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DR 6/11-135A and 135EC 1×N Frequency Diversity Operation and Maintenance Terminal/Regenerator Trouble Isolation

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1 Introduction

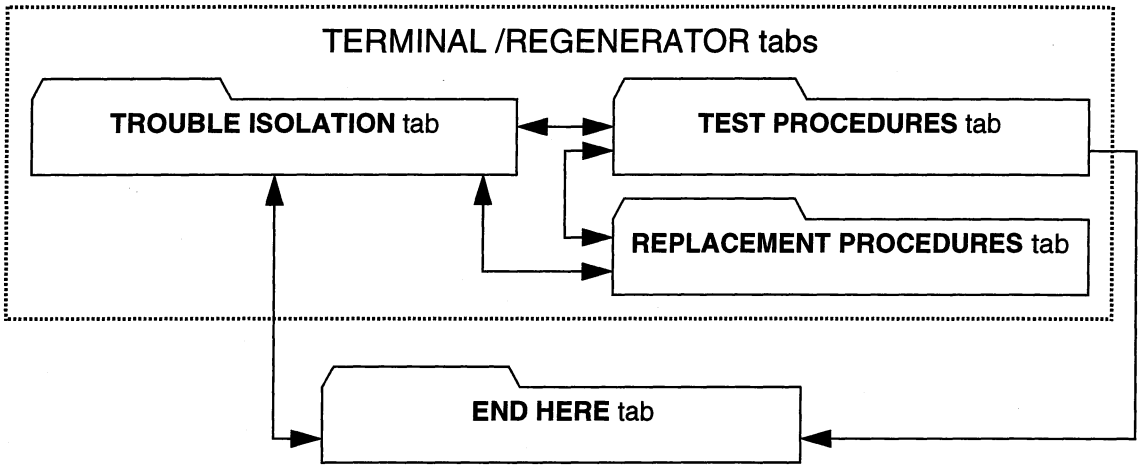
This practice is used to troubleshoot the line terminal bay and regenerator bay equipment in a DR 6/11-135EC or 135A Digital Radio System. There are seven equipment-alarm categories for both terminal and regenerator bays:

a. DC Power
b. Fan Fail
c. Control System
d. Digital Receiver
e. Digital Transmitter
f. Excess
g. Signal Fail

This practice is also to be used to clear an IF level problem or an over-the-air test failure discovered while doing terminal or regenerator test procedures.

The trouble isolation portion of this section consists of flowcharts that guide you through a structured process of isolating and clearing a trouble and performing any required tests. It is assumed that the alarm circuits are functioning properly.

As you go through the trouble isolation process, you will be interacting with the test procedures and the replacement procedures as shown below:



Refer to the **GLOSSARY** tab for terms you are unfamiliar with [Bit Error Rate (BER), Frame (FR), etc.].

1.1 Safety Labels

Safety labels are strategically placed symbols and messages that will alert you to potential risks. There are three types of safety labels.

DANGER:
DANGER *indicates the presence of a hazard that* ***will*** *cause death or severe personal injury if the hazard is not avoided.*

WARNING:
WARNING *indicates the presence of a hazard that* ***can*** *cause death or severe personal injury if the hazard is not avoided.*

CAUTION:
CAUTION *indicates the presence of a hazard that* ***will*** *or* ***can*** *cause minor personal injury or property damage if the hazard is not avoided.*

Within the **CAUTION** safety label, the term "property damage" refers also to possible service interruption or impairment.

Please refer to the Safety Labels heading in the **START HERE** tab for additional information about, and examples of, safety labels.

2 Start—Terminal Bay Equipment-Alarm Trouble Isolation

Flowchart 1, Terminal Bay Trouble Isolation, is the starting point for isolating and clearing alarmed conditions in a line terminal bay. It should be entered when directed by the **START HERE** tab or when referenced from one of the detailed terminal alarm-clearing flowcharts.

Any line terminal bay failure will light the COM ALARM indicator on the MSTR ALARM unit located in the Control and Service Channel Shelf of the initial line terminal bay. All transmission-related failures are centralized on the CHAN CONTR unit of the receiver shelf for each pair of shelves (transmitter and receiver). The resulting office alarm can be silenced by pressing the alarm cutoff (ACO) push button located on the right side of the terminal frame (if equipped). However, DC power failures cannot be silenced by the ACO push button.

Power unit troubles can cause false and misleading alarms. Check the power unit voltages before clearing an alarm. If an output voltage does not meet the requirement, the trouble is either a faulty power unit or an abnormal current demand by one or more of the units supplied by the power unit.

NOTE:
The DIAGNOSTIC CODE display on the RCV STAT unit is referenced in 2.3 Control System (Term).

A functional block diagram of a digital transmitter is shown in Figure 1. Functional block diagrams of a digital receiver equipped with analog transversal equalizers (ATE) and digital transversal equalizers (DTE) are shown in Figures 2 and 3, respectively. The diagrams show the transmission signal flow and the nominal input and output signal levels. All of the diagrams are for 135EC systems; 135A systems do not have the following plug-in units:

- EC CODER
- EC RECDR
- ERROR LOCTR
- ERROR CORR

The detailed alarm-clearing flowcharts are not specifically designed to clear multiple failures or take into account faulty spare units. However, if the alarm indicators are functioning properly and the flowchart instructions and recommendations are followed, any multiple failure should be cleared.

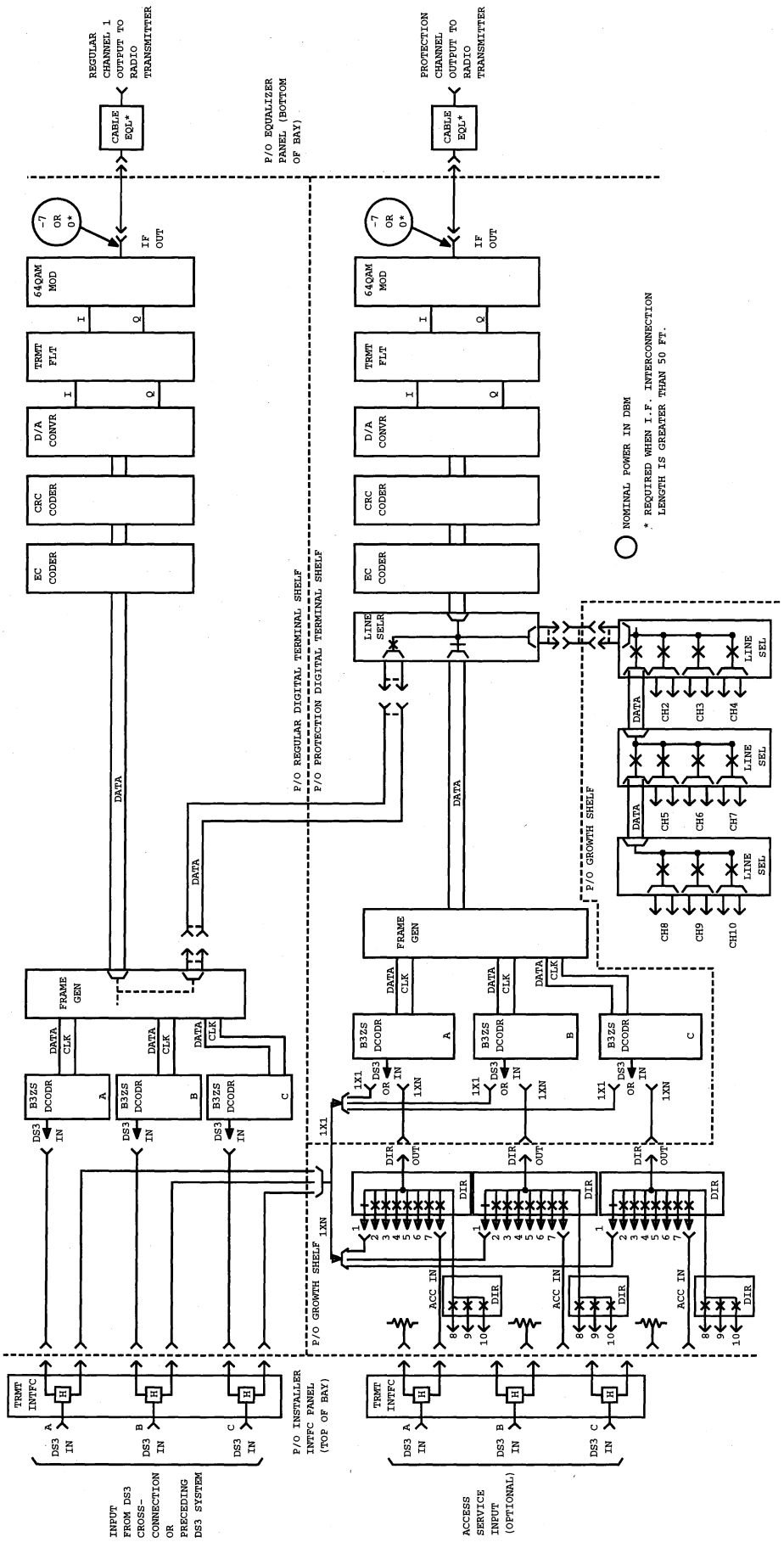


Figure 1. Terminal Transmitter Block Diagram

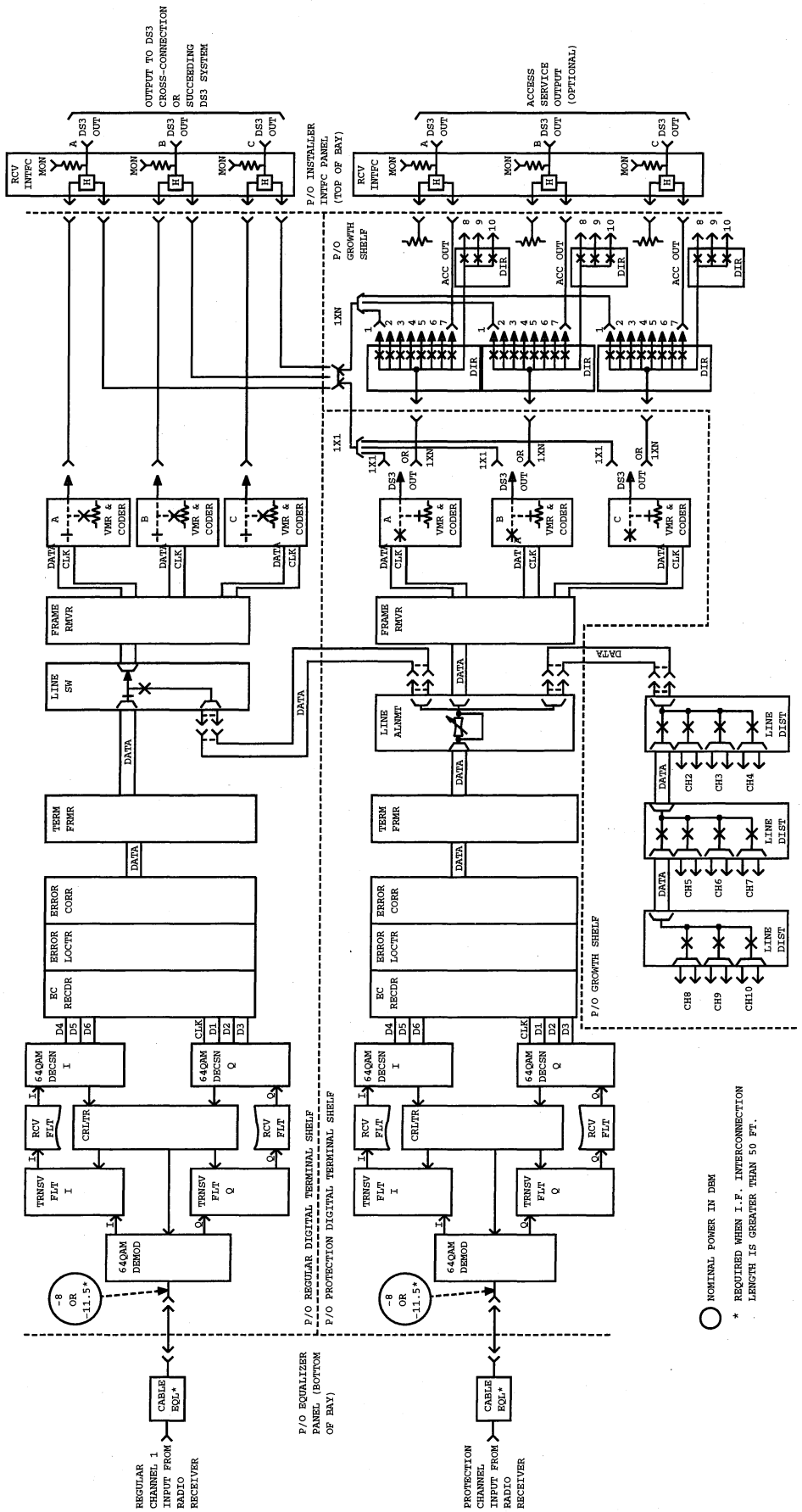


Figure 2. Terminal Receiver (ATE) Block Diagram

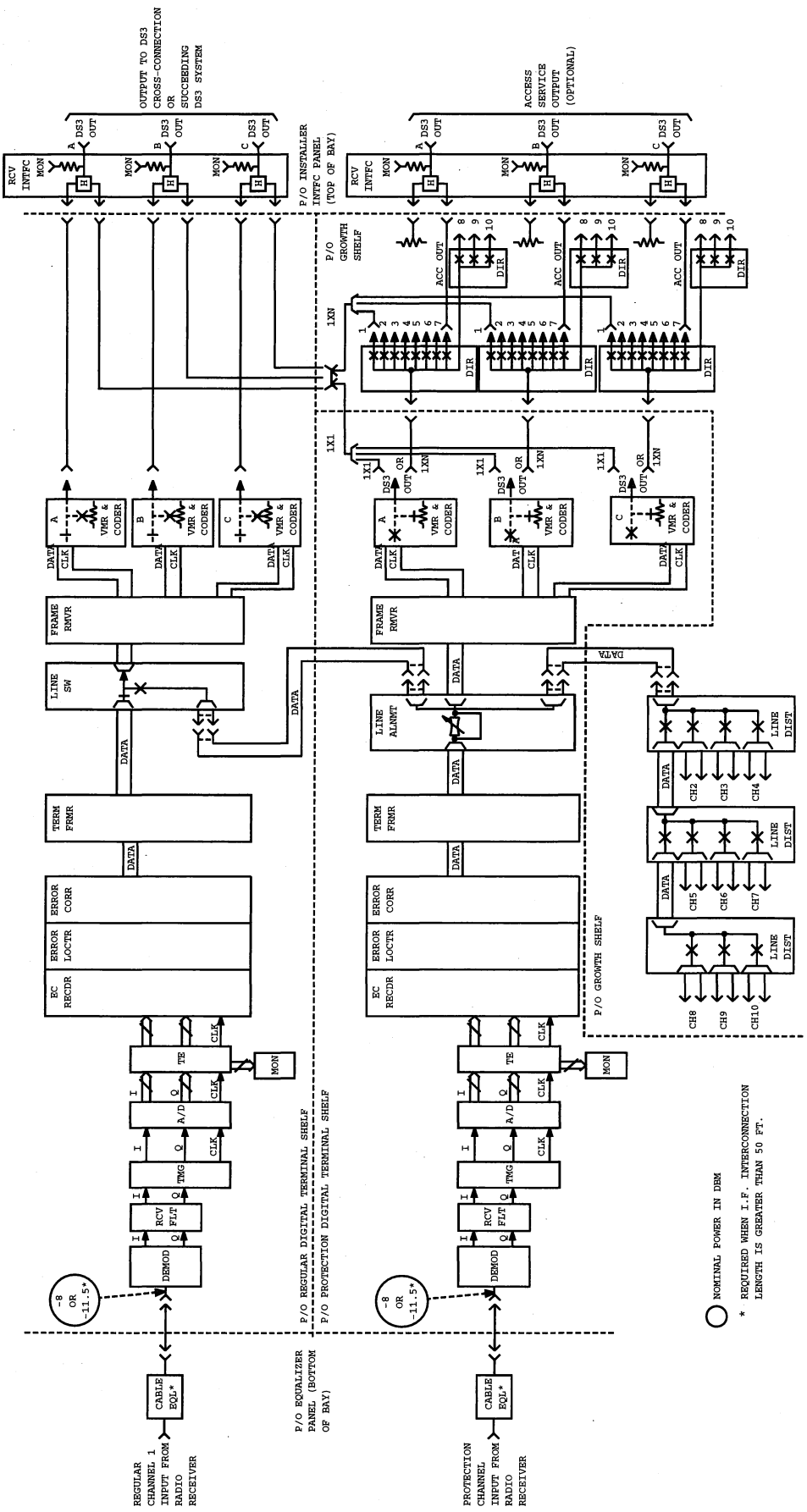
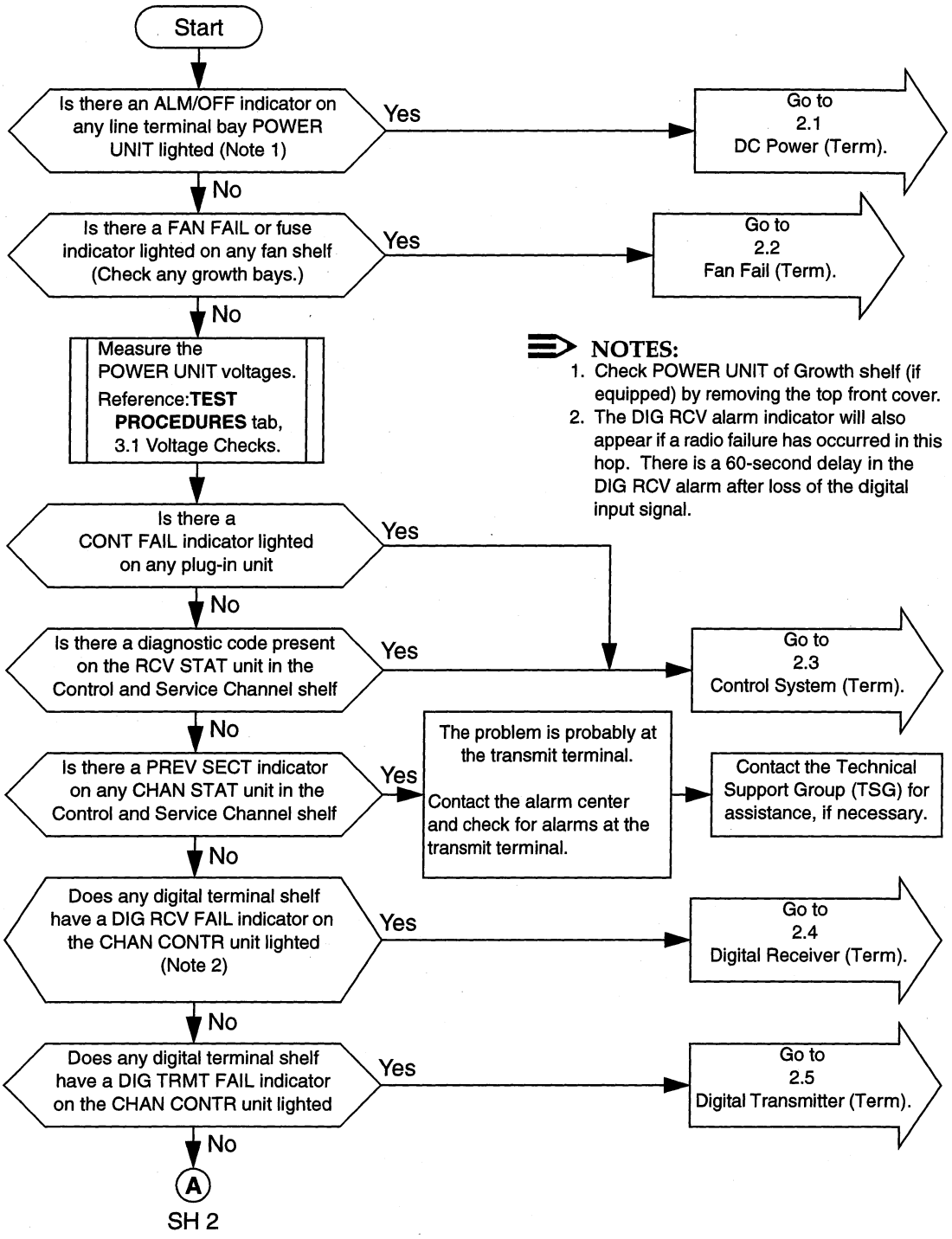
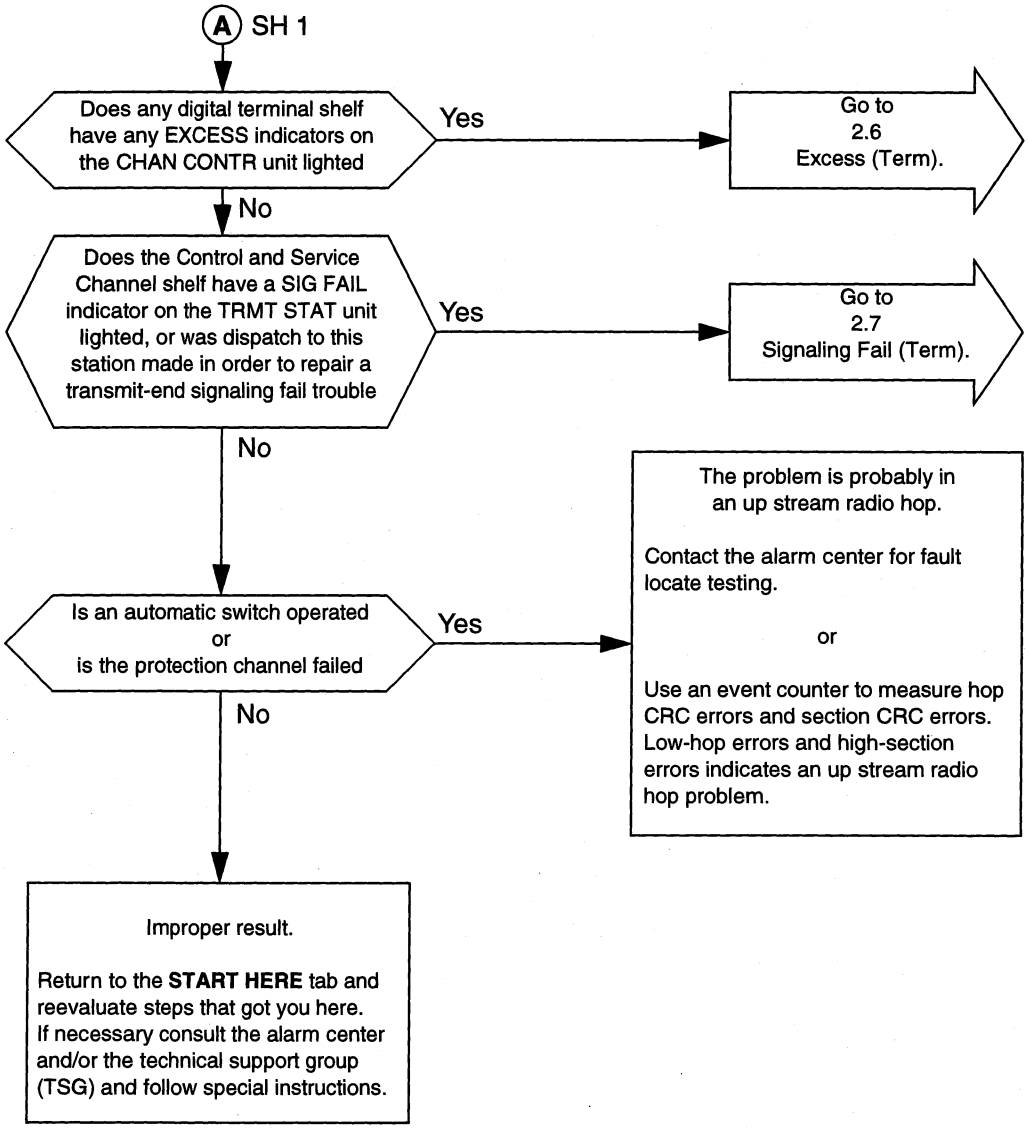


Figure 3. Terminal Receiver (DTE) Block Diagram



Flowchart 1. Terminal Bay Trouble Isolation (Sheet 1 of 2)



Flowchart 1. Terminal Bay Trouble Isolation (Sheet 2 of 2)

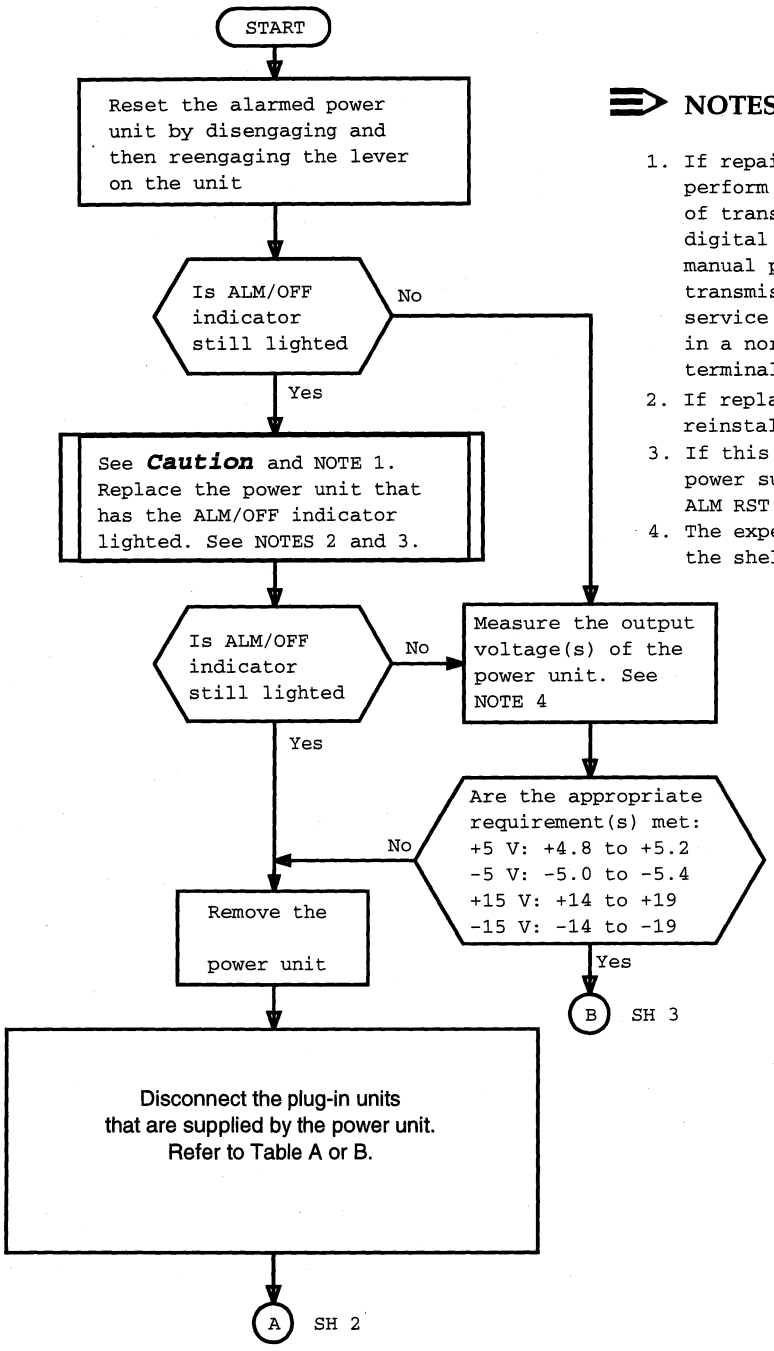
2.1 DC Power (Term)

Flowchart 2 references local equipment indications and any necessary tests that will help determine the source of a power problem. When a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab for information to replace the failed unit. If tests are necessary, refer to **TEST PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a plug-in unit, ensure all ESD precautions are followed.

Before using this flowchart, verify that the –24 V DC or –48 V DC input is good. A power failure in the line terminal bay is indicated by a lighted ALM/OFF indicator on the failed power unit. The power unit is shut down when the ALM/OFF indicator is lighted. It will remain shut down until it is reset by pulling the latch lever down, without disengaging the plug-in unit, and pushing it up again. The power unit voltages should always be measured with the load connected, that is, plug-in units installed.

