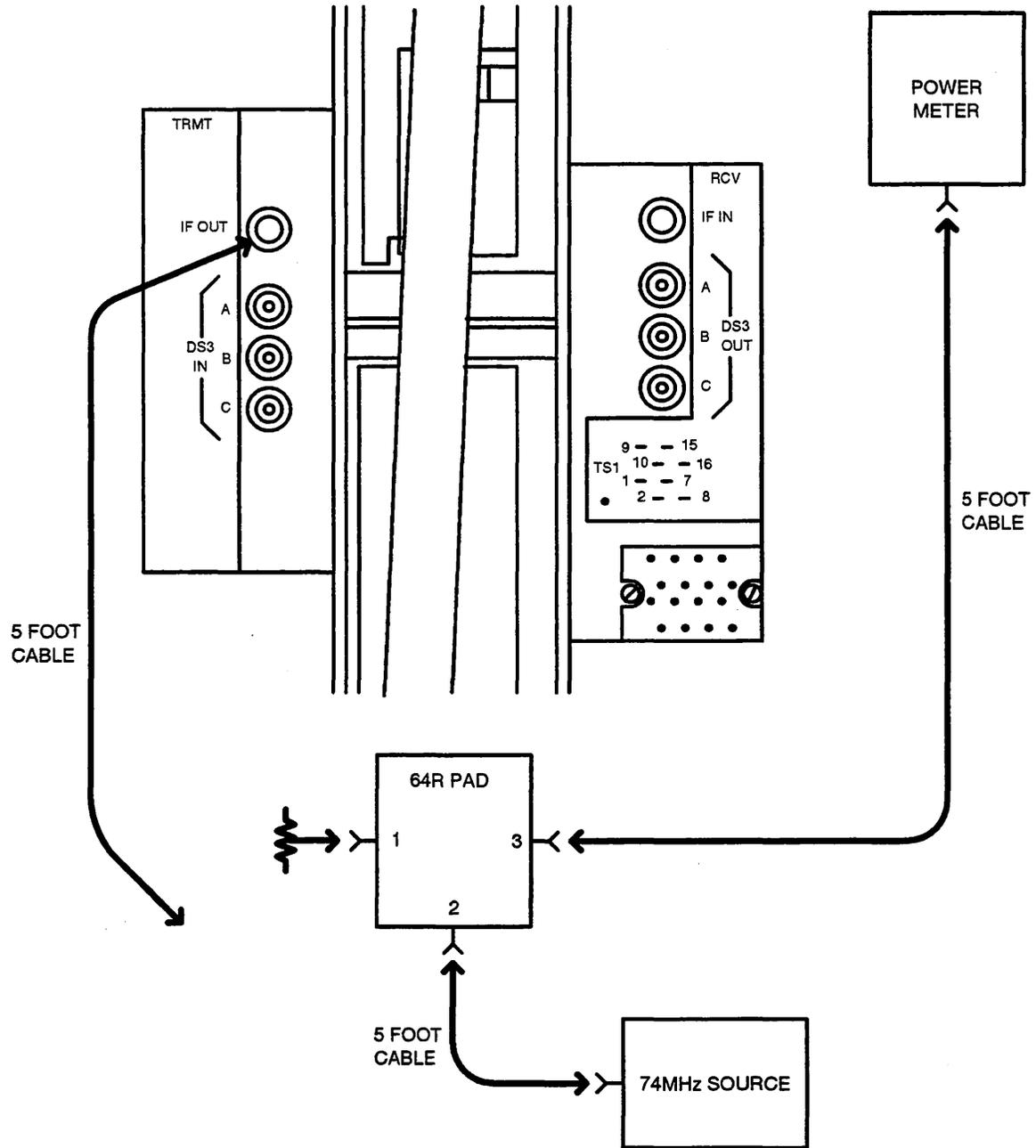