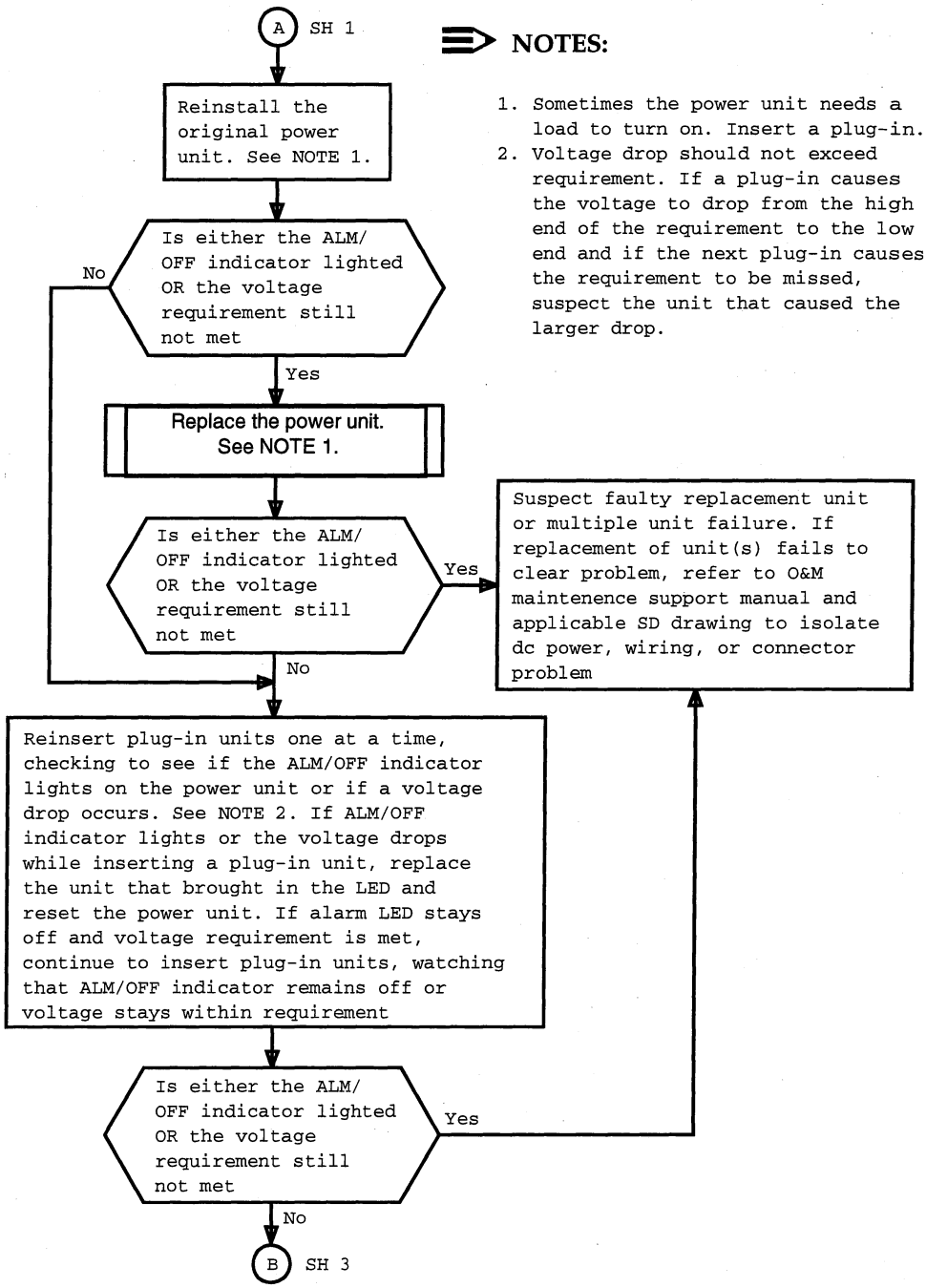
CAUTION:
This may be a service-affecting procedure for both directions of transmission.



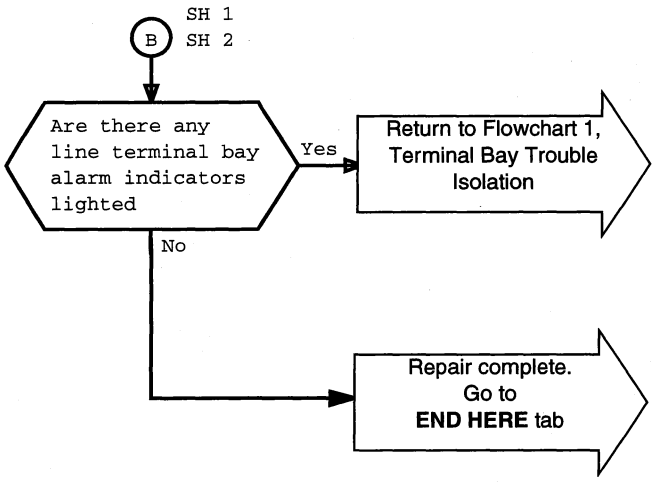
NOTES:

1. If repairing a regular digital terminal shelf, perform a manual span switch for BOTH directions of transmission. If repairing the protection digital terminal or growth shelf, perform a manual protection lockout for BOTH directions of transmission. If repairing the control and service channel shelf, ensure that the system is in a normal, nonswitched state. Refer to the terminal replacement procedures.
2. If replacement unit does not correct problem, reinstall original unit.
3. If this is a control and service channel shelf power supply, it may be necessary to operate the ALM RST on the RCV STAT unit to clear any alarms.
4. The expected output voltage(s) is identified on the shelf label below each power unit.

Flowchart 2. Terminal Bay DC Power Alarm-Clearing (Sheet 1 of 3)



Flowchart 2. Terminal Bay DC Power Alarm-Clearing (Sheet 2 of 3)



Flowchart 2. Terminal Bay DC Power Alarm-Clearing (Sheet 3 of 3)

Table A. DC Power Unit Applications—135EC Terminal

Power Unit		Unit Supplied			
Location	Voltage Supplied	Description and Shelf Location G = 1 X 10 Growth Shelf C = Control and Service Channel Shelf R = Receiver of Terminal Shelf T = Transmitter of Terminal Shelf		Analog or Digital TE Application	Shelf Position From Left
PS1 in Growth Shelf	–5 V	GR LN SELR	G	Both	7 - 9
		GR LN DISTN			10 - 12
PS1 in Control and Service Channel Shelf	+5 V	SPAN DIR			1 - 6 and 13 - 18
		GR LN SELR			7 - 9
		All units in control and service channel shelf.	C	Both	1 - 17
PS1 in Terminal Shelf	–5 V	EC RECDR	R	Both	8
		ERROR LOCTR			9
		ERROR CORR			10
		TERM FRMR		Analog only	11
		LINE SW			12 (Regular)
		LINE ALNMT			12 (Protection)
		FRAME RMVR			13
		VMR & CODER			14, 15, 16
		BLUE GEN			17
PS2 in Terminal Shelf	+5 V	CRLTR		Analog only	4
		64QAM DECSN			6, 7
		DEMOD		Digital only	2
		TMG			4
		A/D			5
		TE			6
		MON			7
		EC RECDR		Both	8
		ERROR LOCTR			9
		ERROR CORR			10
		TERM FRMR			11
		LINE SW			12 (Regular)
		LINE ALNMT			12 (Protection)
		FRAME RMVR			13
		VMR & CODER			14, 15, 16
		BLUE GEN			17
		CHAN CONTR		Analog only	18

Table A. DC Power Unit Applications—135EC Terminal (Contd)

Power Unit		Unit Supplied			
Location	Voltage Supplied	Description and Shelf Location G = 1 X 10 Growth Shelf C = Control and Service Channel Shelf R = Receiver of Terminal Shelf T = Transmitter of Terminal Shelf		Analog or Digital TE Application	Shelf Position From Left
PS3 in Terminal Shelf	+5 V	CHAN CONTR	R	Digital only	18
		B3ZS DCODR	T	Both	1, 2, 3
		FRAME GEN			4
		LINE SELR			5 (Protection)
		EC CODER			6
		CRC CODER			7
		D/A CONVR			8
	±15 V	64QAM MOD		Both	10
	−15 V	D/A CONVR		Both	8
PS4 in Terminal Shelf	±15 V	64QAM DEMOD	R	Analog only	1
		TRNSV FLT			2, 3
		64QAM DECSN			6, 7
		TMG		Digital only	4
	+15 V	DEMOD			2
	−5 V	CRLTR		Analog only	4
		64QAM DECSN			6, 7
		DEMOD		Digital only	2
		TMG			4
		A/D			5
		TE			6
		MON			7
		TERM FRMR			11
		LINE SW			12 (Regular)
		LINE ALNMT			12 (Protection)
		FRAME RMVR			13
		VMR & CODER			14, 15, 16
	−15 V	BLUE GEN		Both	17
	−5 V	B3ZS DCODR	T	Both	1, 2, 3
		FRAME GEN			4
		LINE SELR			5 (Protection)
		EC CODER			6
		CRC CODER			7
		D/A CONVR			8

Table B. DC Power Unit Applications—135A Terminal

Power Unit		Unit Supplied		
Location	Voltage Supplied	Description and Shelf Location G = 1 X 10 Growth Shelf C = Control and Service Channel Shelf R = Receiver of Terminal Shelf T = Transmitter of Terminal Shelf		Shelf Position From Left
PS1 in Growth Shelf	–5 V	GR LN SELR	G	7 - 9
		GR LN DISTN		10 - 12
PS1 in Control and Service Channel Shelf	+5 V	SPAN DIR		1 - 6 and 13 - 18
		GR LN SELR		7 - 9
		All units in control and service channel shelf.	C	1 - 17
PS1 in Terminal Shelf	–5 V	CRLTR	R	4
		64QAM DECSN		6, 7
		TERM FRMR		8
		LINE SW		9 (Regular)
		LINE ALNMT		9 (Protection)
		FRAME RMVR		10
		VMR & CODER		12, 14, 16
		BLUE GEN		17
		B3ZS DCODR	T	1, 2, 3
		FRAME GEN		4
		LINE SEL		5 (Protection)
		CRC CODER		6
		D/A CONVR		7
PS2 in Terminal Shelf	+5 V	CRLTR	R	4
		64QAM DECSN		6, 7
		TERM FRMR		8
		LINE SW		9 (Regular)
		LINE ALNMT		9 (Protection)
		B3ZS DCODR	T	1, 2, 3
		FRAME GEN		4
		LINE SEL		5 (Protection)
		CRC CODER		6
		D/A CONVR		7
	±15 V	64QAM MOD		9
	–15 V	D/A CONVR		7
PS3 in Terminal Shelf	+5 V	FRAME RMVR	R	10
		VMR & CODER		12, 14, 16
		BLUE GEN		17
		CHAN CONTR		18
	±15 V	64QAM DEMOD		1
		TRNSV FLT		2, 3
		64QAM DECSN		6, 7
	–15 V	BLUE GEN		17

2.2 Fan Fail (Term)

Flowchart 3 is used to clear a FAN FAIL alarm indicator on the fan shelf. When a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **Terminal / Regenerator** tab to replace the unit.

This procedure is not service-affecting. No service protection activity is required.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a unit, ensure all ESD precautions are followed.

Each of the three fans and the fan control printed wiring board (PWB) are protected by input fuses as shown in Figure 4. The fuses should always be checked before replacing any unit in the fan shelf.

An inoperative fan is indicated by the FAN 1, 2, or 3 FAIL indicator on the front of the fan shelf. If only one FAN FAIL indicator is lighted, assume that the associated fan or input fuse to the fan is defective and should be replaced. If fan replacement does not clear the alarm, if more than one FAN FAIL indicator is lighted, or if no FAN FAIL indicators are lighted, assume that a fan control PWB or its associated CONTROL input fuse is defective.

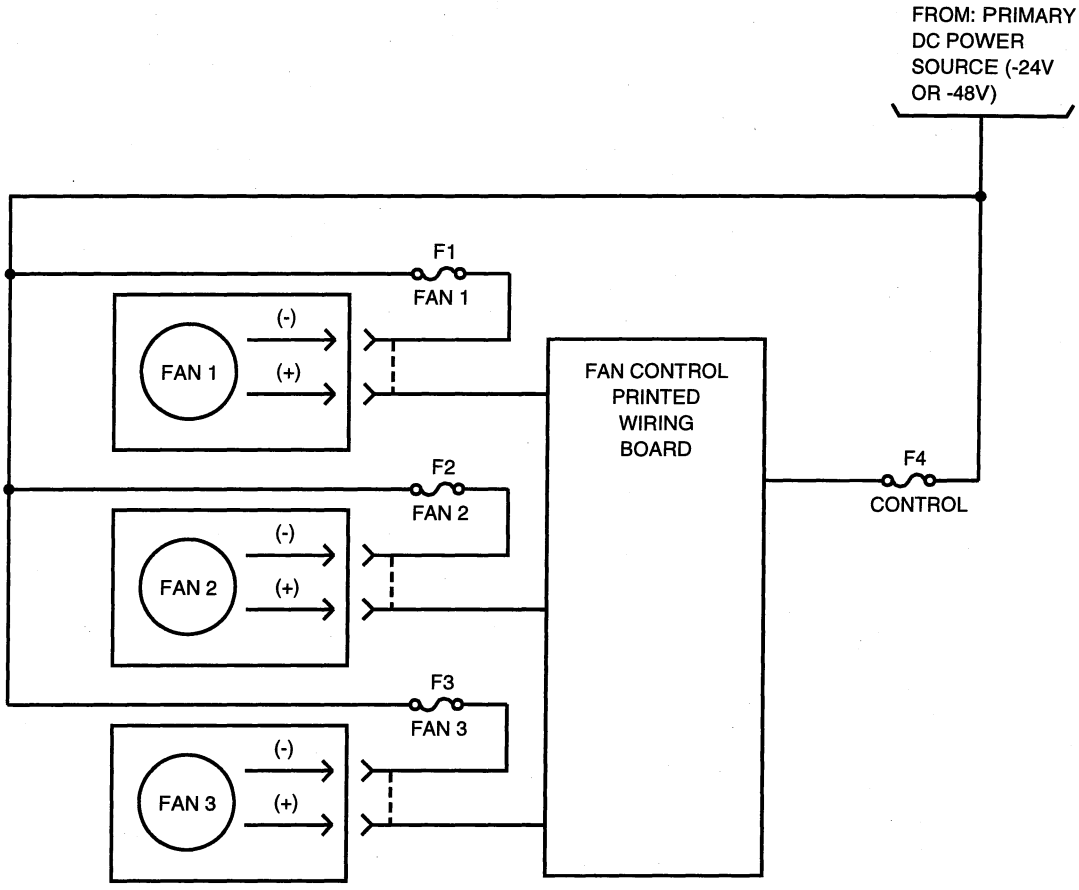
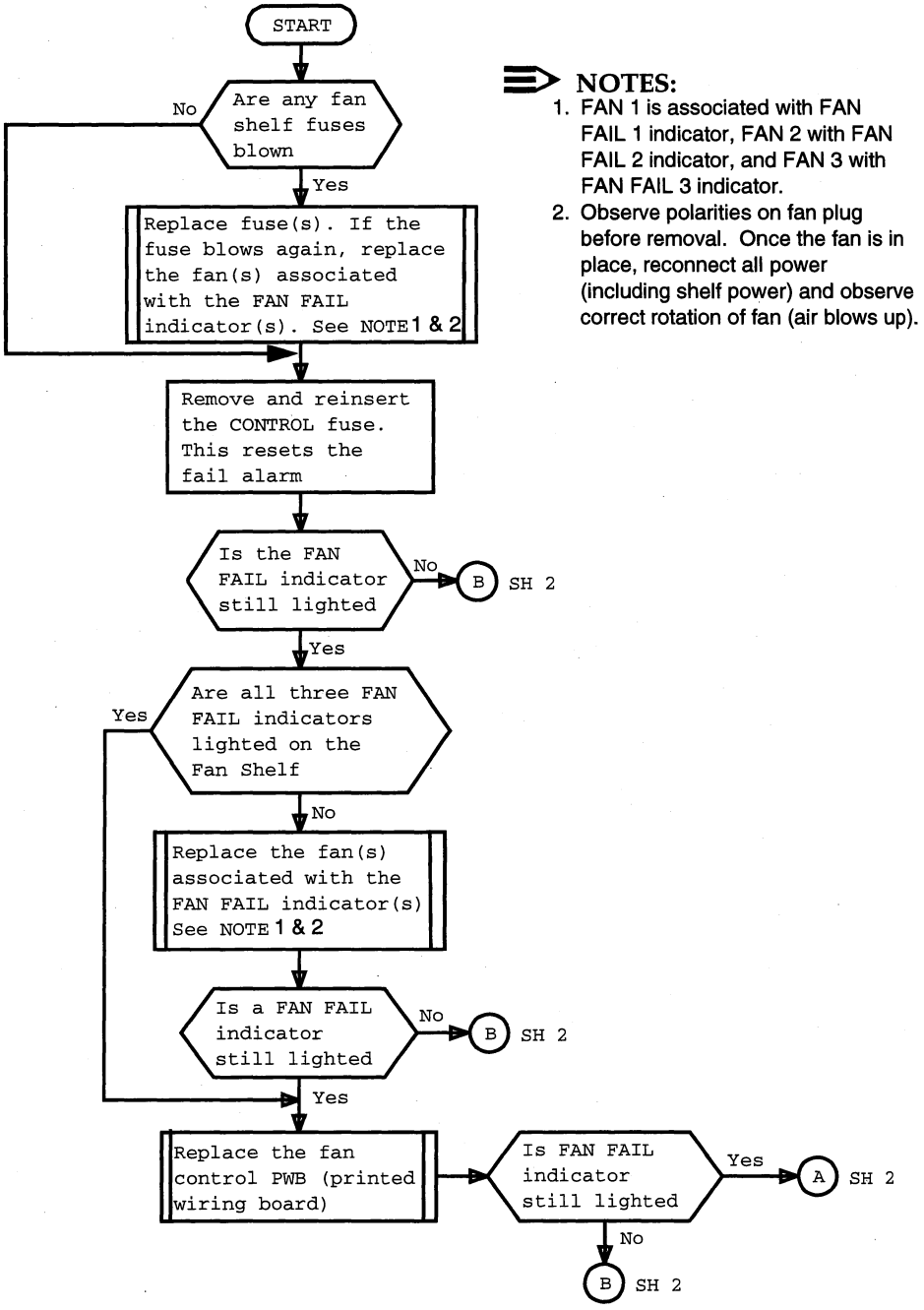
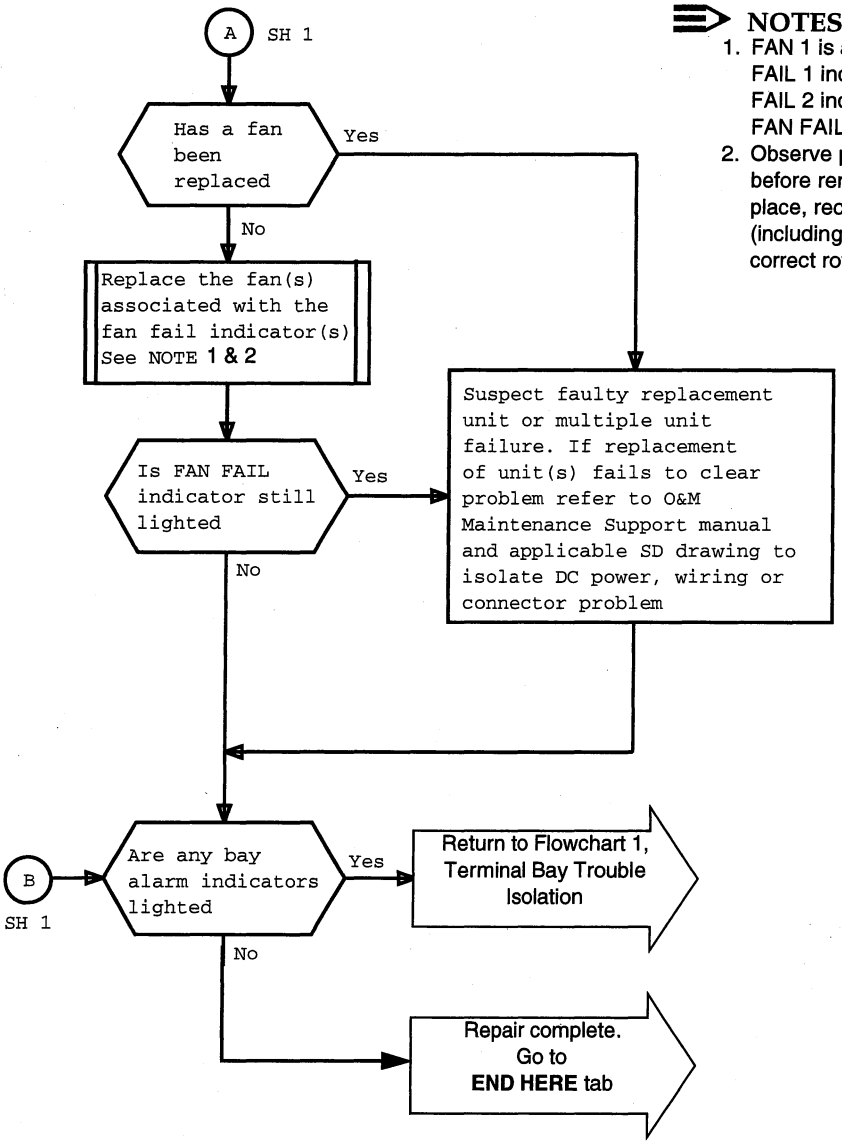


Figure 4. Bay Fan Fusing



Flowchart 3. Bay Fan Fail Alarm-Clearing (Sheet 1 of 2)



NOTES:

1. FAN 1 is associated with FAN FAIL 1 indicator, FAN 2 with FAN FAIL 2 indicator, and FAN 3 with FAN FAIL 3 indicator.
2. Observe polarities on fan plug before removal. Once the fan is in place, reconnect all power (including shelf power) and observe correct rotation of fan (air blows up).

Flowchart 3. Bay Fan Fail Alarm-Clearing (Sheet 2 of 2)

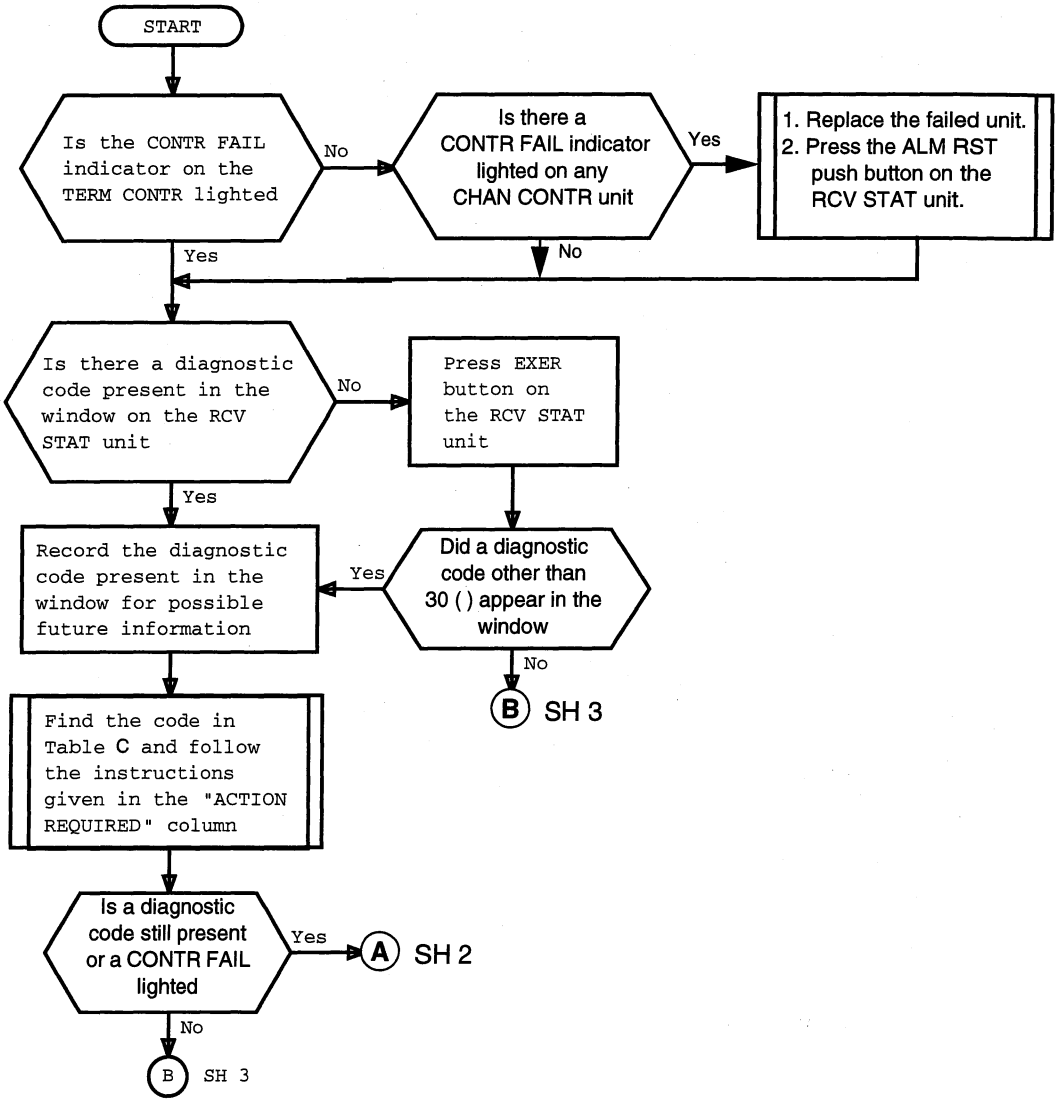
2.3 Control System (Term)

Flowchart 4 is used to clear any CONTR FAIL indicator and any DIAGNOSTIC CODE display. When a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **Terminal / Regenerator** tab to replace the unit.

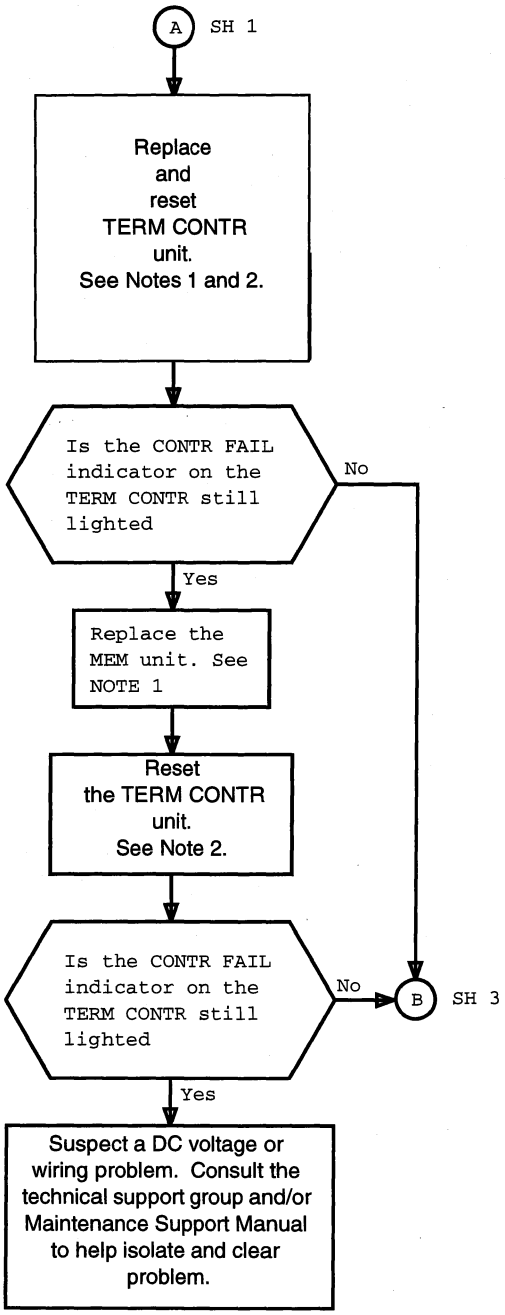
CAUTION:
To prevent electrostatic discharge (ESD) damage to a unit, ensure all ESD precautions are followed.

CAUTION:
*Service interruptions may occur while replacing some of the units referenced in this section unless the proper manual protection switching operation is performed. Always refer to the Terminal / Regenerator—**REPLACEMENT PROCEDURES** tab.*

CAUTION:
Performing this procedure will release any manual or automatic protection switches that may exist. Any transmission alarm on a regular channel ***must*** *be cleared before performing this procedure.*



Flowchart 4. Terminal Bay Control System Alarm-Clearing (Sheet 1 of 3)



NOTES:

1. If replacement unit does not correct problem, reinstall original unit.
2. To reset the TERM CONTR unit:

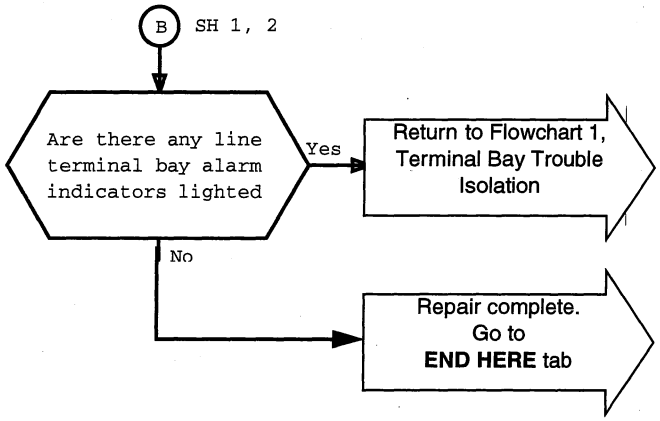
   Upon installing the TERM CONTR unit:

   a. Before inserting unit, press and hold the CONTR RESET push button.
   b. Insert unit while holding button in.
   c. Release CONTR RESET push button.
   d. Wait for indicator lights to clear.
   e. Reset again by pressing and holding the CONTR RESET push button in until the CONTR FAIL indicator lights.
   f. Release the CONTR RESET push button.
   g. Manually run the exerciser (press and release the EXER push button on the RCV STAT unit).

   For installed unit:

   a. Press and hold the CONTR RESET push button in until the CONTR FAIL indicator lights.
   b. Release the CONTR RESET push button.
   c. Manually run the exerciser (press and release the EXER push button on the RCV STAT unit).

Flowchart 4. Terminal Bay Control System Alarm-Clearing (Sheet 2 of 3)



Flowchart 4. Terminal Bay Control System Alarm-Clearing (Sheet 3 of 3)

Table C. Diagnostic Code Display Trouble Clearing

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
Caution: Service interruption may occur while replacing some of the units referenced in this table unless the proper manual protection switching operation is performed. Always refer to Terminal Bay Replacement procedures.		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
	TERMINAL CONTROLLER SELF-TESTS	
01	Line terminal controller RAM memory test failure	(1) Operate the TERM CONTR unit CONTR RESET control. (2) If same code present, replace TERM CONTR unit.
02	Line terminal controller timer – interrupt sanity test failure	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, replace TERM CONTR unit.
03	Program RAM memory test failure	(1) Operate the TERM CONTR unit CONTR RESET control. (2) If same code present, replace MEM unit.
04	Program EPROM memory test failure	(1) Operate the TERM CONTR unit CONTR RESET control. (2) If same code present, replace MEM unit.
06	Telemetry controller failure	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace the equipped TELEM unit.
10	Channel number displayed in the window on the RCV STAT unit has a failed or unplugged CHAN STAT unit.	(1) Restore corresponding channel status unit noted in CHANNEL display. (2) Operate the RCV STAT unit EXER control. (3) If code 10 or 11 is present, replace corresponding channel status unit.
11	Channel number displayed in the window on the RCV STAT unit has a failed CHAN STAT unit.	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace corresponding CHAN STAT unit.
12	Receive status unit failure	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace RCV STAT unit.
13	TDN* serial link failure between TERM CONTR and CHAN CONTR plug-ins. All channels fail exerciser test.	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace RCV STAT unit.
14	PSDN† signaling UART‡ failure (test manually initiated only)	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace RCV STAT unit.
16	Master/alarm unit failure	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace MSTR ALARM unit.
17	Transmit status unit failure	(1) Operate the RCV STAT unit EXER control. (2) If same code present, replace TRMT STAT unit.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
19	Fan fail alarm	(1) Operate ALM RST. (2) If the same code is present and if no fan fail indication is present on the fan shelf, check the dc input power to the fan shelf or the CONTROL fuse (F4).
LINE SWITCH OPERATIONS		
21	No switch verification for corresponding channel received at terminal controller when attempting a line switch. If attempt was via automatic switching due to channel failure, the request will be converted to a span (equipment) switch.	(1) Operate the RCV STAT unit ALM RST control. (2) Attempt a manual line switch. (3) If same code present, replace LINE SW or CHAN CONTR (follow replacement procedures).
22	When attempting a line switch, a failure of the distributed 64QAM protection channel signal is detected. If attempt was via automatic switching, the request will be converted to a span (equipment) switch.	(1) Operate the RCV STAT unit ALM RST control. (2) Attempt a manual line switch. (3) If same code present, verify protection 64QAM distribution transmission by the following: (a) Operate a manual span switch. (b) Operate a manual line switch (simultaneous operation of both receive switches). (c) Look for DS3 FAIL indications on the VMR & CODER units. (d) If a DS3 FAIL indication is present on a VMR & CODER unit, replace the LINE SWITCH unit. (e) If this does not clear the problem, take the line and span switches down and replace the LINE ALNMT unit.
23	No switch release verification for corresponding channel received by terminal controller when attempting to release a line switch.	(1) Operate the RCV STAT unit ALM RST control. (2) Operate a manual line switch and then attempt to reset switch. (3) If same code present, operate a manual span switch and replace LINE SW or CHAN CONTR.
24	Protection channel radio line fails after corresponding line bridge is established when attempting a MAN LINE SW.	(1) Operate ALM RST. (2) Attempt a MAN LINE SW. (3) If same code present, verify transmitting protection 64QAM selector transmission for corresponding channel.
25	Switch release indication received by terminal controller while corresponding channel is switched. Control system will convert to a span (equipment) switch.	(1) Operate manual span switch. (2) Operate the RCV STAT unit ALM RST control. (3) Replace LINE SW or corresponding CHAN CONTR.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
27	Switch operation indication received by terminal controller while corresponding channel is idle. Control system will operate a forced span (equipment) switch.	(1) Operate a manual span switch (2) Operate the RCV STAT unit ALM RST control (3) Replace LINE SW or corresponding CHAN CONTR
EXERCISER TEST OPERATIONS (TROUBLES FOUND BY EXERCISER)		
30	Status indication – system exerciser operating	None.
31	Exerciser alarm – Protection channel not available (can only come in if the exerciser button is pushed manually).	(1) Operate the RCV STAT unit EXER control. (2) If same code present, determine cause of protection unavailability and correct.
32	Exerciser alarm – failure to establish a transmit line bridge for the corresponding channel indicated in diagnostic display	(1) Operate the RCV STAT unit EXER control. (2) If same code present, check for CONTR FAIL indications at transmitting end terminal bay or intermittent protection SIG FAIL indications.
33	Exerciser alarm – Protection channel DS3 fails after a corresponding regular channel line bridge is established.	(1) Operate the RCV STAT unit EXER control. (2) If same code present, verify transmitting protection 64QAM selector transmission for corresponding channel. (3) Problem is not line selector; has to be between selector and regular FRAME GEN or in FRAME GEN.
34	Exerciser alarm – failure to release transmit bridge for corresponding channel	If TRMT SW alarm on PROT STAT unit is present, check for CONTR FAIL indications at transmitting terminal bay or intermittent protection SIG FAIL indication.
35	Exerciser alarm – failure of protection signaling being carried by service channel S1	(1) Operate the RCV STAT unit EXER control. (2) If same code present, check for SIG FAIL indication or CONTR FAIL indications at transmitting terminal bay. Go to SIG FAIL alarm tab.
36	Exerciser alarm – failure to establish transmit span bridge for corresponding channel	(1) Operate the RCV STAT unit EXER control. (2) If same code present, check for CONTR FAIL indications at the transmitting end terminal bay or intermittent protection SIG FAIL indications.
37	Exerciser alarm – The protection channel fails at the transmit-end decoders after corresponding span bridge is established	(1) Operate the RCV STAT unit EXER control. (2) If same code present, verify transmitting protection channel SPAN DIR transmission for corresponding channel in window (SYNC LOSS indication on B3ZS DECODR). Replace SPAN DIR, cable, or hybrid (watch for service interruption).
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
38	Exerciser alarm – Protection channel radio line fails out of frame after a regular channel line bridge is established.	(1) Operate the RCV STAT unit EXER control. (2) If same code present, verify transmitting protection 64QAM selector transmission for corresponding channel. (3) Problem is in regular FRAME GEN or LINE SELR unit.
39	Exerciser alarm – Protection channel radio line fails with high error rate after a regular channel line bridge is established.	(1) Operate the RCV STAT unit EXER control. (2) If same code present, verify transmitting protection 64QAM selector transmission for corresponding channel. (3) Problem is in regular FRAME GEN or LINE SELR unit.
EQUIPMENT (SPAN) SWITCH OPERATIONS		
40	Excessive span switching – The corresponding channel has had an excessive number of line terminating equipment failures (DS3 fails or DS3 alarms) in the last 4 minutes. The control system will operate a forced span switch	(1) Operate a manual span switch. (2) Operate the RCV STAT unit ALM RST control. (3) If channel FAIL indications are present, proceed with transmission trouble analysis (4) Otherwise reset manual span switch. (5) If same code present, replace VMR & CODER unit (FAIL indication may not be lighted).
41§	No switch verification for corresponding channel received at terminal controller when attempting a span switch	(1) Operate the RCV STAT unit ALM RST control. (2) If channel not failed, attempt a manual span switch. (3) If same code present, (a) Lock out channel. (b) Replace VMR & CODER or corresponding RCV STAT unit (via manual patch procedure).
42	Receive protection span switch indication received by terminal controller while system is idle or corresponding channel has line switch	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Restore line switch. (b) Lock out protection channel. (c) Replace receive protection VMR & CODER or PROT STAT unit.
43	No switch release verification for corresponding channel received at terminal controller while attempting to release a span switch	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Reinforce with manual span switch. (b) Replace VMR & CODER or corresponding RCV STAT unit.
44	No receive span director release verification for corresponding channel received at terminal controller when attempting a span switch	(1) Operate the RCV STAT unit ALM RST control. (2) If channel not failed, attempt manual span switch. (3) If same code present, (a) Lock out protection channel. (b) Replace receive SPAN DIR or PROT STAT.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
45	No receive span director release verification for corresponding channel received at terminal controller when attempting to release a span switch	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Reinforce with manual line switch. (b) Replace receive SPAN DIR or PROT STAT.
46	Span switch release indication received by terminal controller while corresponding channel has been span switched	For the regular channel: (1) If switch is still operated: (a) Operate manual span switch. (b) Operate the RCV STAT unit ALM RST control. (c) Replace the VMR & CODER or corresponding CHAN STAT. (2) Otherwise, attempt manual span switch and check for Code 41. For the protection channel: (1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Restore span or access switch. (b) Lock out protection channel. (c) Replace receive protection VMR & CODER or PROT STAT unit.
47	Span switch operation indication received by terminal controller while corresponding channel is idle or line switched. Control system will operate a forced span (equipment) switch or convert the line switch to a span.	(1) Operate manual span switch. (2) Operate the RCV STAT unit ALM RST control. (3) Replace VMR & CODER or corresponding CHAN STAT.
48	Receive span director release indication received by terminal controller while corresponding channel has been span switched	(1) If switch is still operated: (a) Operate manual span switch. (b) Operate the RCV STAT unit ALM RST control. (c) Replace receive SPAN DIR or PROT STAT. (2) Otherwise, (a) Attempt manual span switch. (b) Check code 44.
49	Receive span director operation indication received by terminal controller while system is idle or corresponding channel has been line switched	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Restore line switch. (b) Lock out protection channel. (c) Replace receive SPAN DIR or PROT STAT.
TRANSMIT BRIDGE OPERATIONS		
50	Status indication – current channel with transmit bridge is displayed. If no protection switch is active, the channel selected for the idle bridge source for the protection channel is displayed.	None. (Indication is removed when manual controls are released.)
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
51	Transmit SPAN DIR release indication received by terminal controller while system has a span bridge established.	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Lock out the protection channels far-end receiver (transmitting end control feature). (b) Replace transmit SPAN DIR or TRMT STAT.
52	No transmit SPAN DIR verification for corresponding channel received at terminal controller when attempting or releasing a transmit bridge.	(1) Operate the RCV STAT unit ALM RST control. (2) Attempt a manual SPAN switch for the far-end receiver (TRMT end control feature). (3) If same code or code 51 is present, (a) Lock out protection channel far-end receiver (transmitting end control feature). (b) Replace transmit SPAN DIR or TRMT STAT.
53	Transmit switch alarm - A discrepancy exists between bridging states on the transmitting end and the receiving end terminals. (Always accompanied by PROT status red TRMT SW indication).	Verify controller status at TRMT end terminal bay or check for protection signaling failure.
54	No transmit selector per channel verification for the corresponding channel received by the terminal controller when attempting or releasing a transmit bridge	(1) Operate the RCV STAT unit ALM RST control. (2) Attempt a manual line switch for the far-end receiver (transmit end control feature). (3) If same code present, (a) Lock out protection far-end receiver channels (transmit end control feature). (b) Replace the appropriate transmit LINE SELR or GR LN SELR.
55	No transmit LINE SELR common verification received by terminal controller when attempting or releasing a transmit line bridge	(1) Operate the RCV STAT unit ALM RST control. (2) Attempt a manual line switch for the far-end receiver (transmit-end control feature). (3) If same code present, replace transmit LINE SELR or TRMT STAT unit.
56	Transmit LINE SELR time-out alarm. Line bridge operating no longer hitless (can cause receive modem failures)	(1) Operate the RCV STAT unit ALM RST control. (2) Attempt a manual line switch for the far-end receiver (transmit-end control feature). (3) If same code present, (a) Lock out protection far-end receiver channels (transmit-end control feature). (b) Replace the appropriate transmit LINE SELR or GR LN SELR.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
57	Transmit selector incorrect indication received by terminal controller while system has a line bridge established	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Wait until all switches have been released. (b) Lock out protection channel far-end receiver (transmit-end control feature). (c) Replace transmit LINE SELR or appropriate GR LN SELR or TRMT STAT unit.
58	Transmit selector incorrect indication received by terminal controller while system has a span bridge established or is idle	
59	Transmit SPAN director incorrect indication received by terminal controller while system is idle or has a line bridge established	(1) Operate the RCV STAT unit ALM RST control. (2) If same code present, (a) Wait until line switch has been released. (b) Lock out protection channel far-end receiver (transmit-end control feature). (c) Replace transmit SPAN DIR or TRMT STAT unit.
TERMINAL BAY CONTROLLER FEATURES		
60	TDN* communications failure (between terminal controller and corresponding channel controllers)	(1) Operate the RCV STAT unit EXER control button. (2) If the same code is present, replace the corresponding CHAN CONTR unit.
61	TDN* communicating failure	(1) Operate the RCV STAT unit EXER control button (2) If the same code or code 13 is present, replace the RCV STAT unit.
62	Channel controller failure	(1) Operate the RCV STAT unit EXER control button. (2) If the same code is present, replace the CHAN CONTR that has the CONTR FAIL indication.
63	PSDN† communications failure	(1) Operate the RCV STAT unit EXER control button. (2) If the same code is present, replace the RCV STAT unit.
67	Control system firmware incompatibility	(1) Operate the RCV STAT unit ALM RST control. (2) If the same code is present, replace the corresponding CHAN CONTR unit with the correct (upgraded) version.
TABS TELEMETRY FEATURE		
64	Error or fault in configuration strapping on backplane pins of telemetry controller unit or TS1	Check backplane strapping (pos. 046 on Control Shelf) at both terminal locations using SD-7C425-01, or check strapping on TS1 using SD-7C415-01.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
65	Failure of alarm, status, and control signaling (service channel S3) between terminal and a regenerator. (This diagnostic code is inhibited if SIG FAIL alarm exists.) The CHANNEL number displayed in window indicates the regenerator station that cannot communicate. If display is blank, indicates. failure to communicate to all associated regenerator stations	If CHANNEL display is blank: (1) Replace TELEM unit. (2) If same code is present, replace SC MULDM unit. If CHANNEL display indicates a number: (1) Go to regenerator station assigned to number. (2) Replace each REGEN I/O unit, one at a time, and check for diagnostic code (at terminal location) to clear after each replacement. (3) If same code is present, replace each SC MULDEM unit, one at a time, and check for diagnostic code (at terminal location) to clear after each replacement. (4) If same code is present, replace REGEN CONTR unit.
66	Failure of fault-locating signaling (service channel S4) between terminal and a regenerator. (This diagnostic code is inhibited if SIG FAIL alarm exists.) The CHANNEL number displayed in window indicates the regenerator station that cannot communicate. If display is blank, indicates failure to communicate to all associated regenerator stations.	If CHANNEL display is blank: (1) Replace TELEM unit. (2) If same code is present, replace SC MULDM unit. If CHANNEL display indicates a number: (1) Go to regenerator station assigned to number. (2) Replace each REGEN I/O unit, one at a time, and check for diagnostic code (at terminal location) to clear after each replacement. (3) If same code is present, replace each SC MULDM unit, one at a time, and check for diagnostic code (at terminal location) to clear after each replacement. (4) If same code is present, replace REGEN CONTR unit.
TBOS TELEMETRY FEATURE		
65	Telemetry controller failure – E2A alarm serial link	(1) Operate the RCV STAT unit EXER control button. (2) If the same code is present, replace the SER TELEM unit.
ALIGNMENT FAILURES		
70	Static alignment failure – no clock alignment	(1) Operate the RCV STAT unit EXER control button. (2) If the same code is present, replace the LINE ALNMT, PROT STAT, or the corresponding CHAN CONTR or LINE SW unit.
71	Static alignment failure – no page alignment	(1) Operate the RCV STAT unit EXER control button. (2) If the same code is present, replace the LINE ALNMT, PROT STAT or the corresponding CHAN CONTR or LINE SW unit.
72	Initialization of static alignment incomplete	(1) Operate the RCV STAT unit EXER control button. (2) Check for codes 70 and 71.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
73	Line switch alignment enable is on (internal control function) when no LINE SWITCH is established. This will prevent proper errorless switching on the other channels	For the regular channel: (1) Operate the ALM RST button on the RCV STAT unit. (2) If the same code is present, replace the corresponding CHAN CONTR unit. For the protection channel: (1) Operate the ALM RST button on the RCV STAT unit. (2) If the same code is present, replace the PROT STAT unit or each equipped LINE SW unit until faulty unit is isolated.
BLUE SIGNAL OPERATION		
75	Blue signal is erroneously inserted at the system output port when no DS3 frame failure exists. The control system will operate a forced span switch or convert the line switch to a span	For the regular channel: (1) Perform a manual span switch. (2) Operate the ALM RST button on the RCV STAT unit. (3) If the same code is present, replace the corresponding VMR & CODER unit that has the BLUE SIGNAL indication or the CHAN CONTR unit. For the protection channel: (1) Operate the ALM RST button on the RCV STAT unit. (2) If the same code is present, (a) Release the LINE switch, if present. (b) Lock out the protection channel receiver. (c) Replace the protection channel VMR & CODER unit that has the BLUE SIGNAL indication or the CHAN CONTR unit.
76	Blue signal is erroneously inserted at the protection channel system output port while a span switch is established and when no DS3 frame failure exists on the protection channel.	(1) Operate the manual span switch. (2) Operate the RCV STAT unit ALM RST control button. (3) If the same code is present, release the span switch and lock out the protection receiver. (4) Replace the protection channel VMR & CODER that has the BLUE SIGNAL indication or the protection CHAN CONTR unit.
77	Failure of the blue signal clock generator	(1) Operate the ALM RST button on the RCV STAT unit. (2) If the same code is present, replace the corresponding BLUE GEN or CHAN CONTR unit.
See notes and footnotes at end of table.		

Table C.)Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
	BLUE SIGNAL OPERATION	
78	Blue signal is erroneously removed from or not inserted into the system output port when a DS3 frame failure exists	For the regular channel: (1) Perform a manual span switch. (2) Fail the regular receiver by removing the IF IN signal. (VMR & CODER indications should be lighted.) (3) Operate the ALM RST button on the RCV STAT unit. (4) If the same code is present, replace the corresponding VMR & CODER unit that has no BLUE SIGNAL indication or the CHAN CONTR unit. For the protection channel: (1) Lock out the protection channel. (2) Fail the regular receiver by removing the IF IN signal. (VMR & CODER indications should be lighted.) (3) Operate the ALM RST button on the RCV STAT unit. (4) If the same code is present, replace the corresponding VMR & CODER unit that has no BLUE SIGNAL indication or the CHAN CONTR unit.
	TRIBUTARY CONFIGURATION	
79	Current tributary configuration is different from initialized configuration (Additional VMR & CODER units have been added to corresponding channel)	(1) Equip channel with correct number of VMR & CODER units. (2) Operate the TERM CONTR unit CONTR RESET control to reinitialize the system.
	SYSTEM STATUSES	
86	Overactivity alarm – status indication. The corresponding channel has had an excessive number of line failures in the last 5 minutes. The control system will operate a 10-minute overactivity line switch	(1) To release overactivity switch, operate a manual line switch and then reset switch (2) If no switch is present, operate the RCV STAT unit ALM RST control.
87	Span (equipment) force switch-status indication. The corresponding channel has a forced span switch. This status indication is the result of a code 40 (excessive span switching) indication	To release forced switch, operate a manual span switch and then reset switch.
See notes and footnotes at end of table.		

Table C. Diagnostic Code Display Trouble Clearing (Contd)

DIAGNOSTIC CODE DISPLAY TROUBLE CLEARING (NOTES 1 THROUGH 4)		
CODE NUMBER	**DESCRIPTION**	**ACTION REQUIRED**
88	Status indication – transmit line bridge to protection – receive manual operation	Reset manual transmit bridge operation when appropriate.
89	Status indication transmit span bridge to protection – receive manual operation	Reset manual transmit bridge operation when appropriate.

NOTES:

1. Unless otherwise noted, each diagnostic code is a local indication of a line terminal bay alarm condition. A terminal control system alarm is also sent to the alarm surveillance center. The exceptions are status indications which represent clarification information for the operator when certain system conditions are initiated either manually or automatically and therefore do not generate a remote terminal system alarm.
2. The action required statements suggest the most probable circuit failures. If this does not fix the problem, check bay or shelf wiring by verifying interconnecting signals and leads.
3. The CODE present in display represents the last trouble found during equipment self tests.
4. If the numeric code clears when the EXER or ALM RST control is operated, inform alarm/maintenance center and follow instructions. If a different numeric code appears, unless otherwise instructed, perform the corrective action required to clear the numeric code.

* Terminal Data Network – A serial communications link between the microprocessors in the line terminal bay.

† Protection Switching Data Network – A serial communications link between the protection channel microprocessor and the regular channel microprocessors which control the switching in the line terminal bay.

‡ Universal Asynchronous Receiver and Transmitter

§ Due to inability to execute a SPAN switch for the corresponding channel (displayed in the CHAN window), replacing a VMR & CODER plug-in in that channel will cause a service interruption on the DS3 rail associated with the removed unit. Replace the plug-in during low traffic density hours

Due to inability to release a SPAN switch for the corresponding channel (displayed in the CHAN window), replacing a SPAN DIR plug-in in that channel will cause a service interruption on the DS3 rail associated with the removed unit. Replace the plug-in during low trafic density hours.

2.4 Digital Receiver (Term)

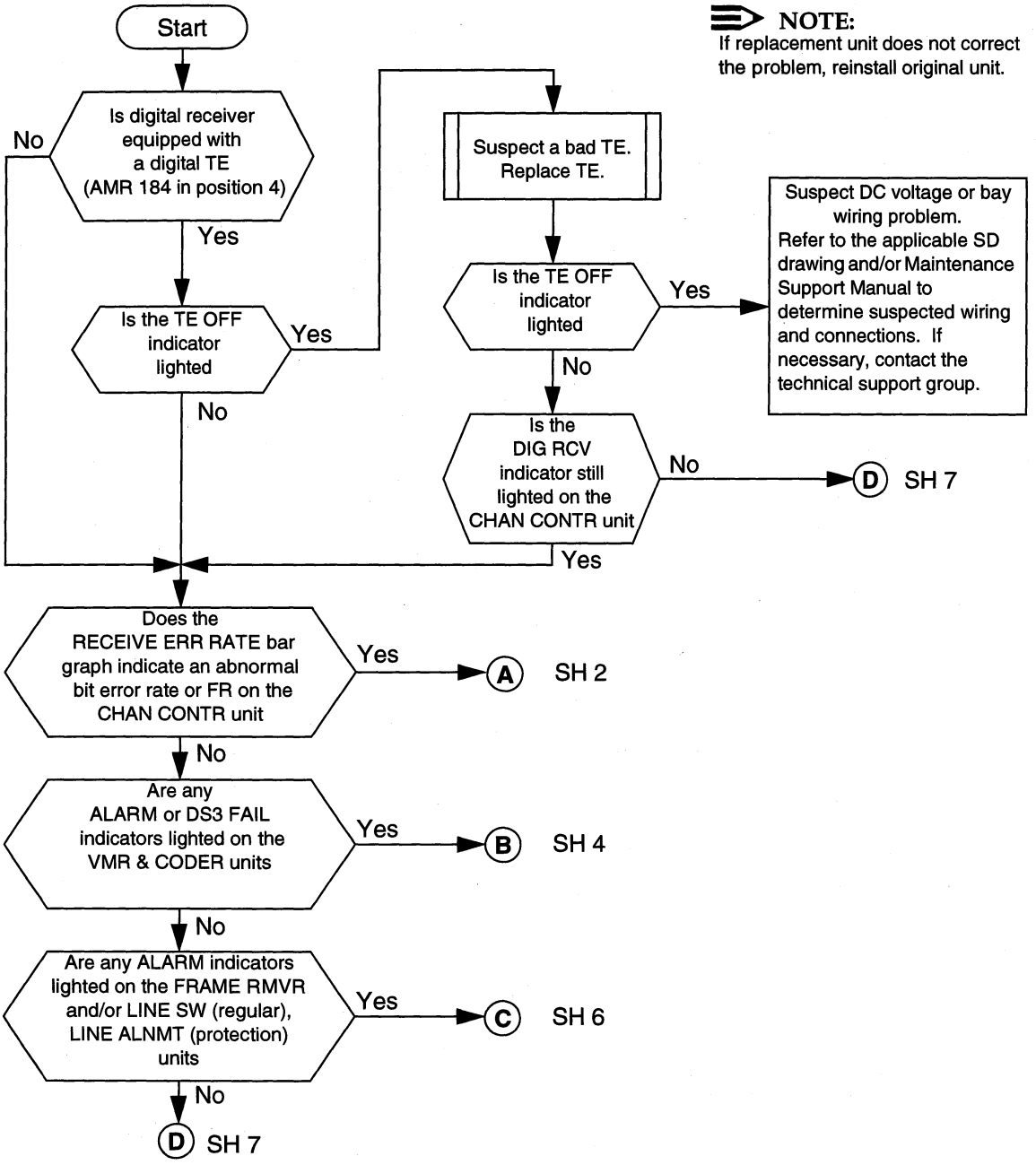
Flowchart 5 is used to clear the DIG RCV FAIL alarm indicator on the CHAN CONTR unit. If this alarm indicator is ON, the associated line terminal has a failure in its receiving circuits or something is wrong with the incoming signal. Local indications and any necessary tests are referenced to isolate the problem.

When terminal bay tests are necessary, refer to the **TEST PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab. If it is determined that a terminal receiver unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit.

For incoming signal problems you will be directed to clear the radio receiver before being sent to the transmit end of the radio hop. If radio receiver tests are necessary, refer to the **TEST PROCEDURES** tab under the **RADIO RECEIVER** tab. Refer to the **REPLACEMENT PROCEDURES** tab under the **RADIO RECEIVER** tab to replace any unit.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a plug-in unit, ensure all ESD precautions are followed.

Prerequisites:
1. FAIL—DIG RCV indicator lighted on the CHAN CONTR unit.
2. If digital TE, the TE NORMAL OFF push-button switch is set to NORMAL.
3. Service is protected with a manual switch (lock out if protection).
4. Fault locate and/or alarm indications isolate problem to this terminal receiver.

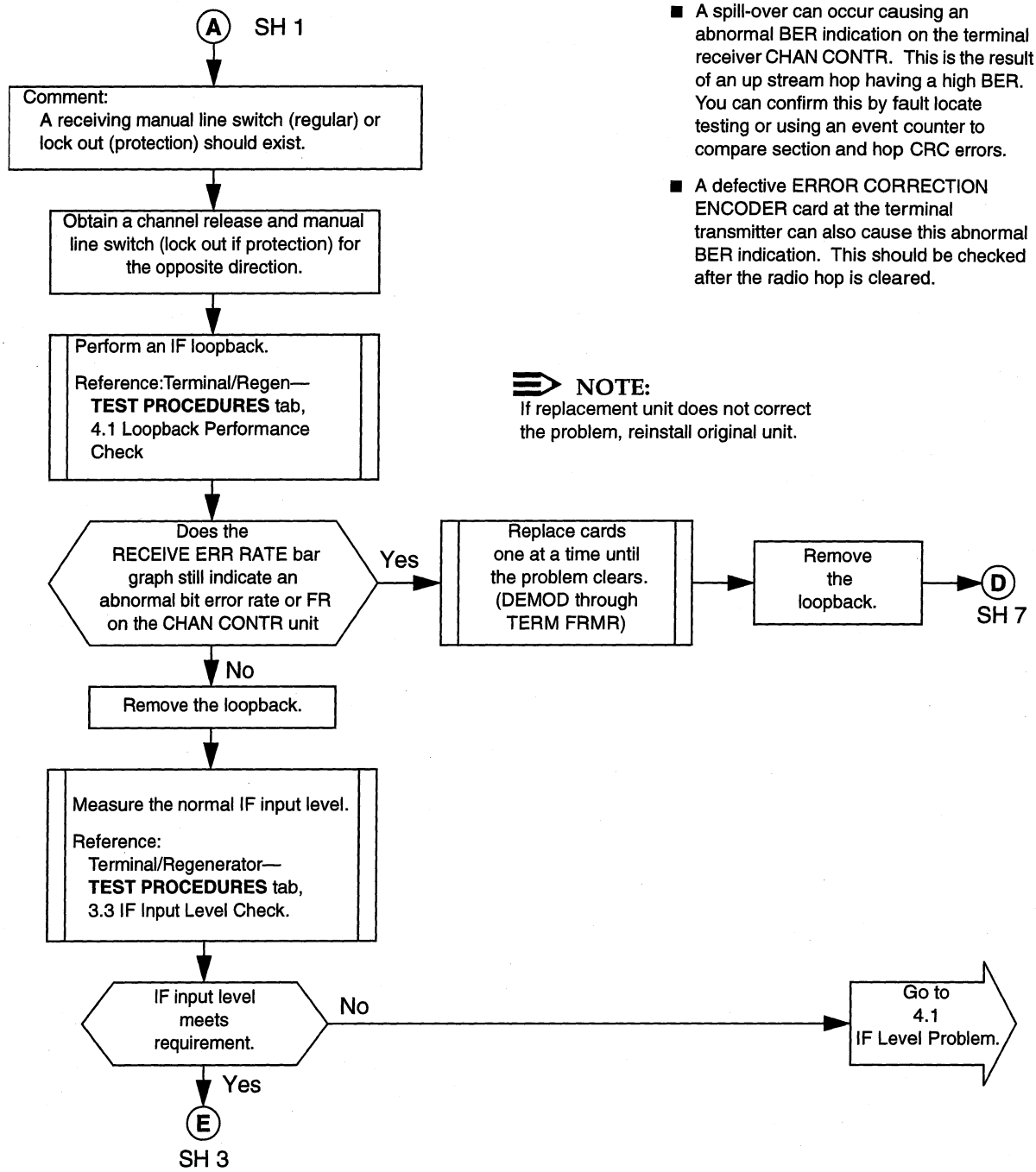


Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 1 of 7)

Prerequisite: Bar graph on CHAN CONTR unit indicates an abnormal BER or FR.