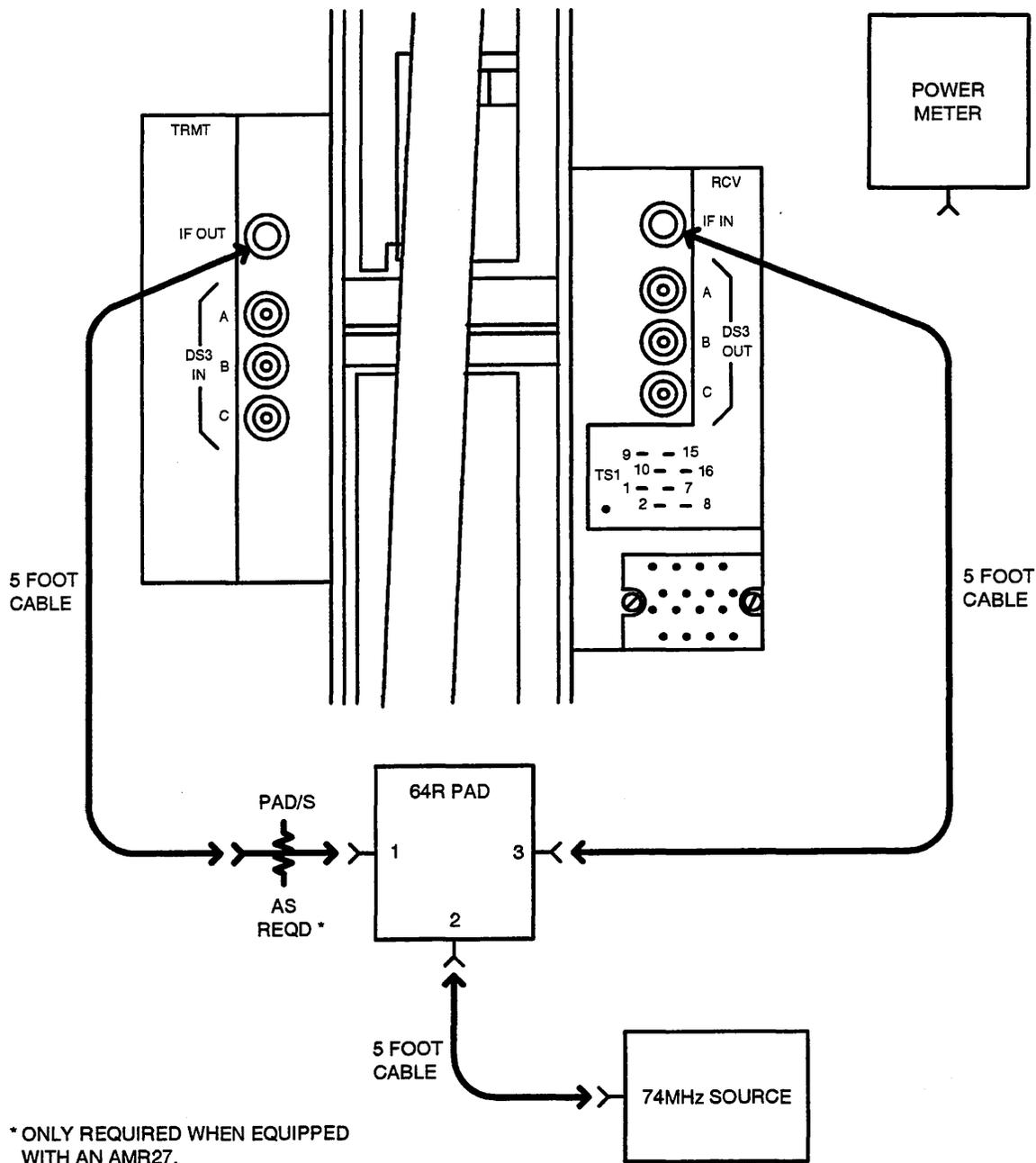