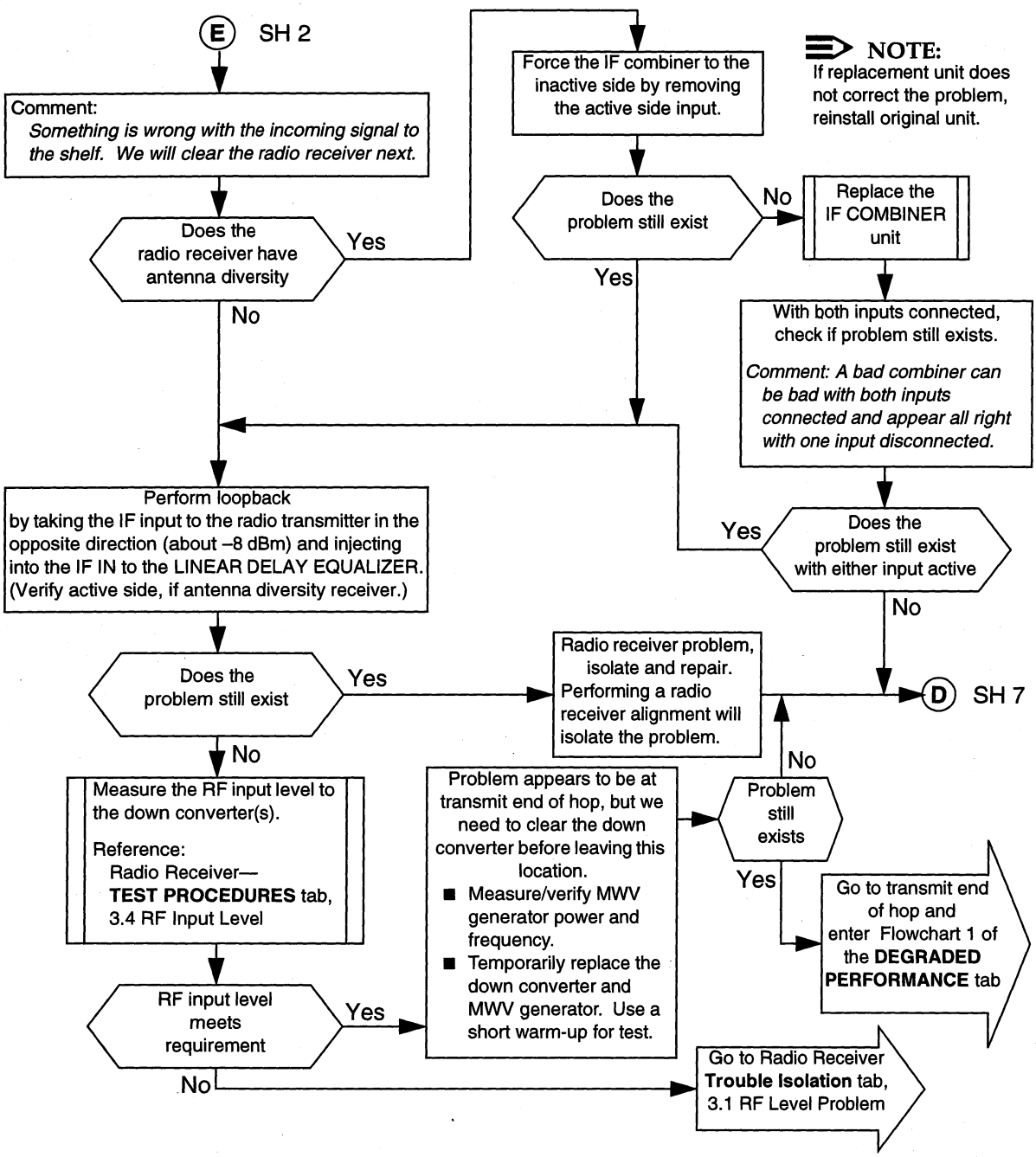
Comment: On an EC system:

- A spill-over can occur causing an abnormal BER indication on the terminal receiver CHAN CONTR. This is the result of an up stream hop having a high BER. You can confirm this by fault locate testing or using an event counter to compare section and hop CRC errors.
- A defective ERROR CORRECTION ENCODER card at the terminal transmitter can also cause this abnormal BER indication. This should be checked after the radio hop is cleared.



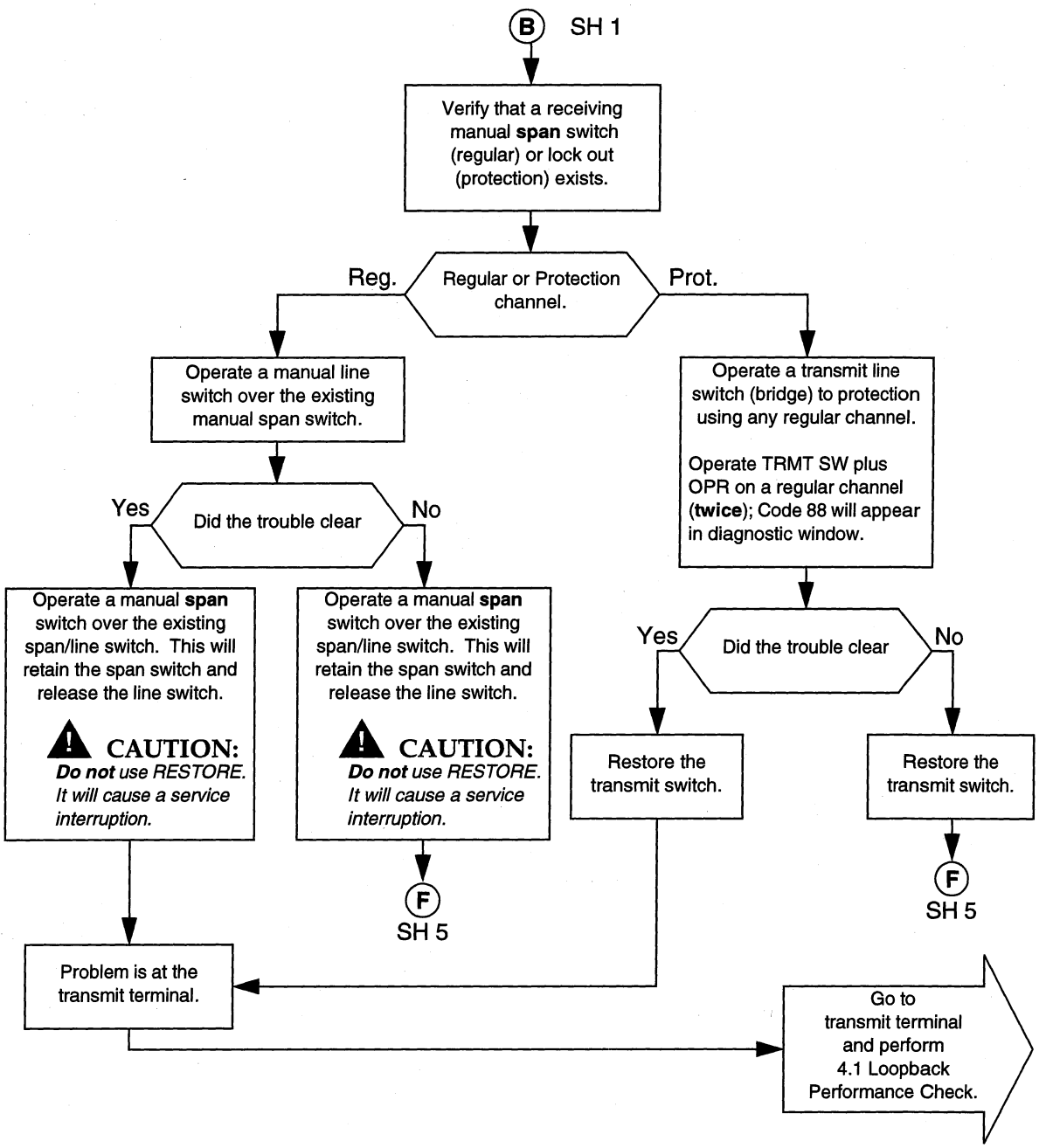
Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 2 of 7)

Prerequisites: 1. Bar graph on CHAN CONTR unit indicates an abnormal BER or FR.
2. Service is protected with a manual line switch (lock out if protection channel) in both directions.
3. The IF input level to the digital shelf meets requirements.
4. The digital receiver is good per IF loopback test.



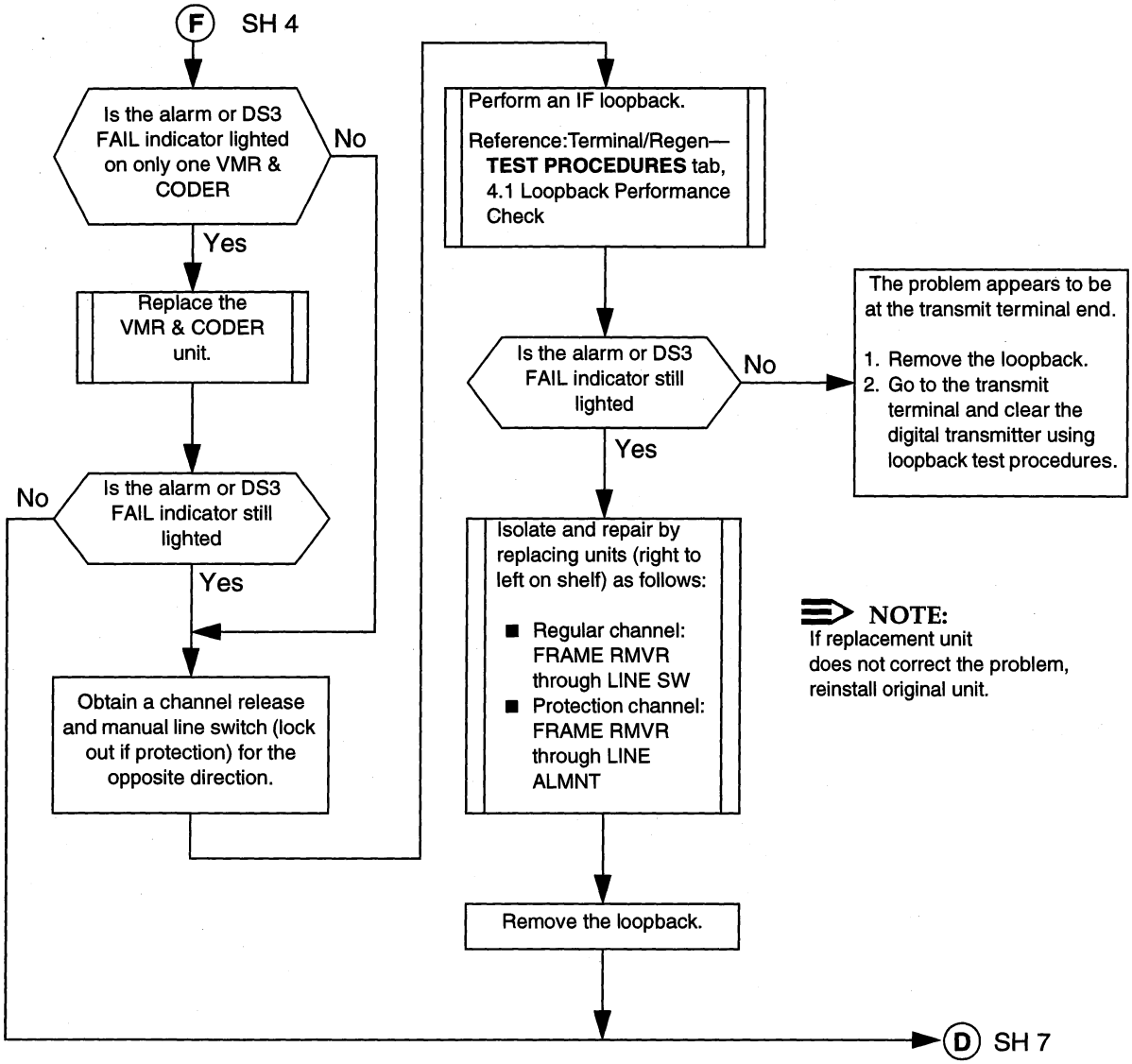
Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 3 of 7)

Prerequisites: 1. There is no PREV SECT indicator on any CHAN STAT unit.
2. ALARM or DS3 FAIL indicator is lighted on a VMR & CODER unit.



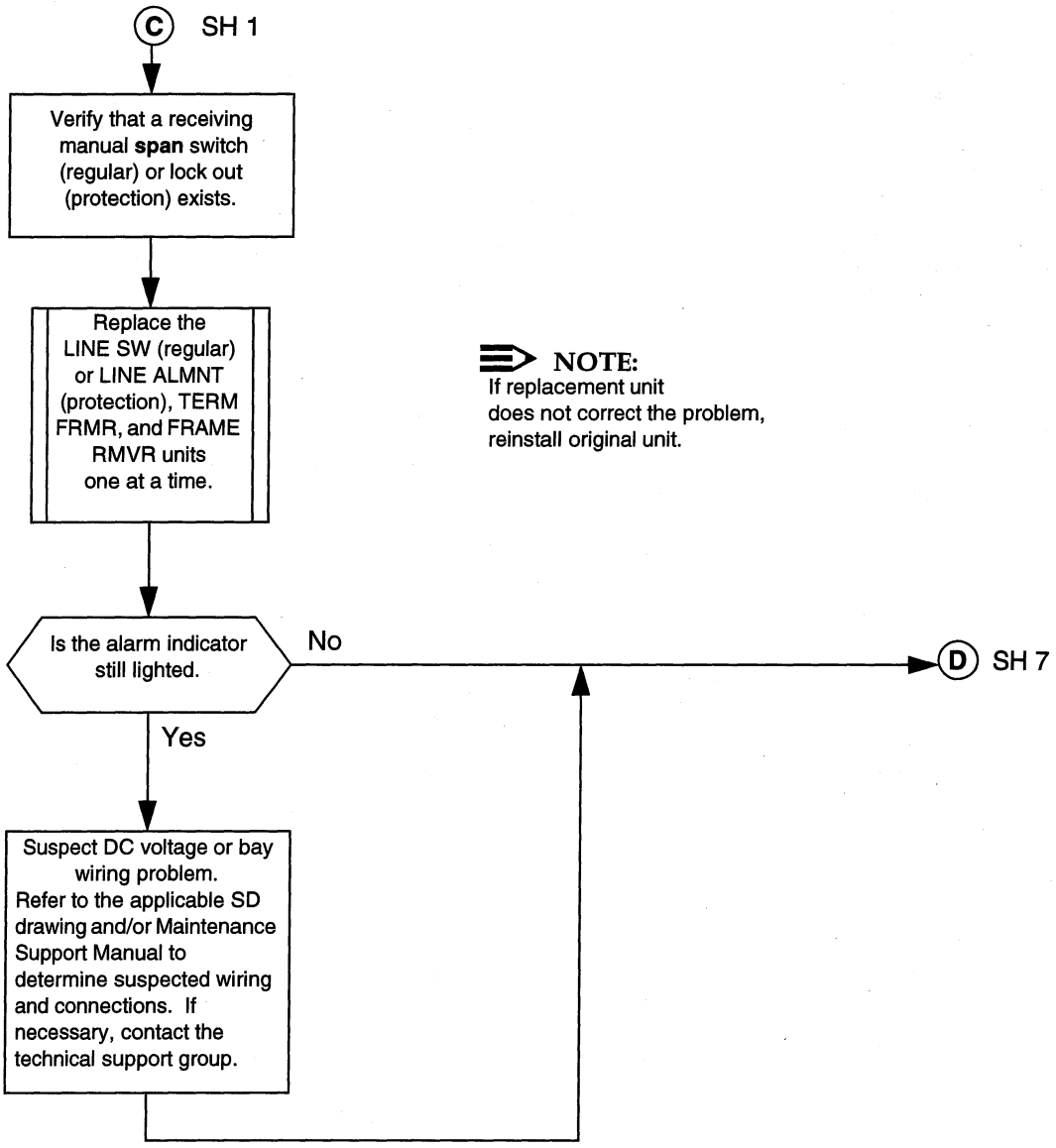
Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 4 of 7)

Prerequisites: 1. There is no PREV SECT indicator on any CHAN STAT unit.
2. ALARM or DS3 FAIL indicator is lighted on a VMR & CODER unit.

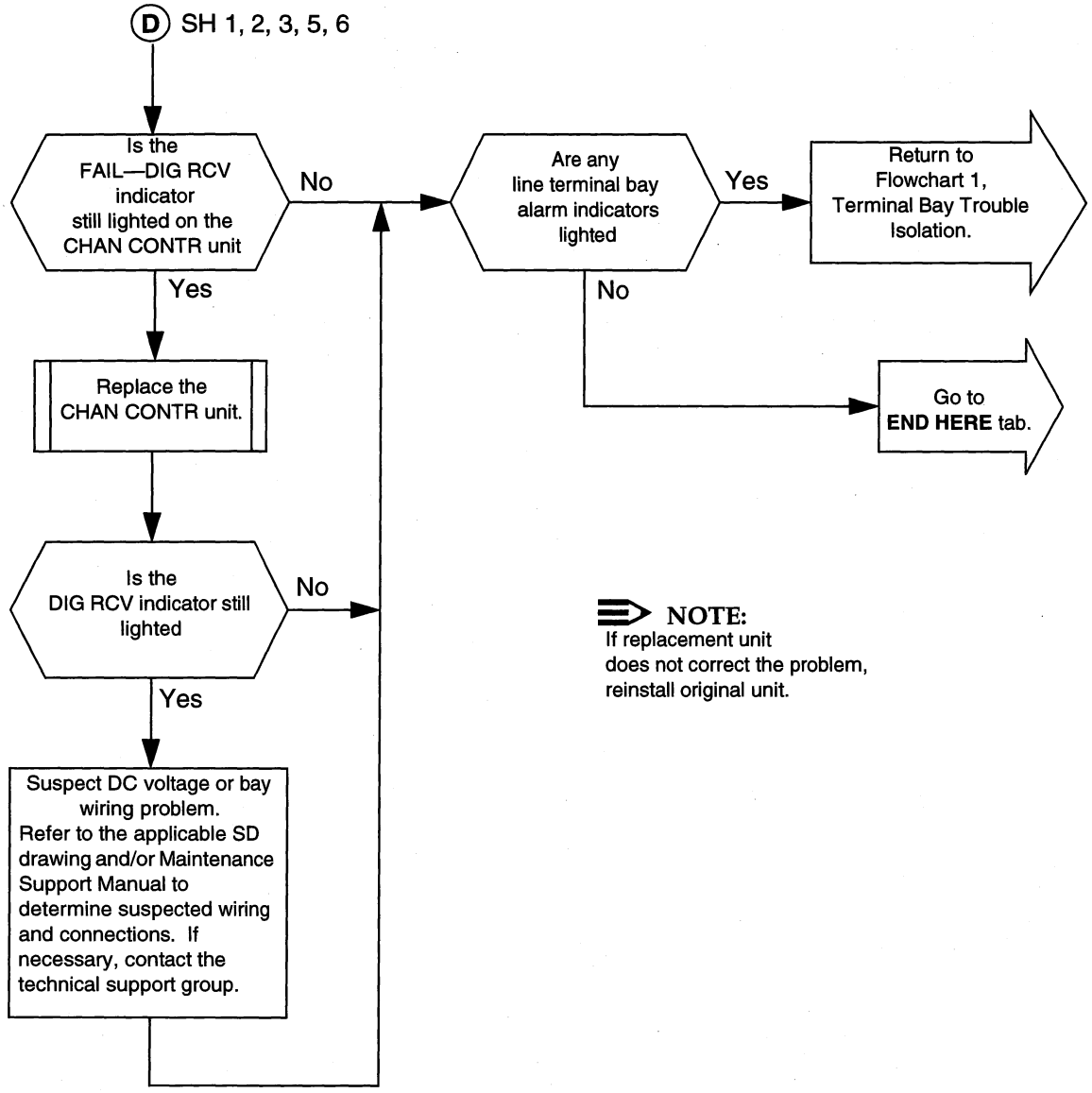


Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 5 of 7)

Prerequisite: ALARM indicator is lighted on FRAME RMVR, LINE SW, or LINE ALNMT unit.



Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 6 of 7)

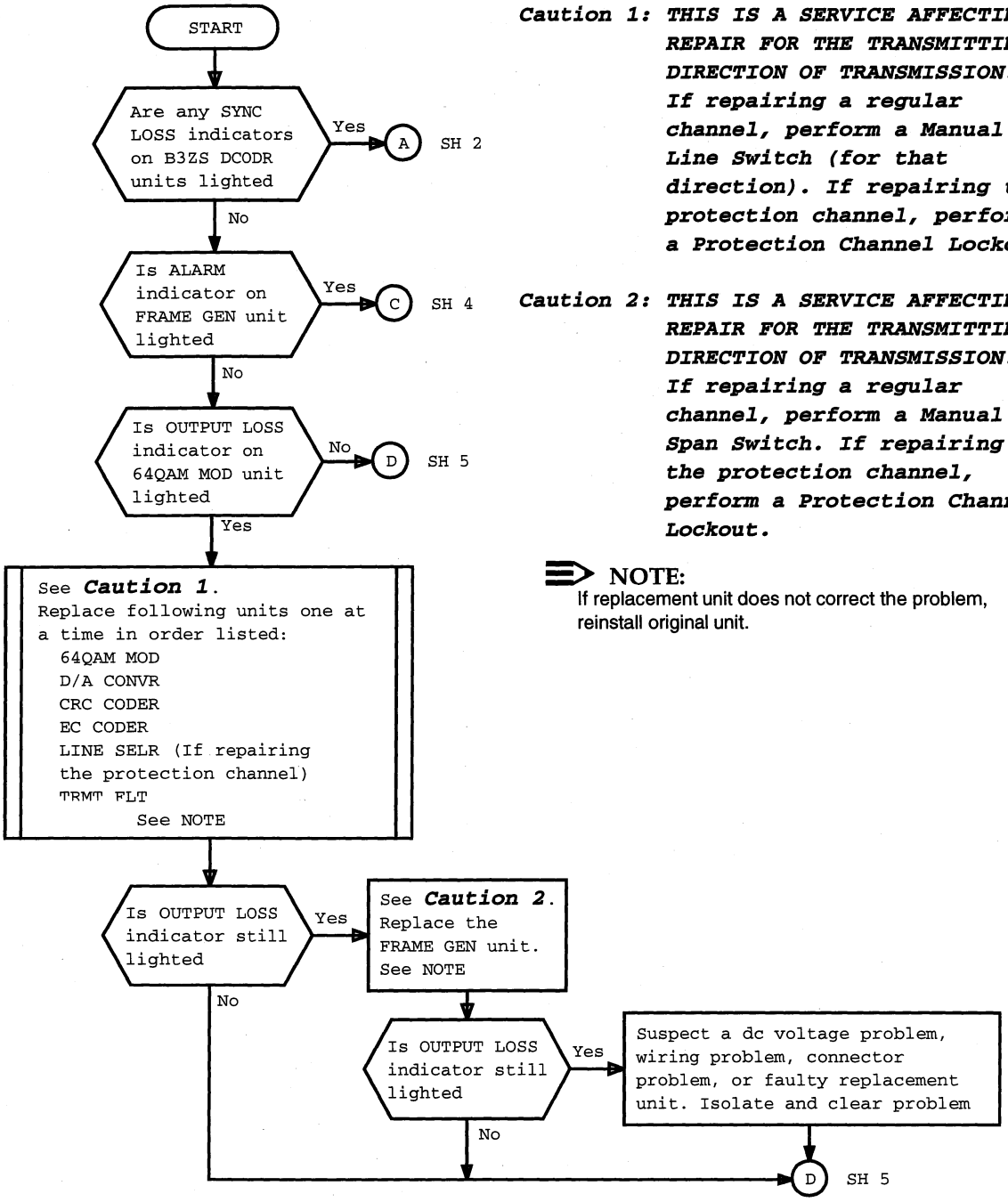


Flowchart 5. Terminal Bay Digital Receiver Alarm-Clearing (Sheet 7 of 7)

2.5 Digital Transmitter (Term)

Flowchart 6 is used to clear the DIG TRMT FAIL alarm indicator on the CHAN CONTR unit. If this alarm indicator is ON, the associated line terminal may have a failure in its transmitting circuits or something is wrong with a DS3 input signal. Local indications and any necessary tests are referenced to determine the failed unit. When it has been determined which unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit. If tests are necessary, refer to the **TEST PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a plug-in unit, ensure all ESD precautions are followed.



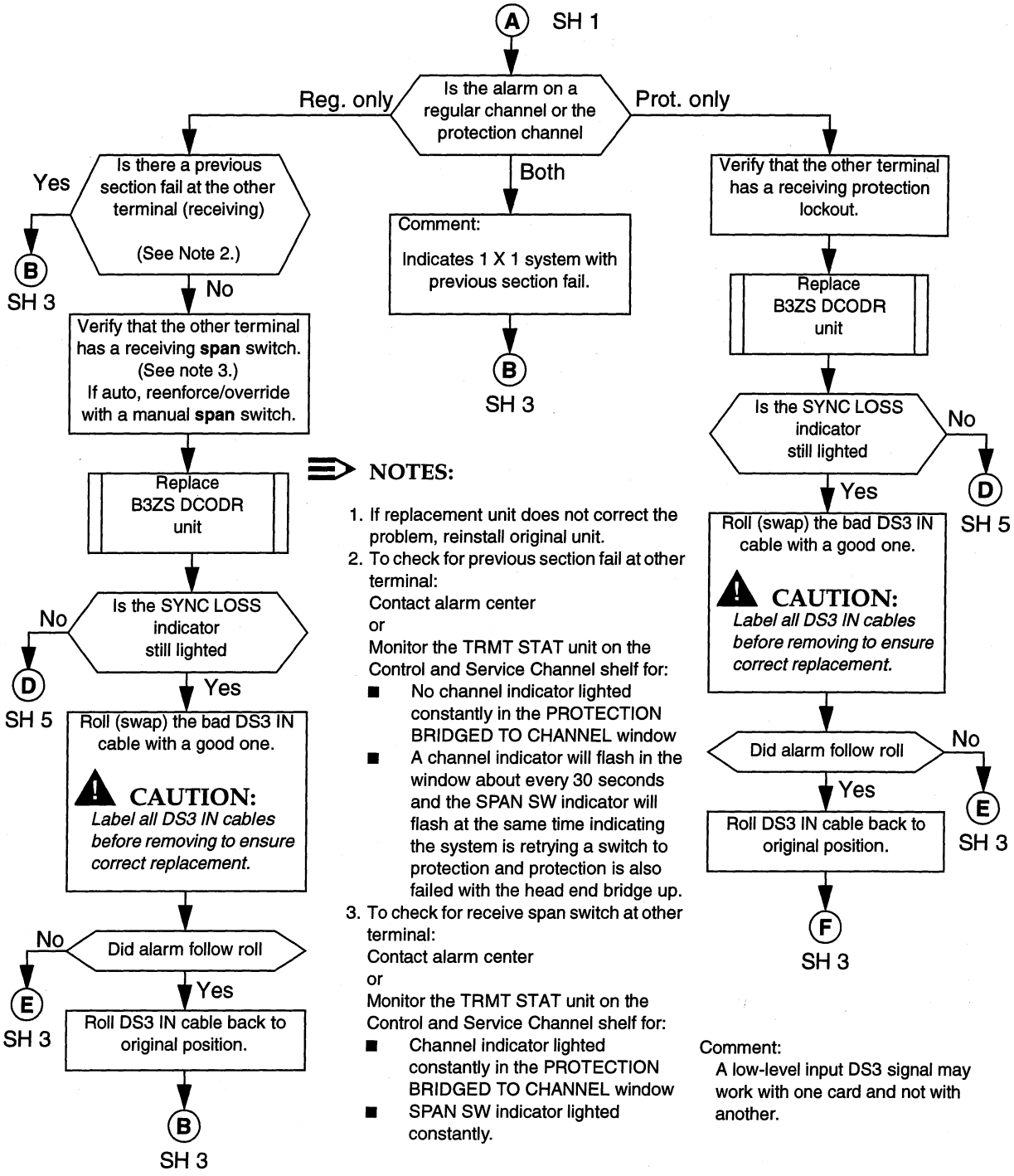
Caution 1: ***THIS IS A SERVICE AFFECTING REPAIR FOR THE TRANSMITTING DIRECTION OF TRANSMISSION. If repairing a regular channel, perform a Manual Line Switch (for that direction). If repairing the protection channel, perform a Protection Channel Lockout.***

Caution 2: ***THIS IS A SERVICE AFFECTING REPAIR FOR THE TRANSMITTING DIRECTION OF TRANSMISSION. If repairing a regular channel, perform a Manual Span Switch. If repairing the protection channel, perform a Protection Channel Lockout.***

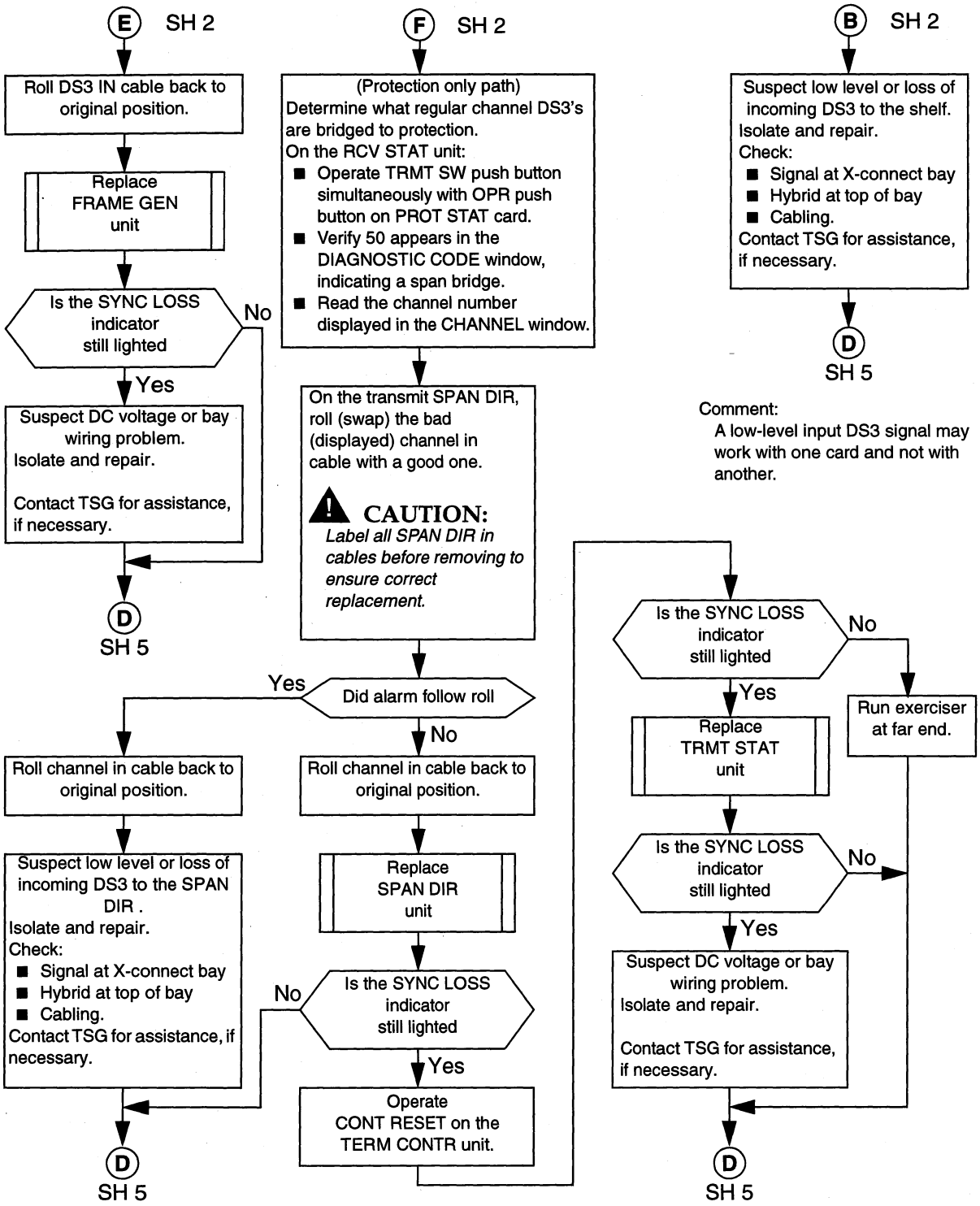
NOTE:
If replacement unit does not correct the problem, reinstall original unit.

Flowchart 6. Terminal Bay Digital Transmitter Alarm-Clearing (Sheet 1 of 5)

Prerequisites: 1. FAIL—DIG TRMT indicator lighted on the CHAN CONTR unit.
2. SYNC LOSS indicator lighted on a B3ZS DCODR unit.

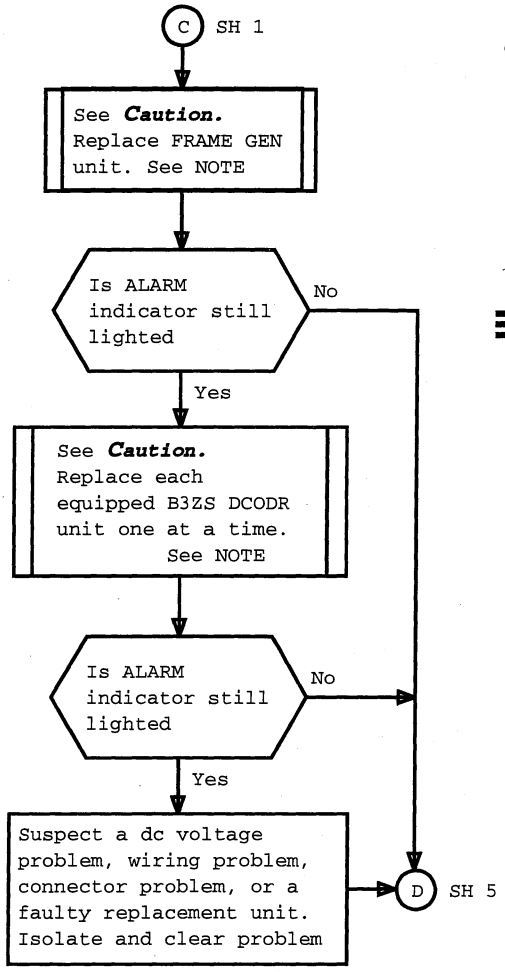


Flowchart 6. Terminal Bay Digital Transmitter Alarm-Clearing (Sheet 2 of 5)



Flowchart 6. Terminal Bay Digital Transmitter Alarm-Clearing (Sheet 3 of 5)

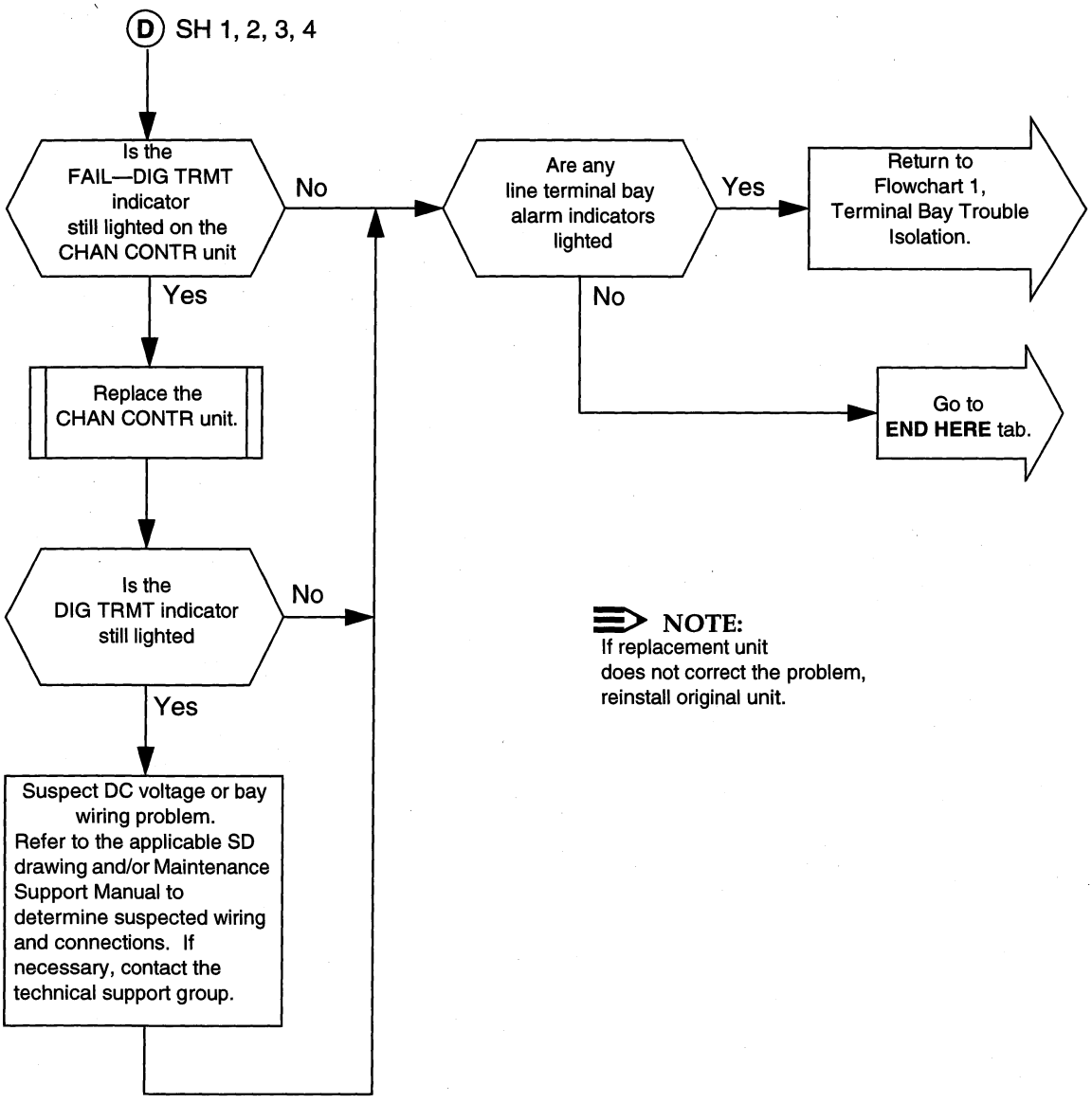
Prerequisite: Alarm indicator on FRAME GEN unit lighted.



Caution: ***THIS IS A SERVICE AFFECTING REPAIR FOR THE TRANSMITTING DIRECTION OF TRANSMISSION. If repairing a regular channel, perform a Manual Span Switch. If repairing the protection channel, perform a Protection Channel Lockout.***

NOTE:
If replacement unit does not correct the problem, reinstall original unit.

Flowchart 6. Terminal Bay Digital Transmitter Alarm-Clearing (Sheet 4 of 5)



Flowchart 6. Terminal Bay Digital Transmitter Alarm-Clearing (Sheet 5 of 5)

2.6 Excess (Term)

This section is used to clear the EXCESS — ERR RATE, MFR, and ACTY indicators on the CHAN CONTR unit. These indicators light when the associated hop performance thresholds have been exceeded.

These alarms are blocked at the General Telemetry Processor (GTP) and not allowed to go to Transport Maintenance and Administration System (TMAS). They are not needed with TMAS.

NOTE:
These alarms and indicators should be locally reset. Reset the alarm by pressing the ALM RST push button on the RCV STAT unit located on the control and service channel shelf.
Maintenance on a channel should be initiated by the continuous performance monitoring performed by TMAS. Fault locate is then used to isolate the problem to a specific hop.

The alarms are hop performance "history" indicators. The activity that caused these alarms may have stopped. Therefore, other than the EXCESS alarm indicators, there may not be any other activity on the digital terminal.

They occur if hop performance thresholds were exceeded for three 30-minute intervals in a 24-hour period.

- EXCESS ERR RATE

  BER exceeded $1X10^{-8}$ (EC) or $1X10^{-10}$ (Non-EC) in three 30-minute intervals of a 24-hour period.

- EXCESS MFR

  Two or more misframes occurred in three 30-minute intervals of a 24-hour period.

- EXCESS ACTY

  Three or more error bursts of $1X10^{-5}$ or greater occurred in three 30-minute intervals of a 24-hour period.

The alarm center can initiate a 15-minute performance test. The EXCESS alarm will automatically reset at the end of the performance test if no activity occurred during the 15-minute test.

2.7 Signaling Fail (Term)

Flowchart 7 is used to clear a SIG FAIL indicator on the TRMT STAT unit. The signaling fail alarm shows that protection switch signaling is not being received at this end of the switching section. Protection switching may not be possible until this condition is cleared.

The protection switch signaling is conveyed from one end of the switching section to the other as part of the internal system service channel. When no switches are operated, the service channel information is transmitted as part of the protection channel digital signal. If the protection channel is not available, the service channel will automatically switch to regular channel 1. In normal system operation, this switch will occur when the protection channel is locked out or if the protection channel has failed. The appropriate SRV CHAN SWITCHES indication will be lighted on the SC MULDEM unit to show which service channel direction has been switched.

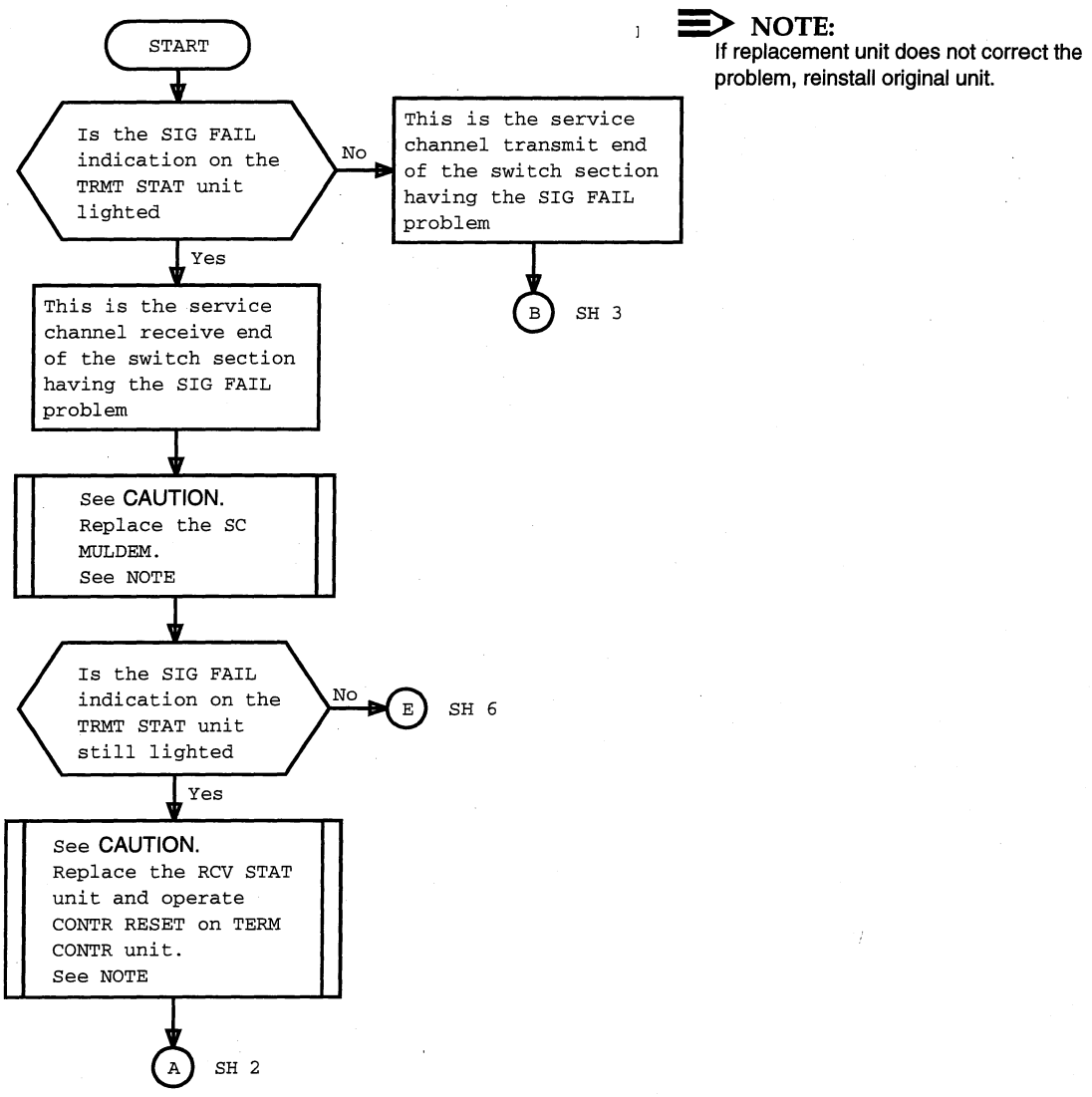
The SIG FAIL alarm condition will be reported when the service channel transmission path has failed or if a service channel unit has failed. Therefore, a signaling fail alarm should be analyzed and localized on a switching section basis. Transmission channel alarms should be cleared first. Contact the alarm center for instructions before starting this procedure.

This is an in-service procedure. When it has been determined that a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit.

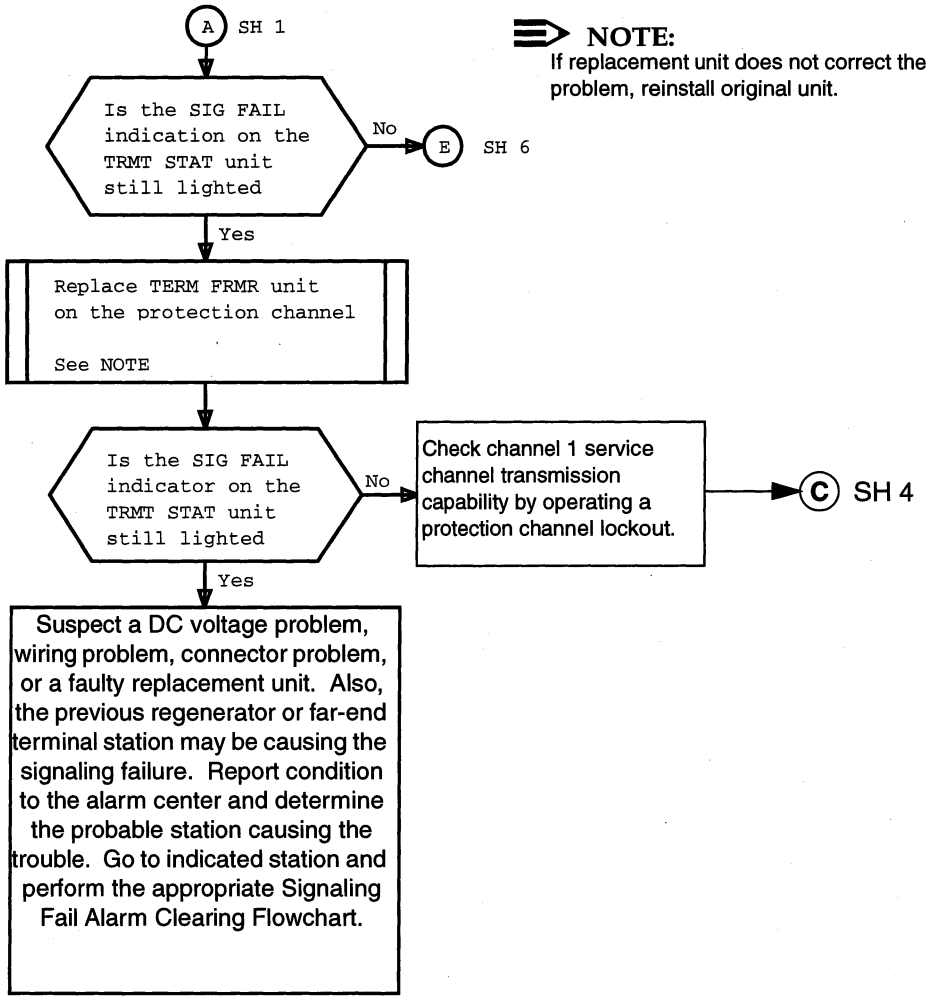
CAUTION:
To prevent electrostatic discharge (ESD) damage to a unit, ensure all ESD precautions are followed.

Prerequisites: 1. Clear all other alarms in the switch section before clearing signaling fail alarm troubles.
2. Signaling failure should be analyzed and localized on a switch section basis by interacting with the alarm center before starting this procedure.

CAUTION:
If replacing or resetting a Control and Service Channel plug-in unit, the "Plug-In Replacement" procedures must be carefully followed to avoid circuit pack damage.

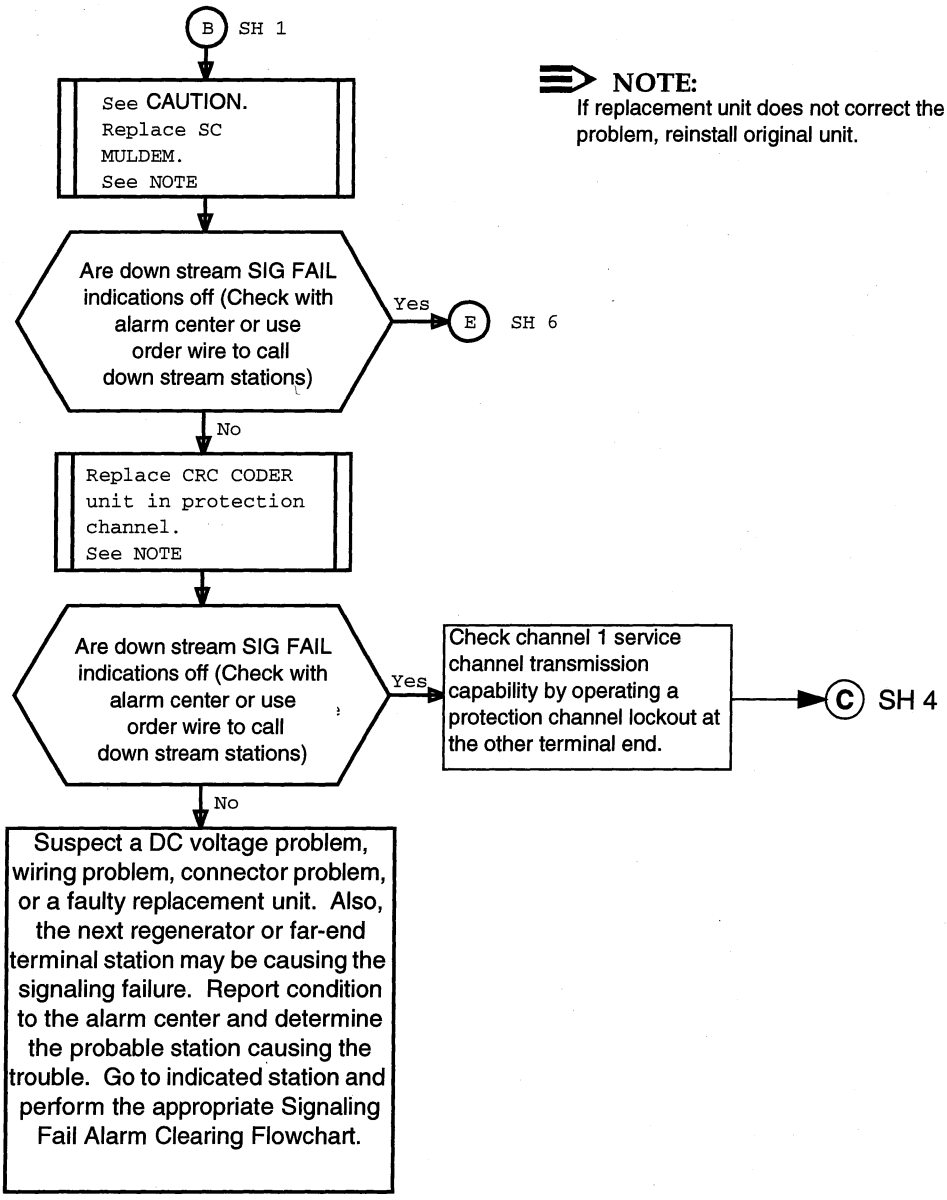


Flowchart 7. Terminal Bay Signaling Fail Alarm-Clearing (Sheet 1 of 6)

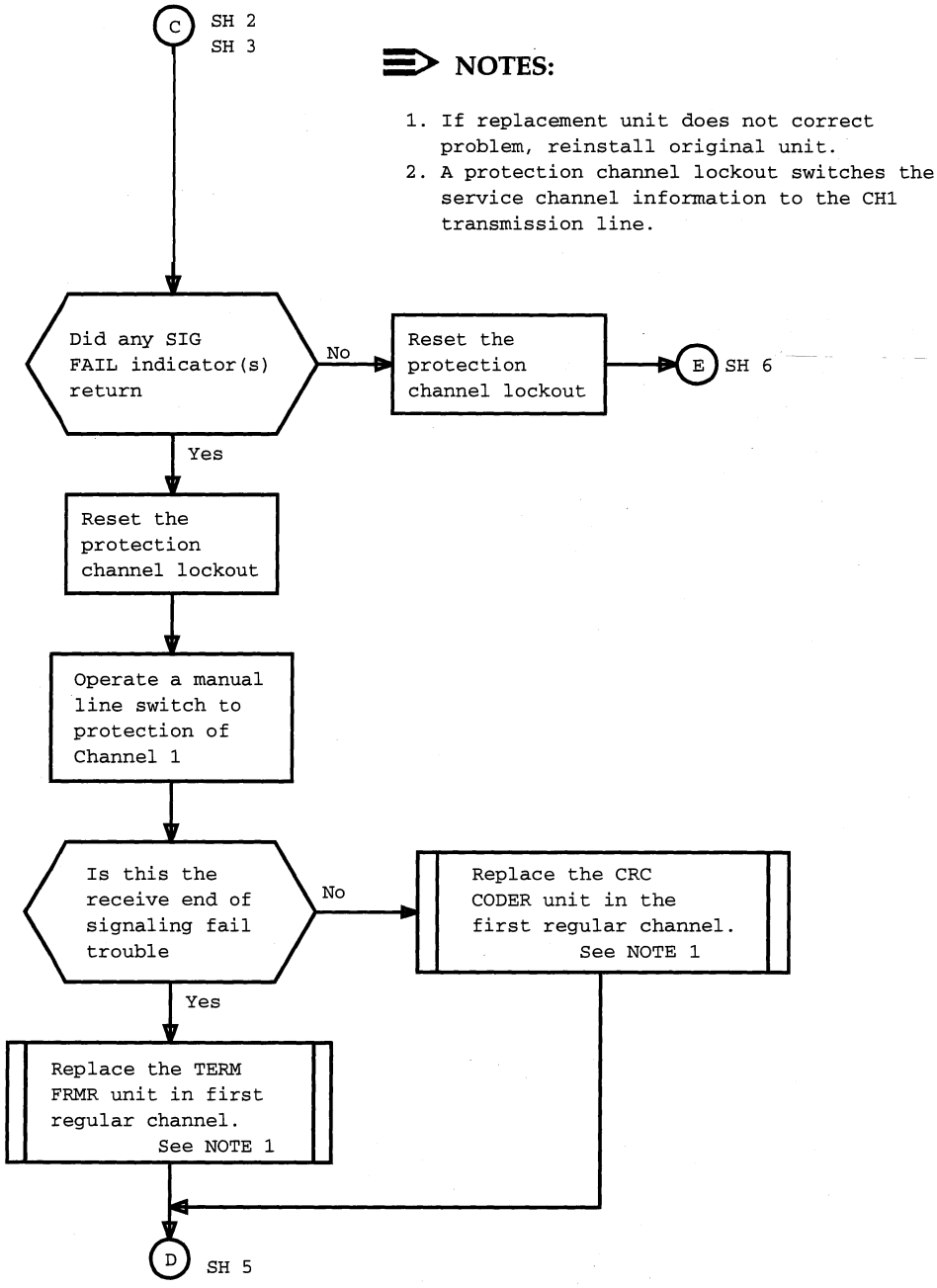


Flowchart 7. Terminal Bay Signaling Fail Alarm-Clearing (Sheet 2 of 6)

CAUTION:
If replacing or resetting a Control and Service Channel plug-in unit, the "Plug-In Replacement" procedures must be carefully followed to avoid circuit pack damage.