Figure 2- "I" (Interference) Power Level Setting Connections



* ONLY REQUIRED WHEN EQUIPPED WITH AN AMR27.

Figure 3-IF Loopback S/I Stress Check Connections

10. IF LOOPBACK ERROR CORRECTOR STRESS CHECK

This procedure is used to check the performance of the error-correcting circuits in the digital terminal receiver while it is isolated from the radio hop. It is also used to isolate suspected error correction unit problems and to evaluate the performance of the replaced error correction circuit packs (transmitter or receiver).

The IF output signal from a digital transmitter (in the opposite direction of transmission) is looped back to supply the IF input signal to a digital receiver. The loopback configuration is dependent on which transmitter and/or receiver is being tested. If testing a regular receiver, use the protection transmitter. If testing a regular transmitter, use the protection receiver.

Performance quality is determined by comparing an uncorrected CRC error rate with the output DS3 parity error rate following error correction.

The test configuration used for this evaluation is shown in Figure 5. An unequal loss combining network is inserted in the coaxial IF input path to the digital terminal receiver for the hop and channel under test. The normal IF input signal is connected through the low-loss path of the combining network, and the adjustable level 74-MHz interference tone is injected into the IF input signal by the high-loss path. For this evaluation, an S/I ratio is established by an independent power measurement of the "S" component at the output of the combining network (Figure 4). The "I" component is then connected and adjusted to establish the proper pre-error-correction error rate with the "S" input port connected to the combining network (Figure 5).

This procedure applies to the regular or protection equipment.

Caution: *THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER SWITCHING OPERATION HAS BEEN PERFORMED.*

Warning: *A SPAN SWITCH is required. This procedure is service-affecting on regular channels due to the SPAN SWITCH. The procedure should only be performed on a trouble basis when there is a strong possibility that there is a problem in the error correction circuits.*

TEST EQUIPMENT

- Refer to Figure 4.

For recommendations and specifications of equivalent, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. If testing a **regular** channel, protect service by performing a manual **span** switch for the **receive** direction and a manual **line** switch for the **transmit** direction.
If testing the **protection** channel, protect service by performing a protection channel lockout for **both** directions of transmission.
2. Remove the two front side covers of the terminal bay.
3. Remove the appropriate bay cables from the RCV IF IN jack and the TRMT IF OUT jack for the channel being tested.

Measure the "S" (IF Signal) Power Level

4. Establish the test connections shown in Figure 4.

Note: For the terminal pair to be tested, determine the test cables to make the connections shown in the figure and use the same cables for all tests in this procedure.

5. Measure the power at the end of the 5-foot test cable, and record the reading as "S."

Requirement:

Standard IF interconnect cable (equal to or less than 50 feet), -6.9 to -8.9 dBm.

Long IF interconnect cable (greater than 50 feet), -11.3 to -13.7 dBm.

If the requirement is *not* met, check the test connections and equipment setup. If it still is not met, go to Step 18.

Set the "I" (Interference) Power Level

6. Condition the 74-MHz "I" source to send 74 MHz at about 0.0 dBm.

Note: If a microwave system analyzer is used as the 74-MHz "I" source, ensure that all transmitter sweep and deviation signals are off.

Establish the "S+I" Test Connections

7. Connect the cable with the "S" signal and the test cable with the "I" interference to the unequal loss combining network as shown in Figure 5.
8. Connect the test cable with the "S+I" combined signal to the RCV IF IN jack of the digital receiver to be evaluated.

Check Error Correction Stress

9. Condition the counter for measuring TTL-type signals at 1-second intervals.
10. Connect the counter to the SECT CRC ERRS jack on the TERM FRMR unit, and adjust the interference tone to achieve 675 counts per second (5×10^{-6}).

Note: The CHAN CONTR bar graph will light to the 6 segment.

11. Condition the counter to measure at 10-second intervals.
12. Disconnect the counter from the SECT CRC ERRS jack, connect it to the DS3 PTY jack on the VMR & CODER unit (beginning with TRIB A), and measure the DS3 parity errors.