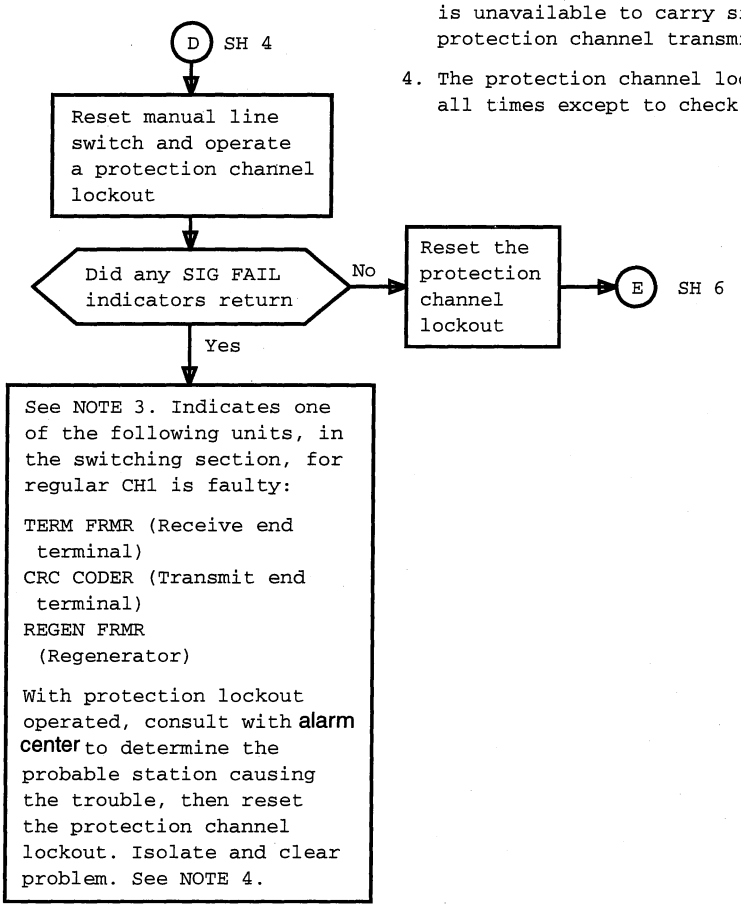
Flowchart 7. Terminal Bay Signaling Fail Alarm-Clearing (Sheet 3 of 6)



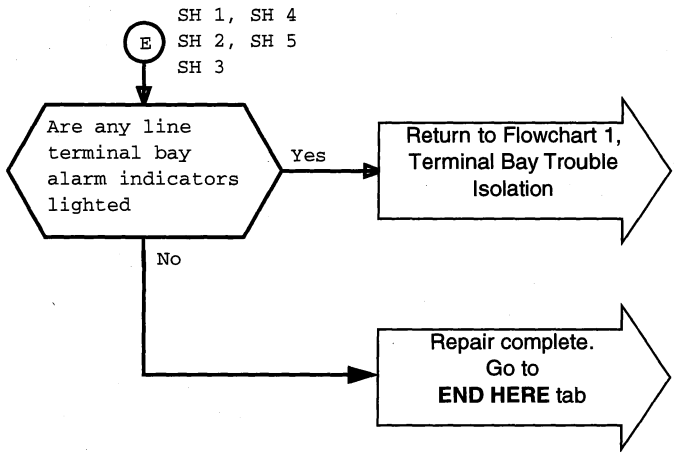
Flowchart 7. Terminal Bay Signaling Fail Alarm-Clearing (Sheet 4 of 6)

NOTES:

3. In this case, the standby service channel path (CH1) is unavailable to carry signaling information if a protection channel transmission failure should occur.
4. The protection channel lockout should be released at all times except to check if CH1 has been repaired.



Flowchart 7. Terminal Bay Signaling Fail Alarm-Clearing (Sheet 5 of 6)



Flowchart 7. Terminal Bay Signaling Fail Alarm-Clearing (Sheet 6 of 6)

3 Start—Regenerator Bay Equipment-Alarm Trouble Isolation

Flowchart 8, Regenerator Bay Trouble Isolation, is the starting point for isolating and clearing alarmed conditions in a regenerator bay. It should be entered when directed by the **START HERE** tab or when referenced from one of the detailed regenerator alarm-clearing flowcharts.

Any regenerator bay failure will light the COM ALARM indicator on the REGEN CONTR unit located in the Control and Service Channel Shelf of the initial regenerator bay. All transmission-related failures are centralized on the CHAN CONTR unit for each separate regenerator shelf. The resulting office alarm can be silenced by pressing the alarm cutoff (ACO) push button located on the right side of the regenerator frame (if equipped). However, DC power failures cannot be silenced by the ACO push button.

Power unit troubles can cause false and misleading alarms. Check the power unit voltages before clearing an alarm. If an output voltage does not meet the requirement, the trouble is either a faulty power unit or an abnormal current demand by one or more of the units supplied by the power unit.

Functional block diagrams of a regenerator equipped with analog transversal equalizers (ATE) and digital transversal equalizers (DTE) are shown in Figures 5 and 6, respectively. The diagrams show the transmission signal flow and the nominal input and output signal levels.

The detailed alarm-clearing flowcharts are not specifically designed to clear multiple failures or take into account faulty spare units. However, if the alarm indicators are functioning properly and the flowchart instructions and recommendations are followed, any multiple failure should be cleared.

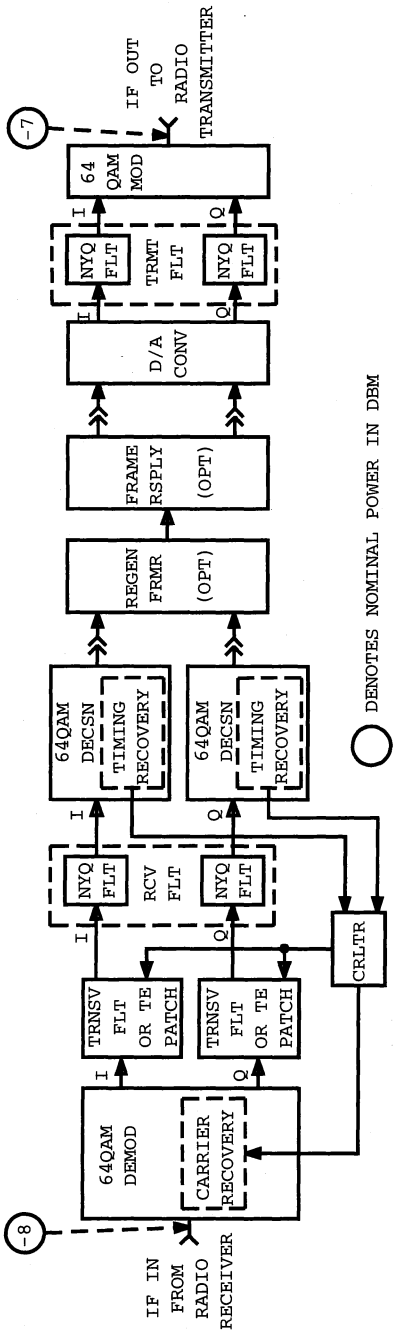


Figure 5. Regenerator (ATE) Block Diagram

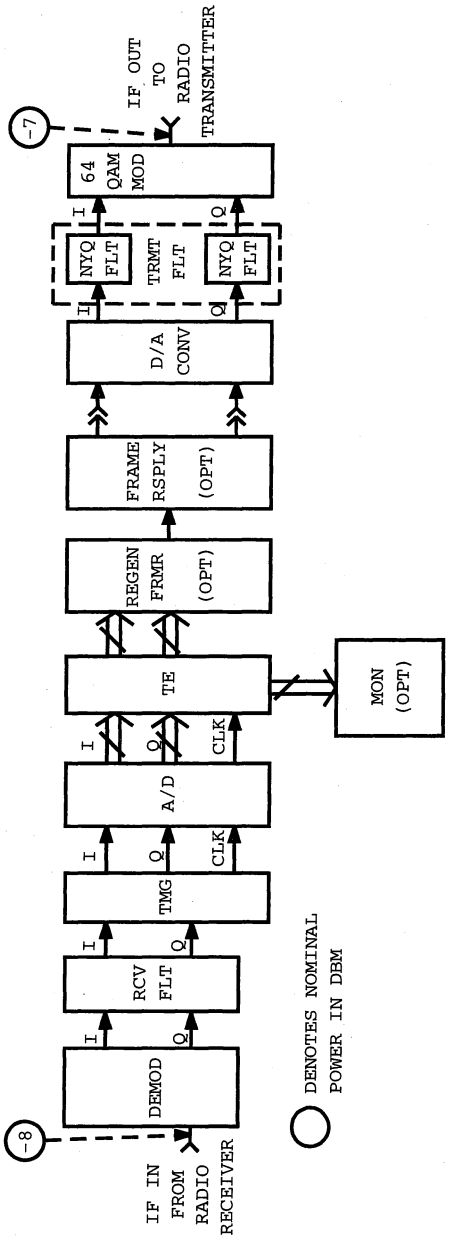
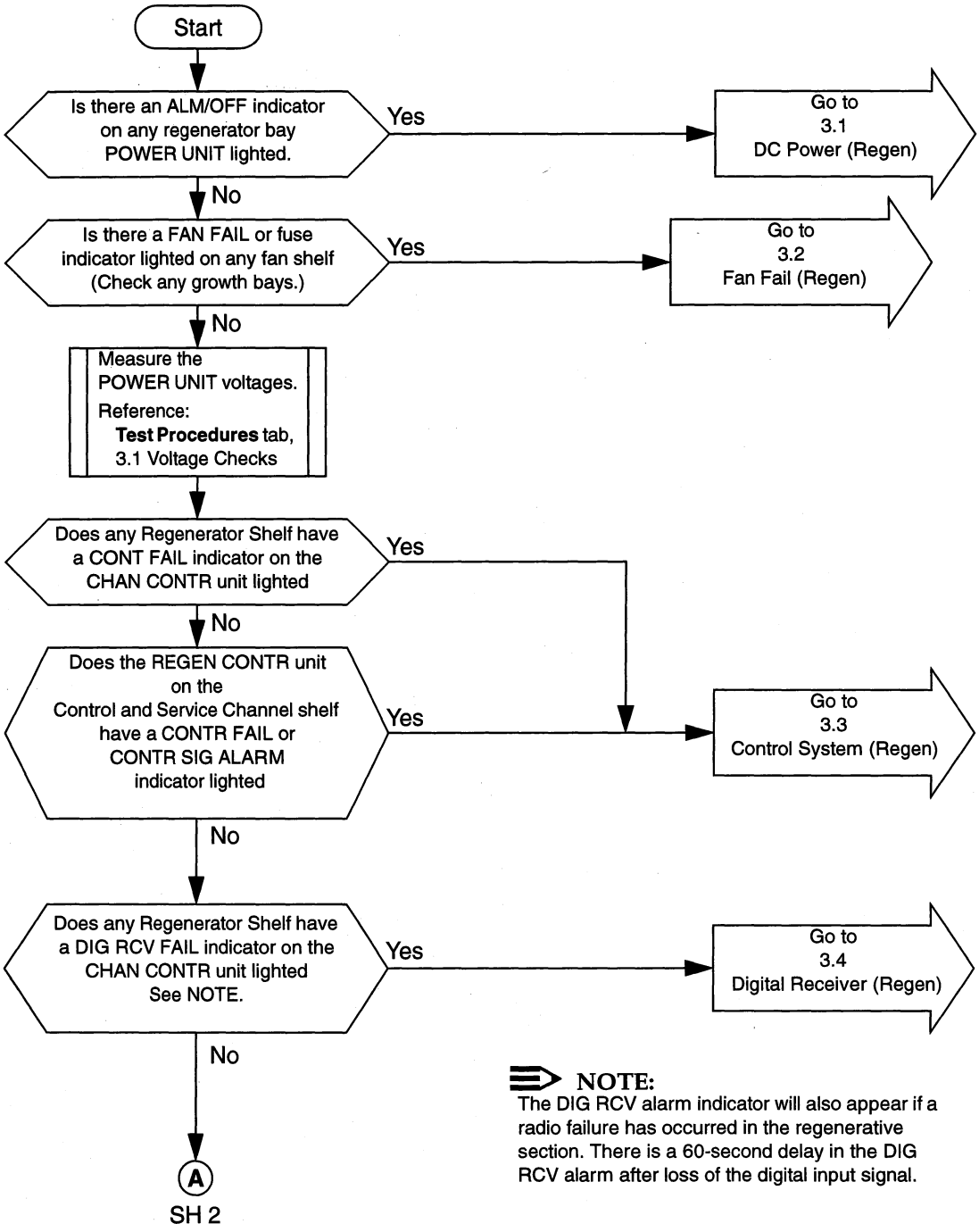
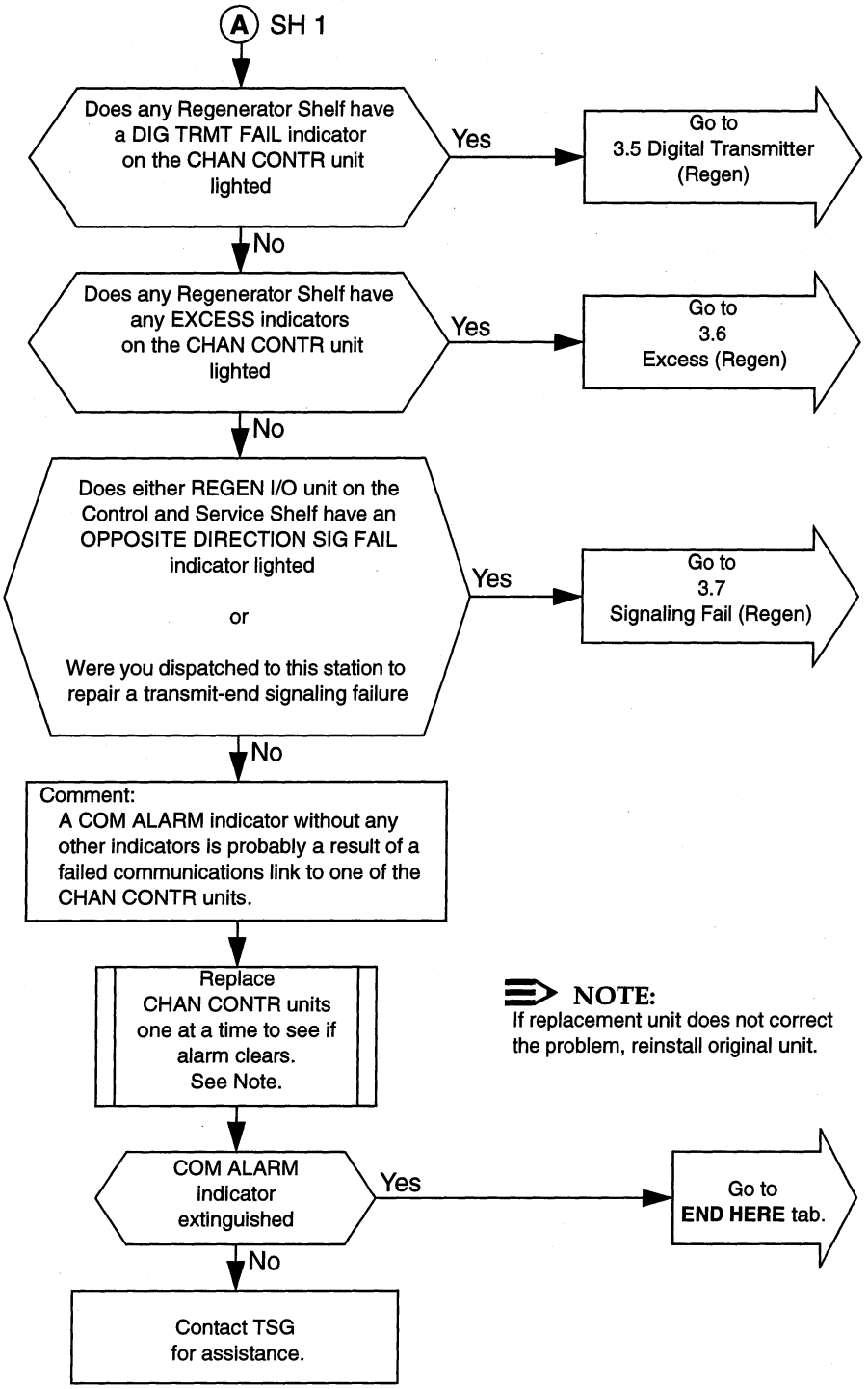


Figure 6. Regenerator (DTE) Block Diagram



Flowchart 8. Regenerator Bay Trouble Isolation (Sheet 1 of 2)



Flowchart 8. Regenerator Bay Trouble Isolation (Sheet 2 of 2)

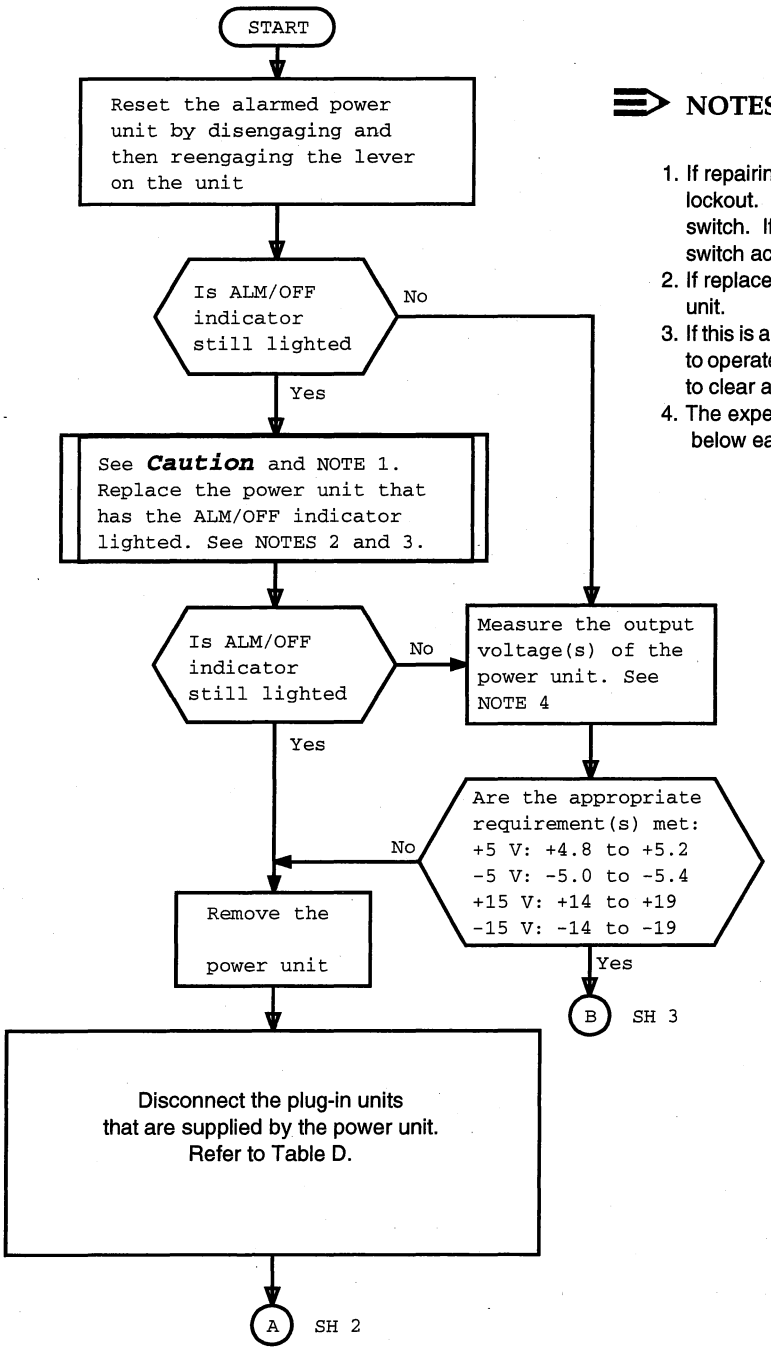
3.1 DC Power (Regen)

Flowchart 9 references local equipment indications and any necessary tests that will help determine the source of a power problem. When a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab for information to replace the failed unit. If tests are necessary, refer to **TEST PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a plug-in unit, ensure all ESD precautions are followed.

Before using this flowchart, verify that the –24 V DC or –48 V DC input is good. A power failure in the regenerator bay is indicated by a lighted ALM/OFF indicator on the failed power unit. The power unit is shut down when the ALM/OFF indicator is lighted. It will remain shut down until it is reset by pulling the latch lever down, without disengaging the plug-in unit, and pushing it up again. The power unit voltages should always be measured with the load connected; that is, plug-in units installed.

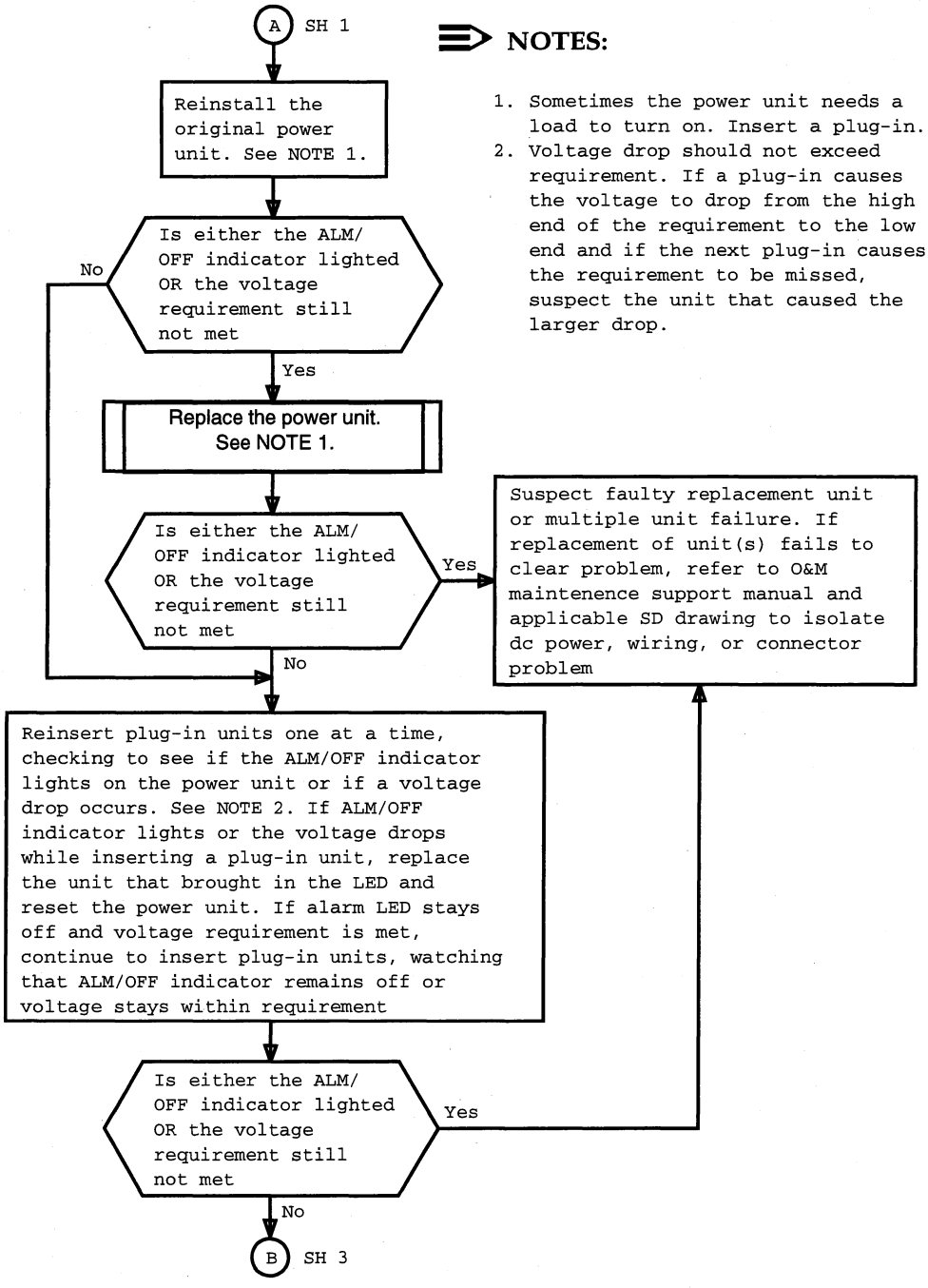
CAUTION:
This may be a service affecting procedure for one direction of transmission. Call the receiving terminal station or the alarm center to ensure service is properly protected. See NOTE 1.



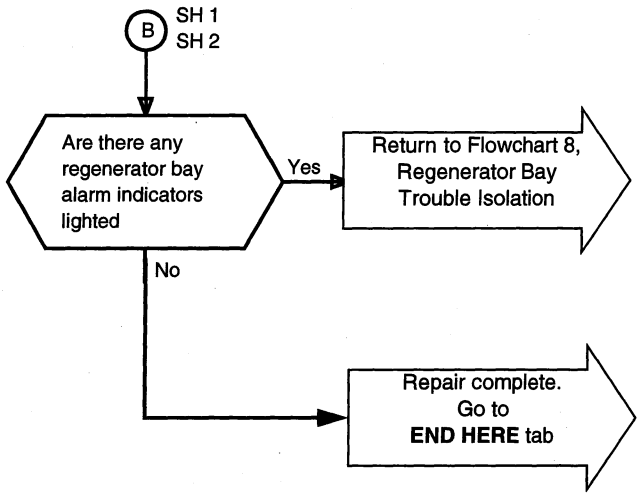
NOTES:

1. If repairing the protection channel, perform a protection channel lockout. If repairing a regular channel, perform a manual line switch. If repairing the Control and Service Channel shelf, no switch action is required.
2. If replacement unit does not correct problem, reinstall original unit.
3. If this is a Control and Service Channel shelf, it may be necessary to operate the ALM RST push button on the REGEN CONTR unit to clear any alarms.
4. The expected output voltage(s) is identified on the shelf label below each power unit.

Flowchart 9. Regenerator Bay DC Power Alarm-Clearing (Sheet 1 of 3)



Flowchart 9. Regenerator Bay DC Power Alarm-Clearing (Sheet 2 of 3)



Flowchart 9. Regenerator Bay DC Power Alarm-Clearing (Sheet 3 of 3)

Table D. DC Power Unit Applications—Regenerator

Power Unit		Unit Supplied		
Location	Voltage Supplied	Description	Analog or Digital TE Application	Shelf Position From Left
PS1 in Control and Service Channel Shelf	+5 V	All units in control and service channel shelf.	Both	1 - 16
PS1 in Regenerator Shelf for A - C Direction or PS2 in Regenerator Shelf for B - D Direction	–15 V	D/A CONV	Both	11
	±15 V	64QAM MOD		13
	+5 V	CRLTR	Analog only	4
		64QAM DECSN		6, 7
		DEMOD	Digital only	2
		TMG		4
		A/D		5
		TE		6
		MON		7
		REGEN FRMR	Both	8
		FRAME RSPLY		10
		D/A CONV		11
		CHAN CONTR		14
PS3 in Regenerator Shelf for A - C Direction or PS4 in Regenerator Shelf for B - D Direction	±15 V	64QAM DEMOD	Analog only	1
		TRNSV FLT		2, 3
		64QAM DECSN		6, 7
		TMG	Digital only	4
	+15 V	DEMOD		2
	–5 V	CRLTR	Analog only	4
		64QAM DECSN		6, 7
		DEMOD	Digital only	2
		TMG		4
		A/D		5
		TE		6
		MON		7
		REGEN FRMR	Both	8
		FRAME RSPLY		10
		D/A CONV		11

3.2 Fan Fail (Regen)

Flowchart 10 is used to clear a FAN FAIL alarm indicator on the fan shelf. When a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit.

This procedure is not service-affecting. No service protection activity is required.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a unit, ensure all ESD precautions are followed.

Each of the three fans and the fan control printed wiring board (PWB) are protected by input fuses as shown in Figure 7. The fuses should always be checked before replacing any unit in the fan shelf.

An inoperative fan is indicated by the FAN 1, 2, or 3 FAIL indicator on the front of the fan shelf. If only one FAN FAIL indicator is lighted, assume that the associated fan or input fuse to the fan is defective and should be replaced. If fan replacement does not clear the alarm, if more than one FAN FAIL indicator is lighted, or if no FAN FAIL indicators are lighted, assume that a fan control PWB or its associated CONTROL input fuse is defective.