Requirement: 23 counts or less (5×10^{-8})

13. Repeat this measurement for the TRIB B and TRIB C VMR & CODER units, as equipped.

If the requirement is met, go to Step 14; otherwise, go to Step 18.

Restore the Equipment For Normal Operation

14. Disconnect all test connections at the terminal bay.
15. Reinstall the IF cables to the RCV IF IN and TRMT IF OUT jacks.
16. If no further access to the terminal IF jacks is required, reinstall the side cover.
17. If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

Evaluate a Failure to Meet Requirements

18. If the requirement was not met and this procedure was referenced from another procedure, return to that procedure to see if there are instructions about a failure to meet requirements. If there are no instructions or the given instructions are inadequate or this procedure was not referenced from another procedure, go to the next step.
19. Failure to meet the requirements of this performance check is probably caused by a defective error correction circuit pack. Use the information in the O&M maintenance support manual to do a one-at-a-time replacement/retest procedure with the terminal still in the looped configuration.

If replacing the unit does not correct the problem, check for a defective spare, a wiring problem, or a defect on the terminal shelf. Use the applicable shelf SDs, circuit pack input/output information in the O&M maintenance support manual, and a circuit pack extender card to isolate and eliminate the problem.

When the problem has been corrected and the terminal receiver has passed the error correction stress check, go to Step 14.

END OF PROCEDURE

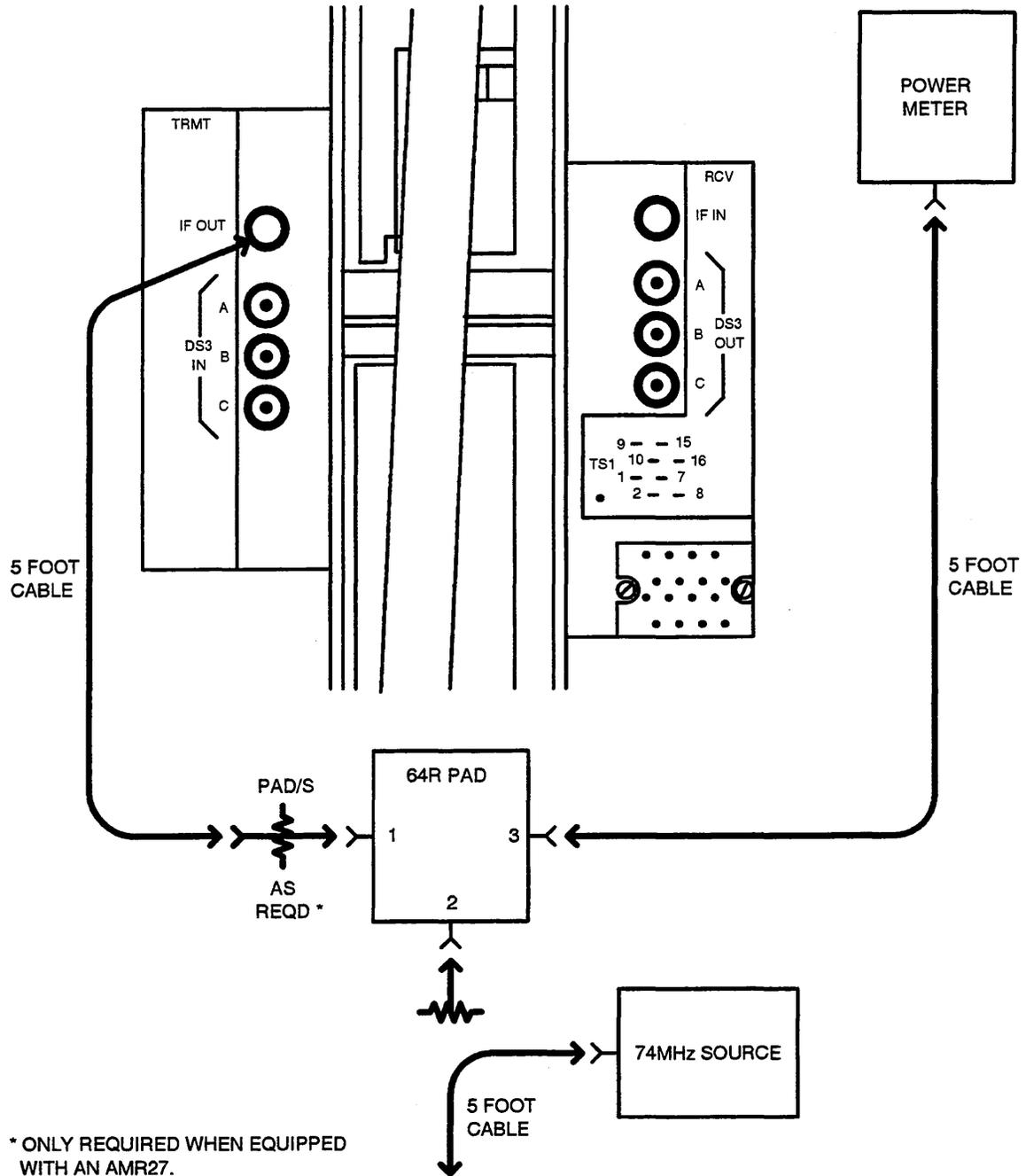


Figure 4- "S" (IF Signal) Power Level Measuring Connections

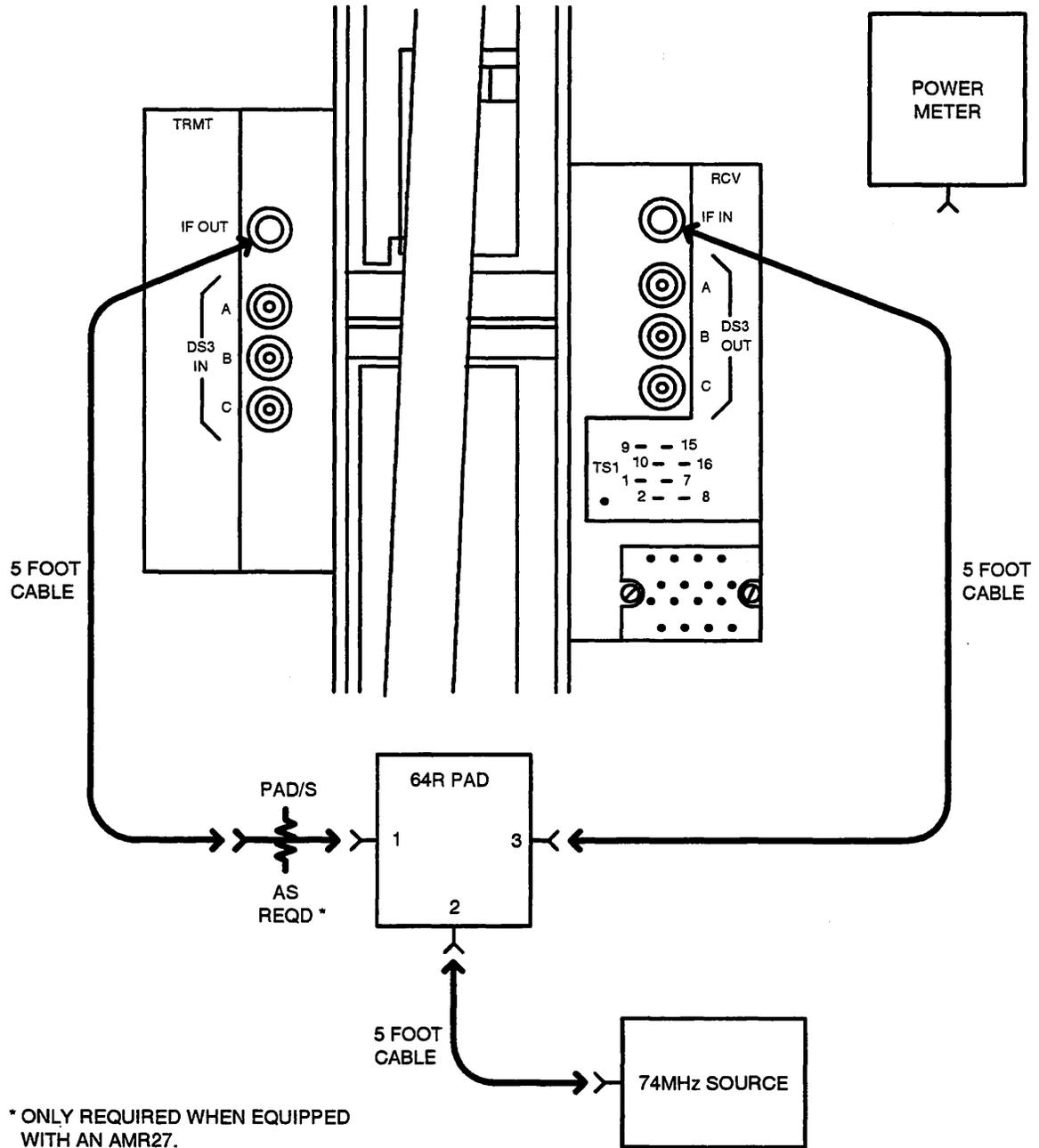


Figure 5-IF Loopback Error Corrector Stress Check Connections

11. IF LOOPBACK TRANSVERSAL EQUALIZER PERFORMANCE CHECK

This procedure is used to check the performance of the transversal equalizer unit in the digital receiver while it is isolated from the radio hop. It is also used to isolate suspected TE problems and to evaluate a repaired terminal after replacing performance-affecting circuits.

For this test, the digital transmitter IF output signal is looped back to the digital receiver through a TE propagation distortion simulator (PDS) test set, the IF AGC amplifier, and adaptive slope equalizer (ASE) circuits in the associated radio receiver. The radio IF AGC amplifier and adaptive slope equalizer circuits are required in this loopback configuration to compensate for the losses and gross slope shapes introduced by the TE PDS during the dynamic stress tests.

The test is completed by observing the ERR RATE (bar graph) display on the CHAN CONTR while simulated propagation distortion is manually swept back and forth across the IF spectrum for several seconds.

Performance quality is determined by the capability of the equalizer-equipped terminal receiver to correct for the simulated propagation distortion inserted in the IF loopback path. There should be no frame loss.