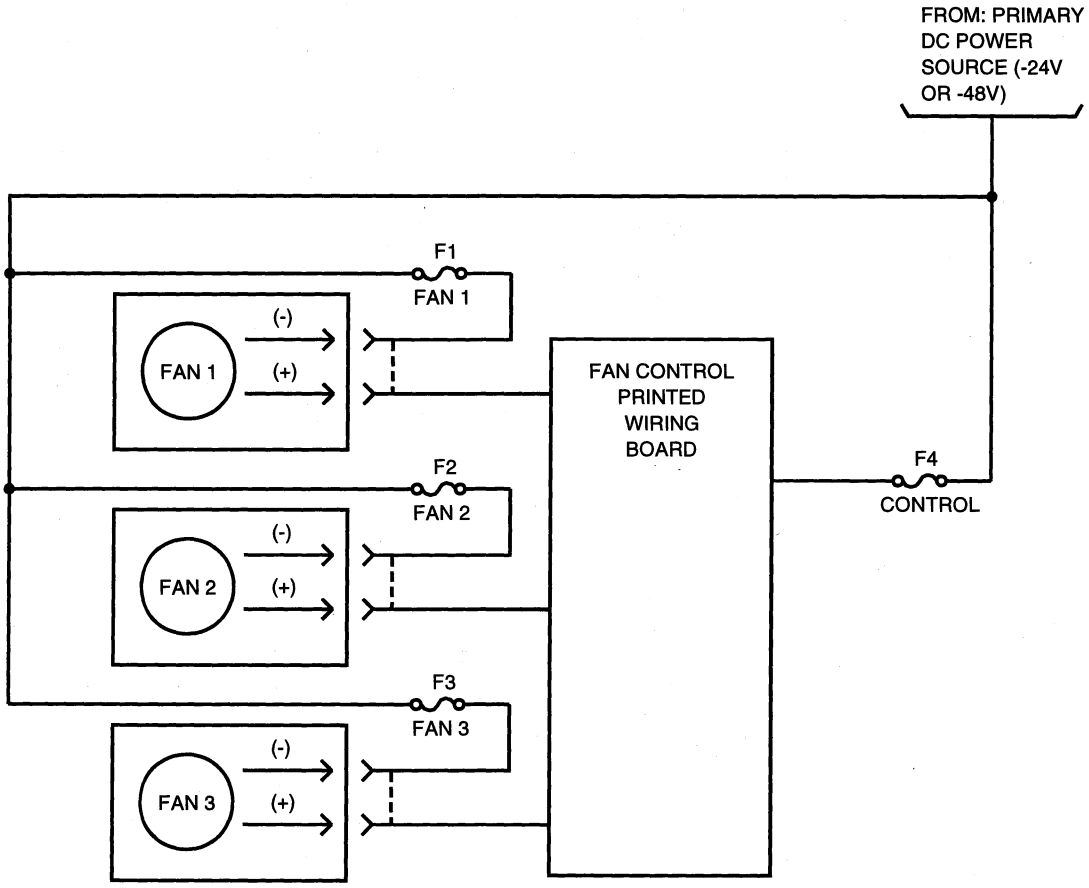
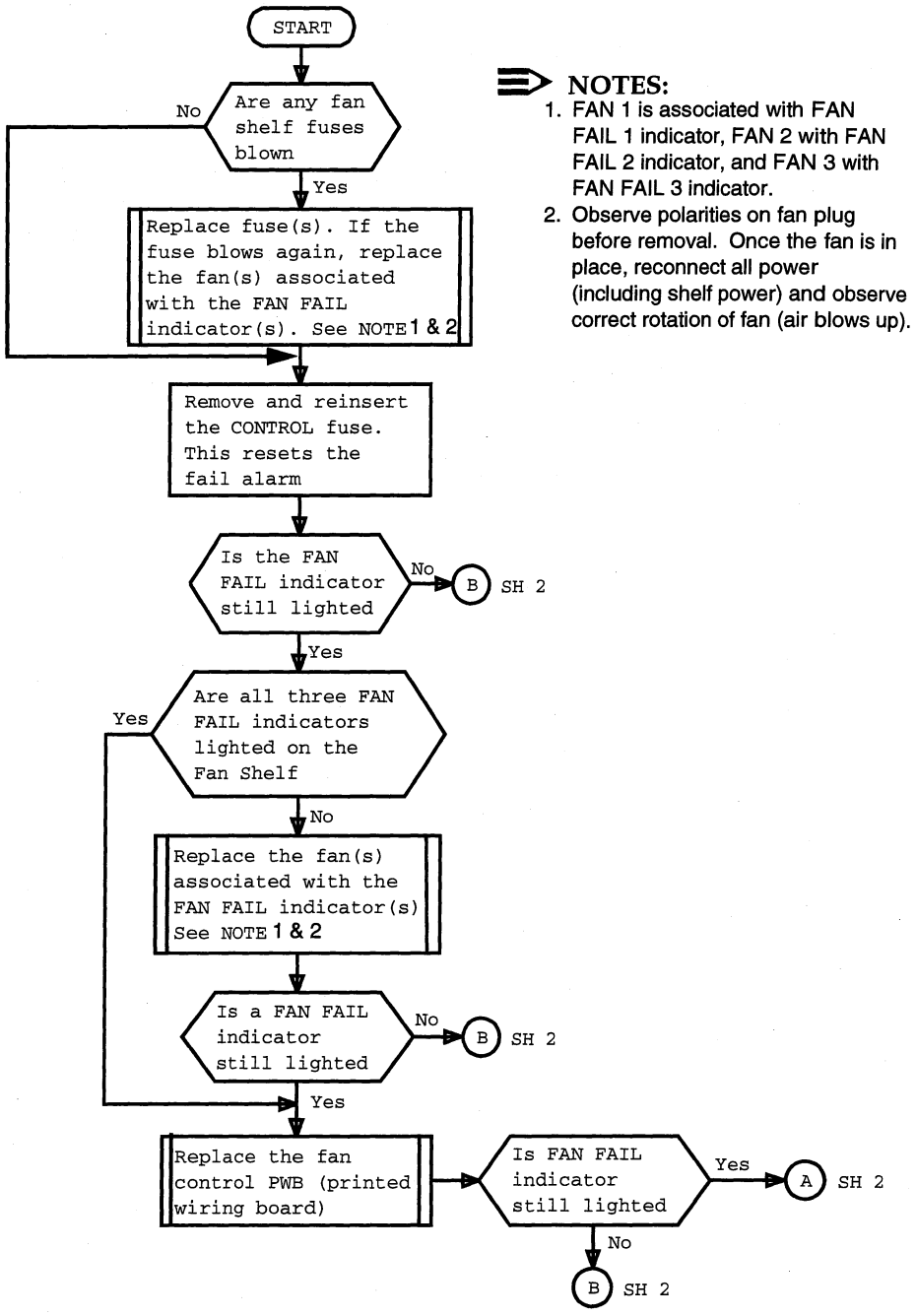
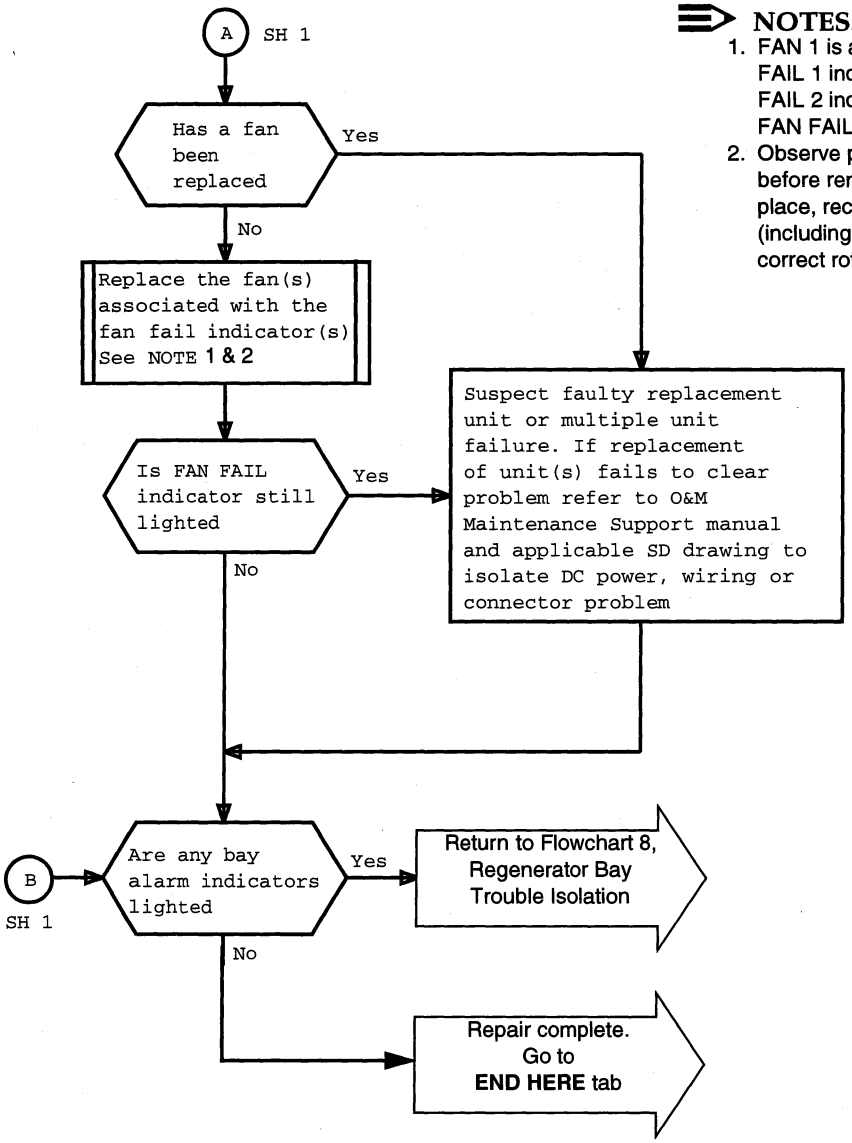


Figure 7. Bay Fan Fusing



Flowchart 10. Bay Fan Fail Alarm-Clearing (Sheet 1 of 2)



NOTES:

1. FAN 1 is associated with FAN FAIL 1 indicator, FAN 2 with FAN FAIL 2 indicator, and FAN 3 with FAN FAIL 3 indicator.
2. Observe polarities on fan plug before removal. Once the fan is in place, reconnect all power (including shelf power) and observe correct rotation of fan (air blows up).

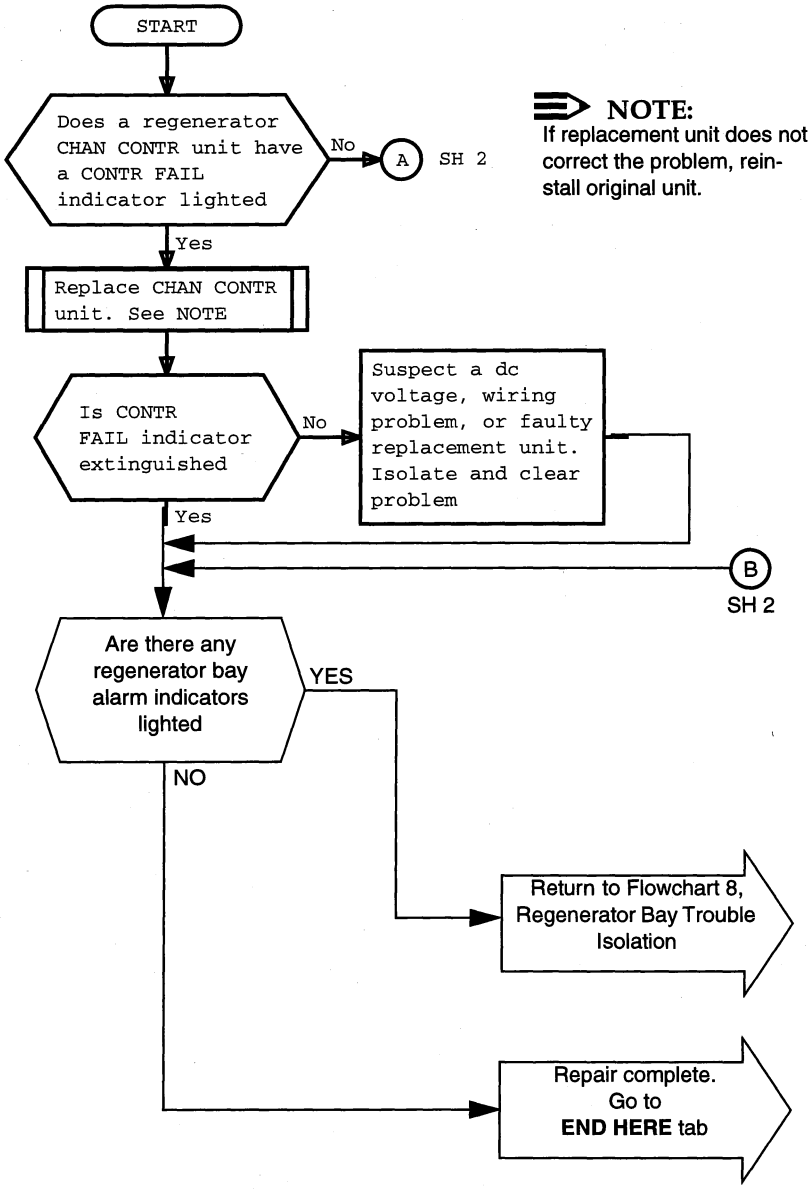
Flowchart 10. Bay Fan Fail Alarm-Clearing (Sheet 2 of 2)

3.3 Control System (Regen)

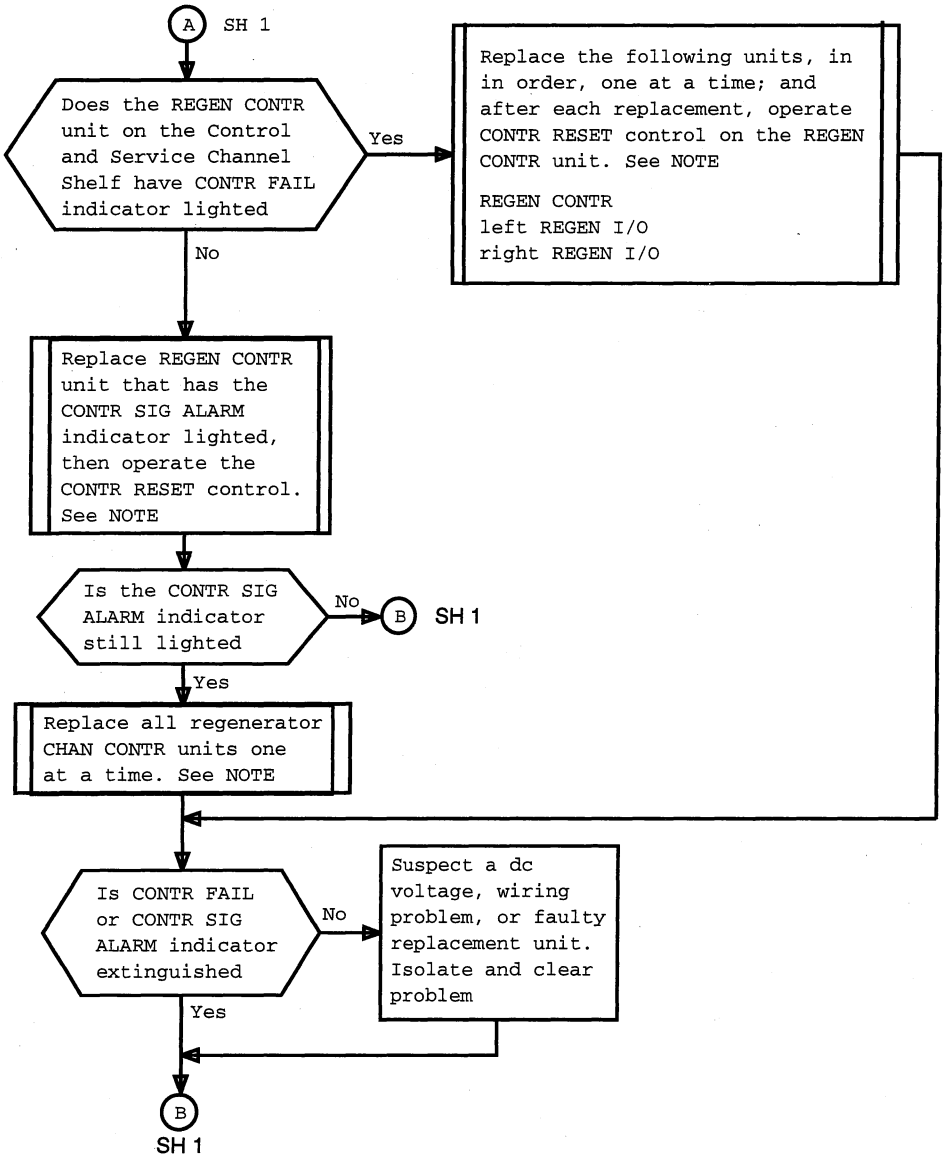
Flowchart 11 is used to clear any CONTR FAIL indicator and the CONTR SIG ALARM indicator. When a unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit.

This procedure does not affect service; therefore, no service protection activity is required.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a unit, ensure all ESD precautions are followed.



Flowchart 11. Regenerator Bay Control System Alarm-Clearing (Sheet 1 of 2)



NOTE:
If replacement unit does not correct the problem, reinstall original unit.

Flowchart 11. Regenerator Bay Control System Alarm-Clearing (Sheet 2 of 2)

3.4 Digital Receiver (Regen)

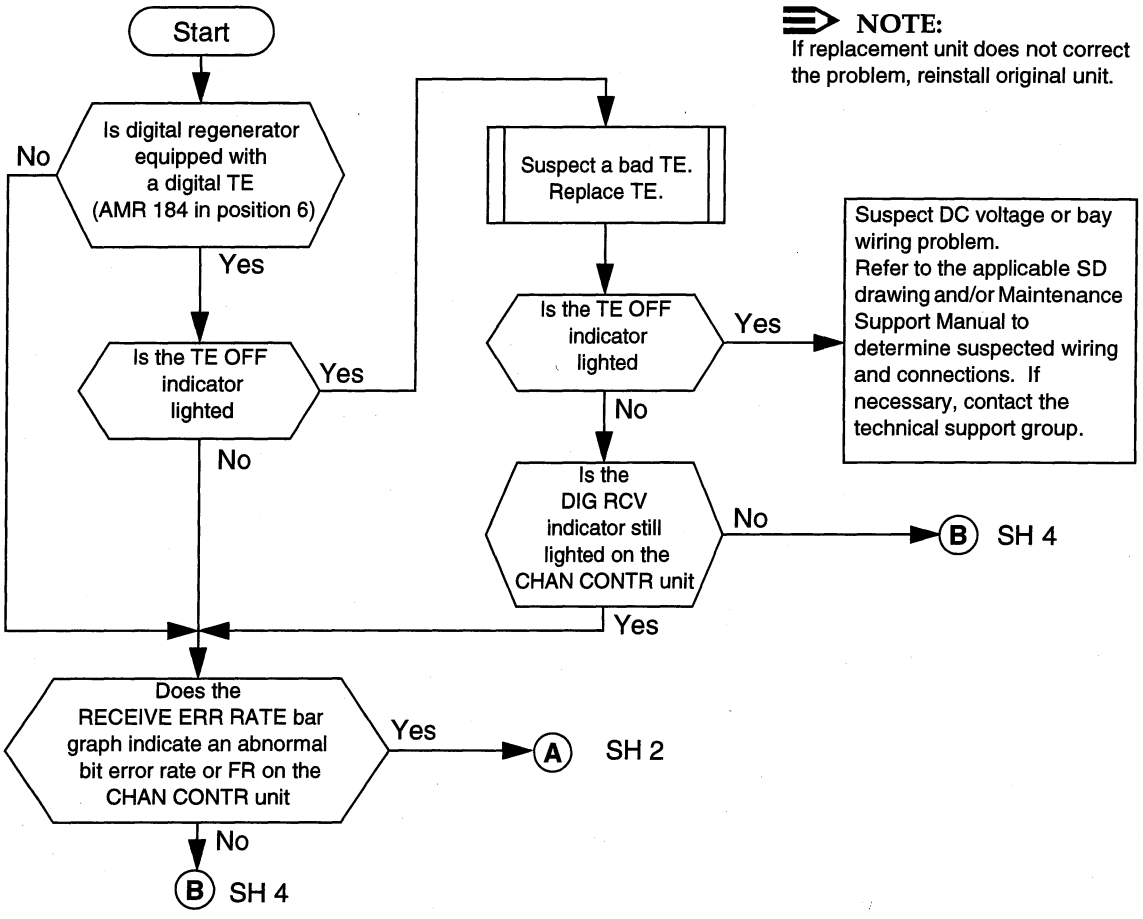
Flowchart 12 is used to clear the DIG RCV FAIL alarm indicator on the CHAN CONTR unit. If this alarm indicator is ON, the associated regenerator has a failure in its receiving circuits or something is wrong with the incoming signal. Local indications and any necessary tests are referenced to isolate the problem.

When regenerator bay tests are necessary, refer to the **TEST PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab. If it is determined that a regenerator receiver unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit.

For incoming signal problems you will be directed to clear the radio receiver before being sent to the transmit end of the radio hop. If radio receiver tests are necessary, refer to the **TEST PROCEDURES** tab under the **RADIO RECEIVER** tab. Refer to the **REPLACEMENT PROCEDURES** tab under the **RADIO RECEIVER** tab to replace any unit.

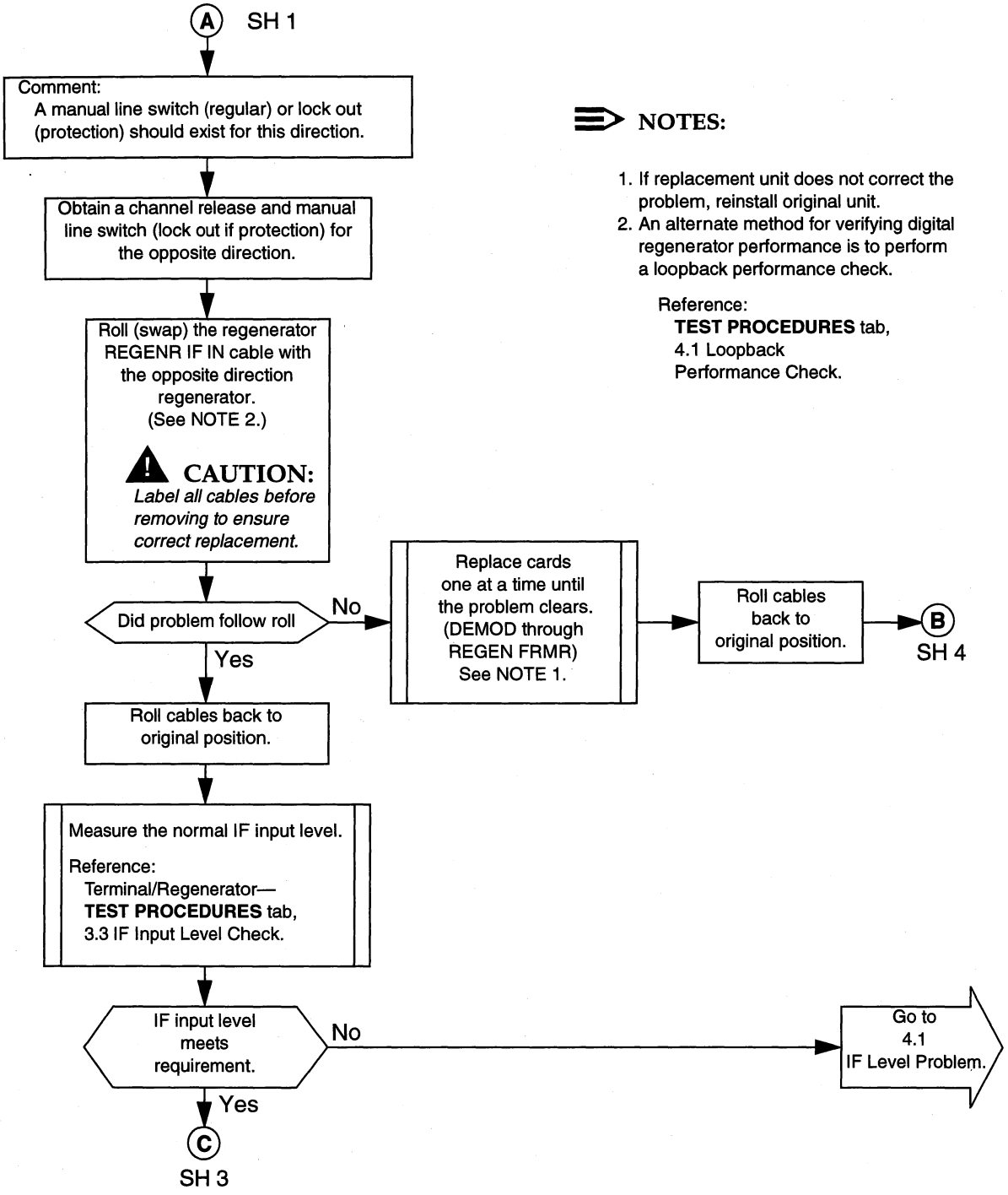
CAUTION:
To prevent electrostatic discharge (ESD) damage to a plug-in unit, ensure all ESD precautions are followed.

Prerequisites: 1. FAIL—DIG RCV indicator lighted on the CHAN CONTR unit.
2. If digital TE, the TE NORMAL OFF push-button switch is set to NORMAL.
3. Service is protected with a manual line switch (lock out if protection channel).
4. Fault locate and/or alarm indications isolate problem to this regenerator receiver.



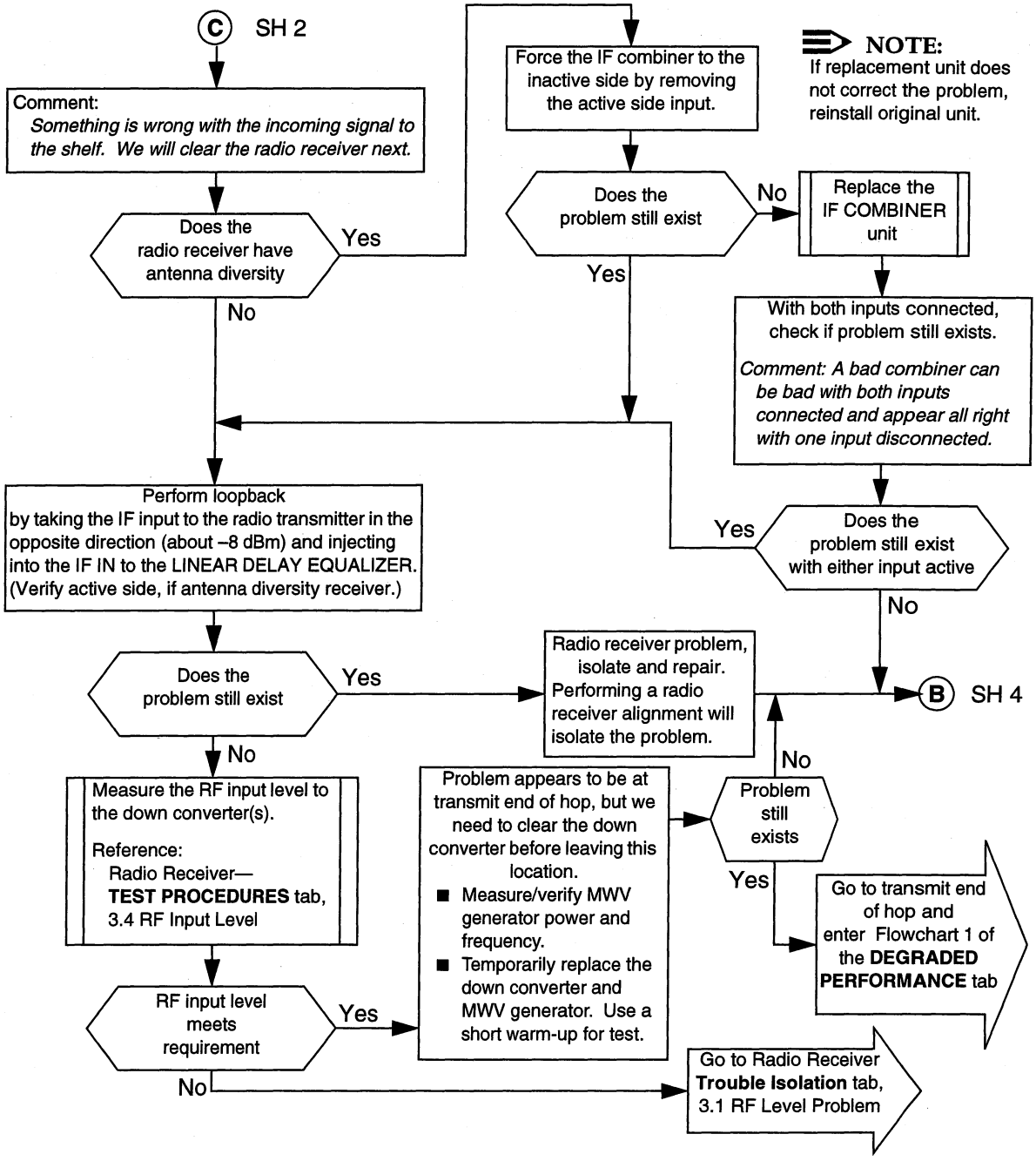
Flowchart 12. Regenerator Bay Digital Receiver Alarm-Clearing (Sheet 1 of 4)

Prerequisite: Bar graph on CHAN CONTR unit indicates an abnormal BER or FR.