The test configuration for the TE dynamic stress procedure is shown in Figure 4. The test procedure will vary depending on the type of digital transmitter/receiver configuration. There are three configurations of digital equipment:

1. **Non-robust**—Analog or no TE with AMR34 CRLTR
2. **Robust**—TRNSV FLT (Analog TE) and AMR234 CRLTR
3. **Digital TE**—AMR184 TE.

Following TE evaluation with a moving notch, the carrier recovery performance of the digital receiver is tested by interrupting the loopback IF signal ahead of the radio receiver. Carrier recovery performance is evaluated by determining how quickly the digital receiver can **regain** carrier lock after reconnecting the IF signal.

This procedure applies to regular or protection terminal channels. The ASE in the associated radio receiver should be able to pass its Over-the-Air Propagation Distortion Performance Check. If there is any doubt, perform that test first.

Caution: *THIS PROCEDURE IS SERVICE-AFFECTING UNLESS THE PROPER SWITCHING OPERATION HAS BEEN PERFORMED.*

Prerequisite: Radio receiver AGC amplifier and adaptive slope equalizer are working properly and the radio delivers proper IF signal to the terminal receiver. If in doubt, perform appropriate radio test to verify.

Warning: *To prevent ESD damage to plug-in units, ensure that all ESD precautions are followed.*

TEST EQUIPMENT

- Refer to Figure 1.

For recommendations and specifications of test equipment, see the TEST EQUIPMENT AND ACCESSORIES tab.

PROCEDURE

1. If testing a regular channel, protect service by performing a manual line switch for **both** directions (even if an automatic line switch exists).

OR

If testing the protection channel, prevent access by performing a protection lockout for **both** directions.

Establish Loopback Test Setup

2. Remove the front side covers on the terminal bay to be tested.
3. Establish the test connections shown in Figure 6.

Check Transversal Equalizer Notch Performance

4. Turn the TE PDS control to the left stop position.
5. While observing the ERR RATE display (bar graph) on the associated CHAN CONTR unit, turn the TE PDS control back and forth between the left and right stop posts. Turn the control at a rate of one end-to-end sweep about every 2 seconds. Continue the sweep action for about 10 seconds.

Requirement: The bar-graph display shall not show a frame loss (bar graph does not light to the **FR** segment).

If the requirement is met with the "NON-MIN" output, repeat this step with the "MIN" output of the TE PDS. If the requirement is met with each output, go to Step 6.

If the requirement is not met, repeat this step to verify that the sweep speed and procedure were performed correctly. If the requirement is still not met, go to Step 13.

Check Digital Receiver Recovery Performance

6. If testing a **robust** or **digital TE** receiver, rotate the TE PDS control to locate the notch at about **70** MHz (about 3/4 turn clockwise between the stop posts).

OR

If testing a **non-robust** receiver, disconnect the TE PDS test set and patch the test cables with the appropriate adapter.

7. Disconnect the test cable from the digital transmitter TRMT IF OUT jack.
8. While observing the CARRIER LOCK LOSS indicator on the 64QAM DEMOD unit, reconnect the test cable to the TRMT IF OUT jack. Note the time required for this indicator to extinguish after reconnecting the test cable.

Requirement for robust or digital TE Receivers: Immediately (1 second or less)

Requirement for non-robust receiver: Delayed (3 seconds or less)

Repeat the test for robust or digital TE receivers with both the MIN and NON-MIN outputs of the TE PDS.

If the requirement is met, go to Step 9.

If the requirement cannot be met, go to Step 13.

Restore Equipment to Normal Operation

9. Disconnect all test connections from the radio bay and the terminal bay.
10. Reconnect the IF cable at the TRMT IF OUT jack on the terminal bay and the bay cable at the IF IN jack of the IF AGC AMPL unit in the radio bay.
11. If no further access to the IF jacks is required, reinstall the side cover on the terminal bay.
12. Return to the instruction that referenced this procedure.

If this procedure was used on a stand-alone basis, go to the REPAIR VERIFICATION tab unless other tests are required.

Evaluate a Failure to Meet Requirements

13. If the requirement was not met and this procedure was referenced from another procedure, return to that procedure to see if there are instructions about a failure to meet requirements. If there are no instructions or the given instructions are inadequate or this procedure was not referenced from another procedure, go to the next step.
14. The failure of a terminal receiver to meet the requirements of this TE performance check is probably because of defective TE units or a failure in one or more of the associated circuits that generate the control signals for the TE units. Do a one-at-a-time replacement/retest procedure with the terminal still in the looped configuration. This process should start with the TE units and if necessary the correlator unit.

If this does not solve the problem, the rest of the terminal receiver demodulation circuits, up to and including the decision circuits, should also be replaced one at a time while the TE performance check is made.

If the problem is still not resolved, replace and retest the radio receiver units involved in the loopback.

If unit replacement does not correct the problem, check for a defective spare, a wiring problem, or a defect on the terminal shelf. Use the applicable shelf SDs, circuit pack input/output information in the O&M maintenance support manual, and a circuit pack extender card to isolate and eliminate the problem.

When the problem has been corrected and *all* requirements in this procedure have been met, go to Step 9.

END OF PROCEDURE

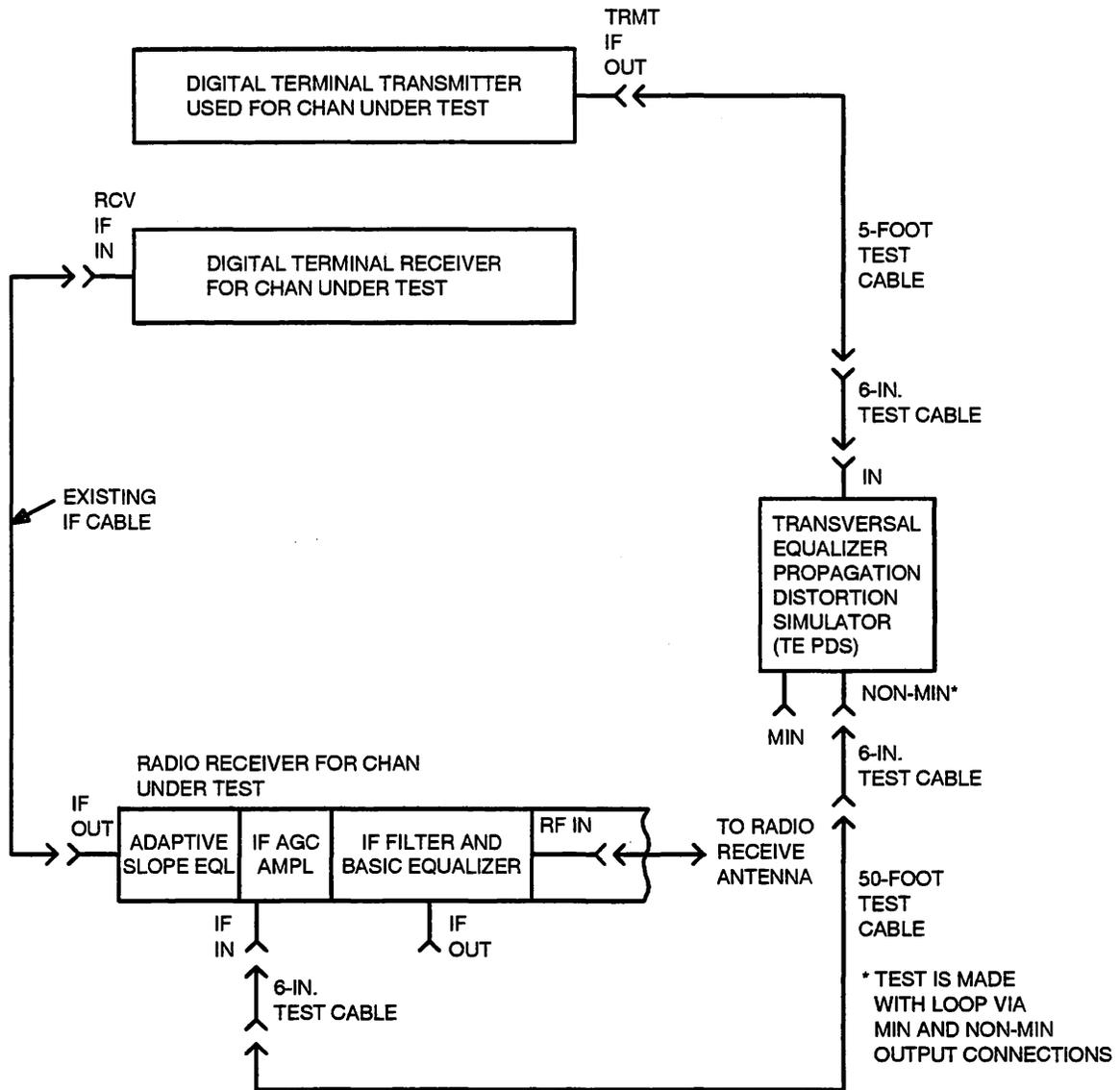


Figure 6-IF Loopback TE Performance Check Connections