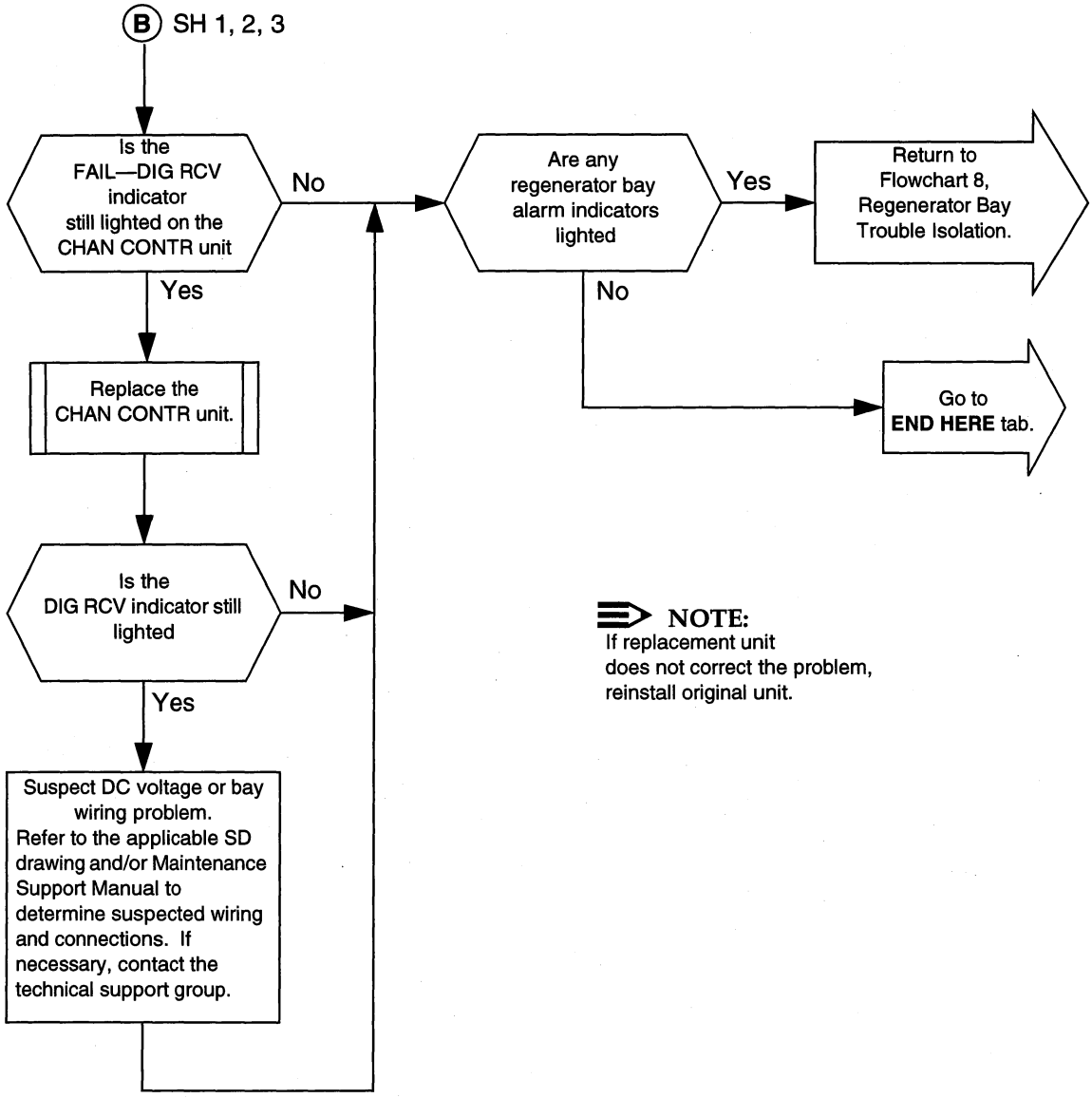


Flowchart 12. Regenerator Bay Digital Receiver Alarm-Clearing (Sheet 2 of 4)

Prerequisites: 1. Bar graph on CHAN CONTR unit indicates an abnormal BER or FR.
2. Service is protected with a manual line switch (lock out if protection channel) in both directions.
3. The IF input level to the digital shelf meets requirements.
4. The digital regenerator is good per previous test.



Flowchart 12. Regenerator Bay Digital Receiver Alarm-Clearing (Sheet 3 of 4)



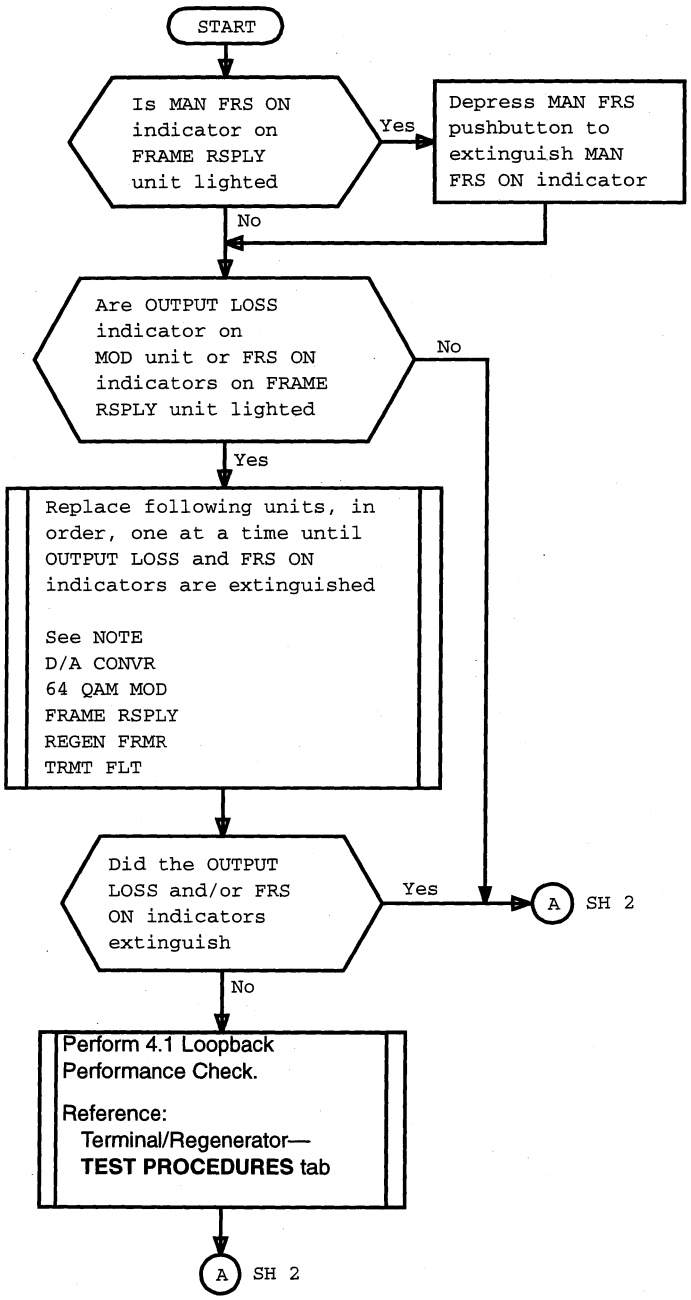
Flowchart 12. Regenerator Bay Digital Receiver Alarm-Clearing (Sheet 4 of 4)

3.5 Digital Transmitter (Regen)

Flowchart 13 is used to clear the DIG TRMT FAIL alarm indicator on the CHAN CONTR unit. If this alarm indicator is ON, the associated regenerator has a failure in its transmitting circuits. Local indications and any necessary tests are referenced to determine the failed unit. When it has been determined which unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit. If tests are necessary, refer to the **TEST PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab.

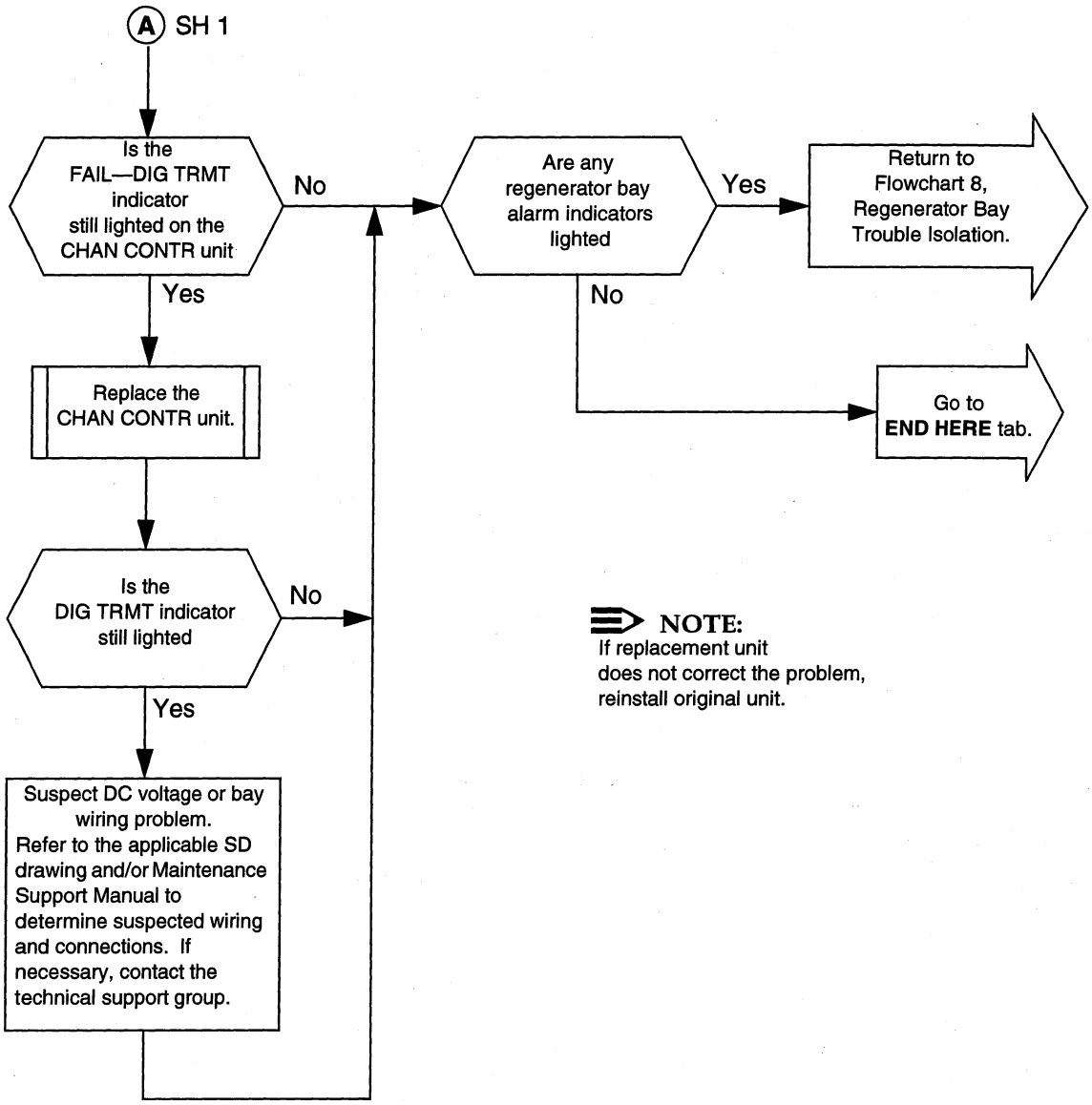
CAUTION:
To prevent electrostatic discharge (ESD) damage to a plug-in unit, ensure all ESD precautions are followed.

Prerequisite: Service is protected with a manual line switch (lock out if protection channel) in the direction of transmission.



NOTE:
If replacement unit does not correct the problem, reinstall original unit.

Flowchart 13. Regenerator Bay Digital Transmitter Alarm-Clearing (Sheet 1 of 2)



Flowchart 13. Regenerator Bay Digital Transmitter Alarm-Clearing (Sheet 2 of 2)

3.6 Excess (Regen)

This section is used to clear the EXCESS — ERR RATE, MFR, and ACTY indicators on the CHAN CONTR unit. These indicators light when the associated hop performance thresholds have been exceeded.

These alarms are blocked at the GTP and not allowed to go to TMAS. They are not needed with TMAS.

NOTE:
These alarms and indicators should be locally reset. Reset the alarm by pressing the ALM RST push button on the REGEN CONTR unit located on the control and service channel shelf.
Maintenance on a channel should be initiated by the continuous performance monitoring performed by TMAS. Fault locate is then used to isolate the problem to a specific hop.

The alarms are hop performance "history" indicators. The activity that caused these alarms may have stopped. Therefore, other than the EXCESS alarm indicators, there may not be any other activity on the digital terminal.

They occur if hop performance thresholds were exceeded for three 30-minute intervals in a 24-hour period.

- EXCESS ERR RATE

  BER exceeded $1X10^{-8}$ (EC) or $1X10^{-10}$ (Non-EC) in three 30-minute intervals of a 24-hour period.

- EXCESS MFR

  Two or more misframes occurred in three 30-minute intervals of a 24-hour period.

- EXCESS ACTY

  Three or more error bursts of $1X10^{-5}$ or greater occurred in three 30-minute intervals of a 24-hour period.

The alarm center can initiate a 15-minute performance test. The EXCESS alarm will automatically reset at the end of the performance test if no activity occurred during the 15-minute test.

3.7 Signaling Fail (Regen)

Flowchart 14 is used to clear an OPPOSITE DIRECTION SIG FAIL indicator on a REGEN I/O UNIT. Local indications are referenced to determine the failed unit. When it has been determined which unit has failed, refer to the **REPLACEMENT PROCEDURES** tab under the **TERMINAL / REGENERATOR** tab to replace the unit.

This is an in-service procedure. Protection switching may not be possible when an alarm is present.

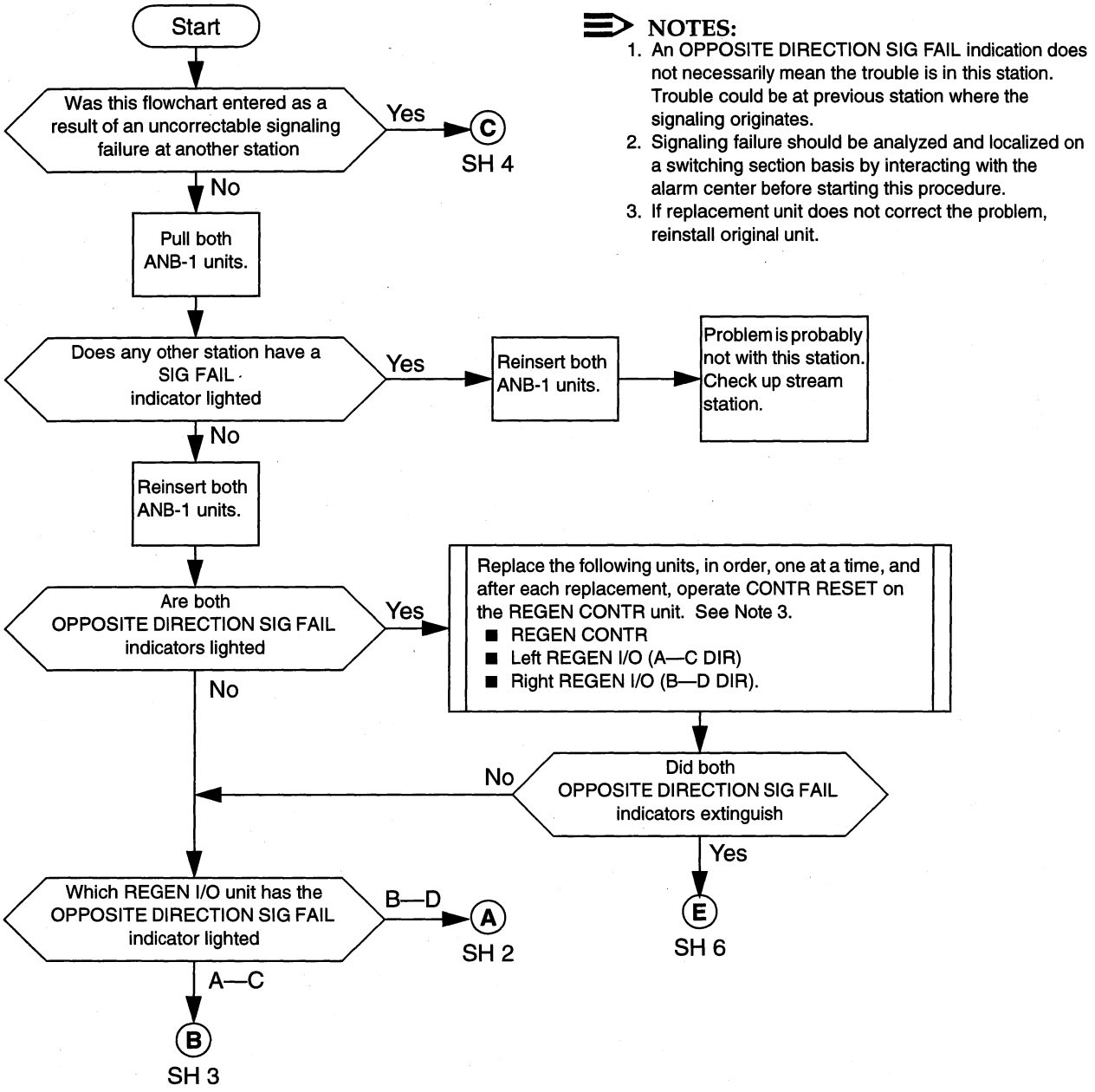
The protection switch signaling is conveyed from one end of the switching section to the other as part of the internal system service channel. When no switches are operated, the service channel information is transmitted as part of the protection channel digital signal. If the protection channel is not available, the service channel will automatically switch to regular channel 1. In normal system operation, this switch will occur when the protection channel is locked out or if the protection channel has failed. The appropriate SRV CHAN SWITCHES indication will be lighted on the SC MULDEM unit to show which service channel direction has been switched. The SIG FAIL alarm condition will be reported when the service channel transmission path is failed or if a service channel unit is failed.

The service channel protection switching is controlled by the receiving end of a regenerative section. This means that reverse signaling is used to switch the transmitting end after the receiving end executes a service channel switch. Therefore, when the A-C direction (leftmost) REG I/O unit has an OPPOSITE DIRECTION SIG FAIL indicator lighted, the problem is most likely in the B-D direction plug-in units. When the B-D direction (rightmost) REG I/O unit has an OPPOSITE DIRECTION SIG FAIL indicator lighted, the problem is most likely in the A-C direction plug-in units.

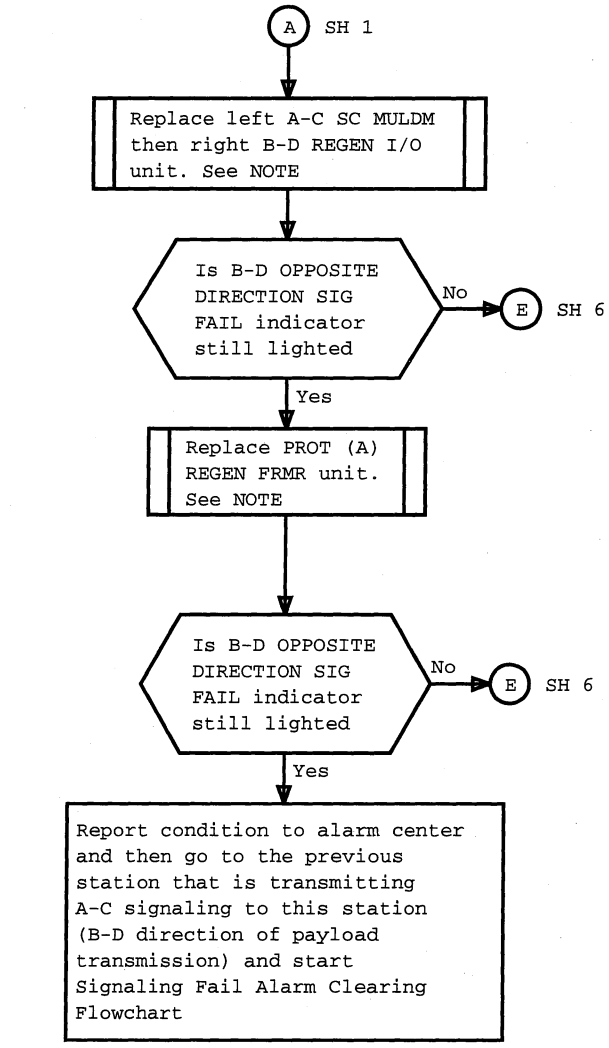
This flowchart references all plug-in units in a transmitting and/or receiving station that could cause an OPPOSITE DIRECTION SIG FAIL indicator to light. Therefore, the signaling failure should be analyzed and localized on a switching section basis by interacting with the alarm center for instructions before starting this procedure.

CAUTION:
To prevent electrostatic discharge (ESD) damage to a unit, ensure all ESD precautions are followed.

Prerequisites: 1. Clear all other alarms in the switching section before clearing signaling fail alarm troubles.
2. Clear all transmission alarms at this station before proceeding.
3. Read Notes 1 and 2.

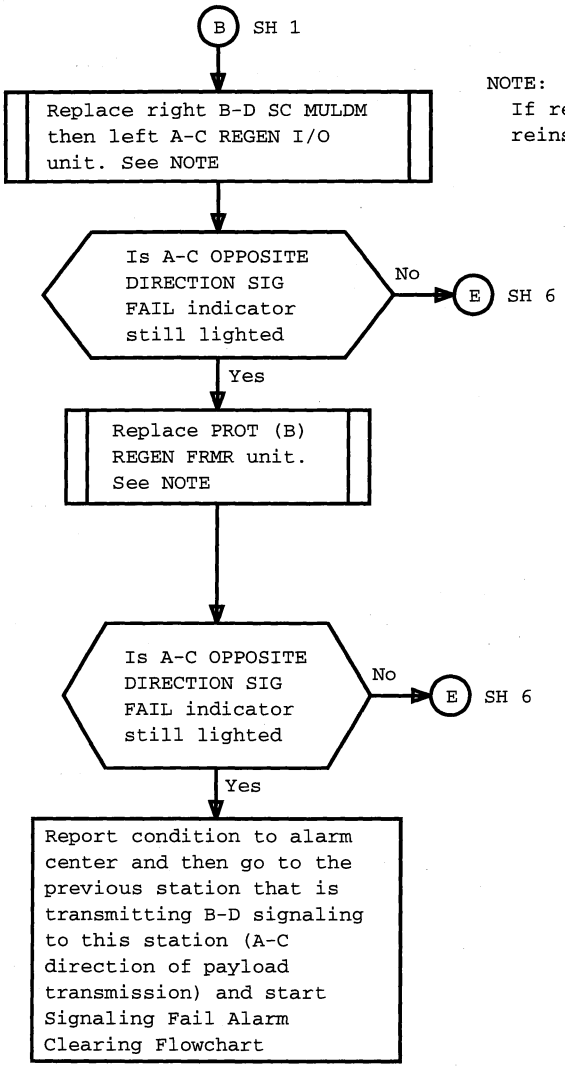


Flowchart 14. Regenerator Bay Signaling Fail Alarm-Clearing (Sheet 1 of 6)

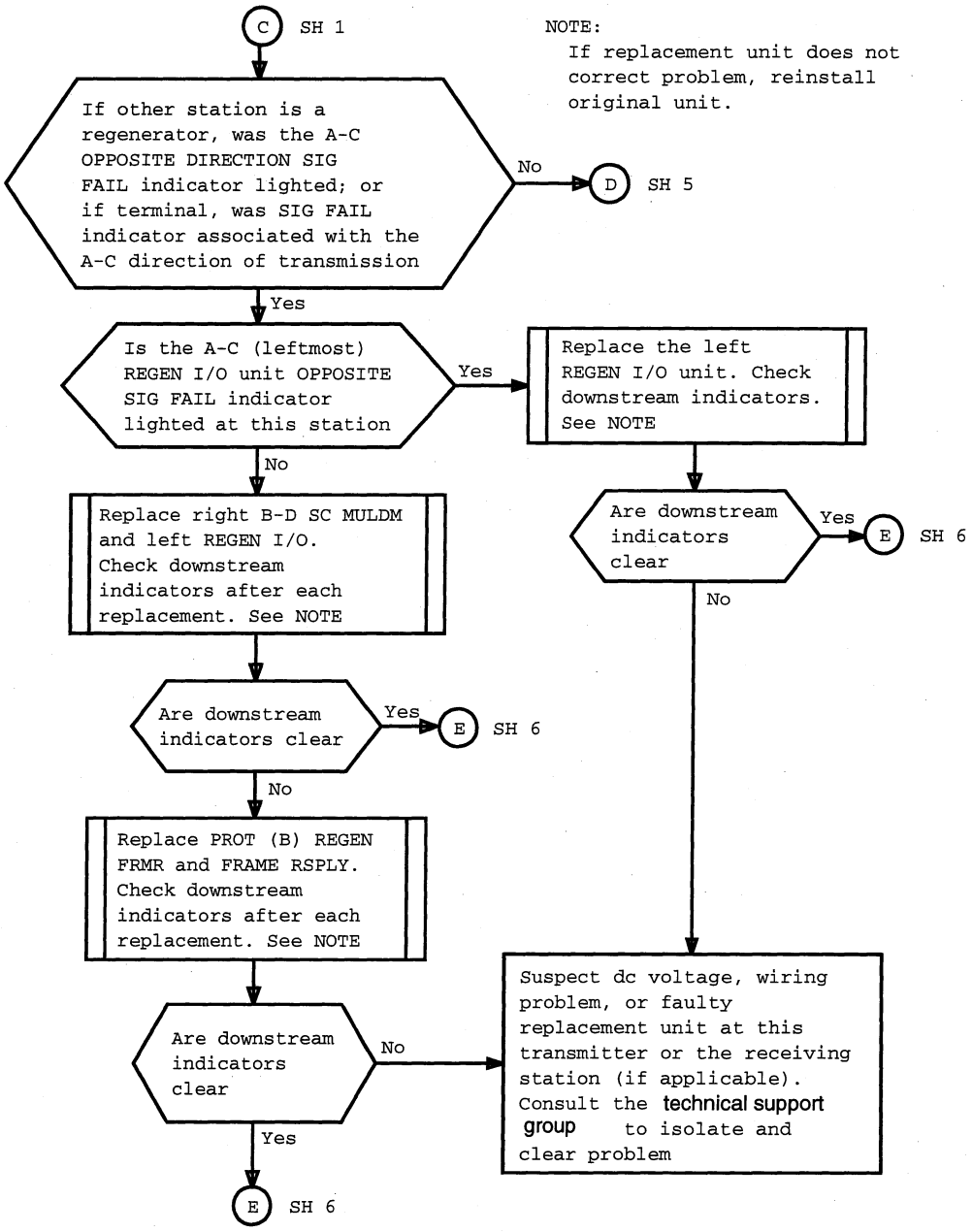


NOTE:
If replacement unit does not correct problem, reinstall original unit

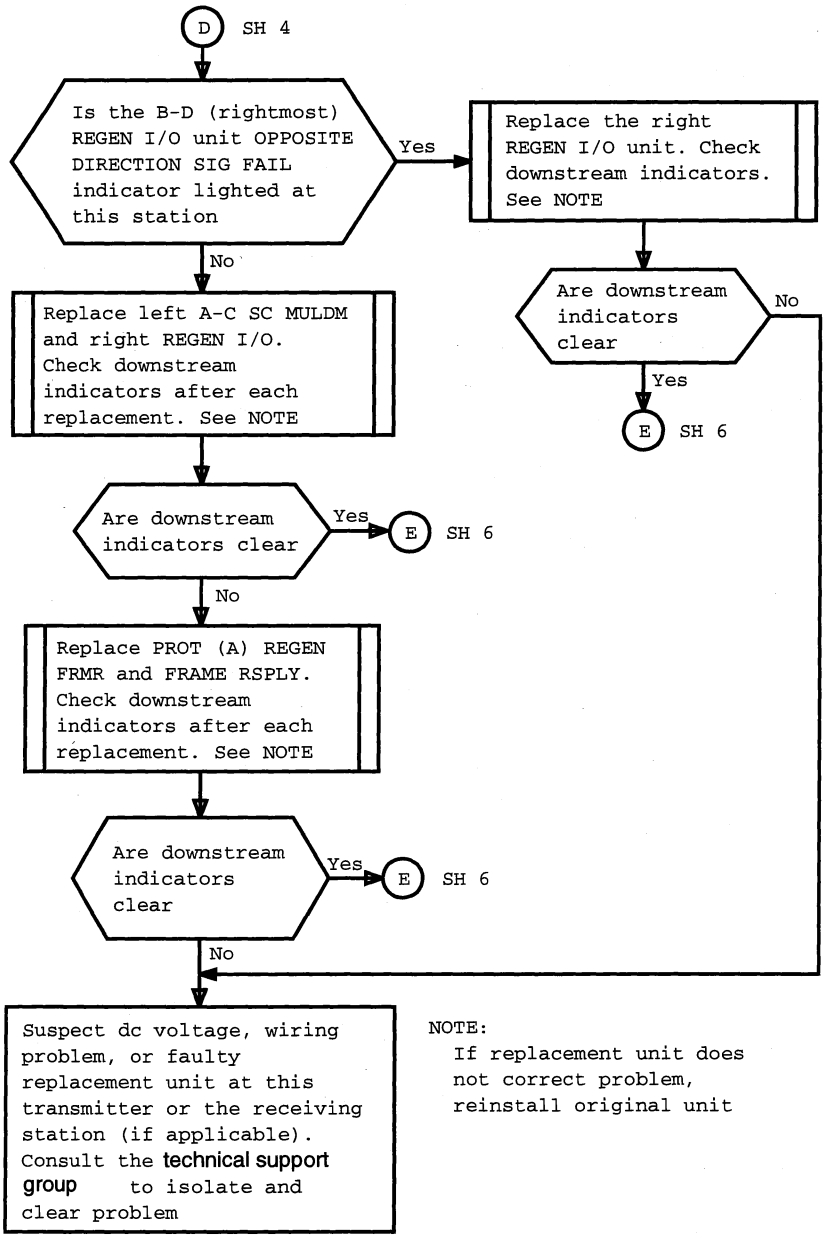
Flowchart 14. Regenerator Bay Signaling Fail Alarm-Clearing (Sheet 2 of 6)



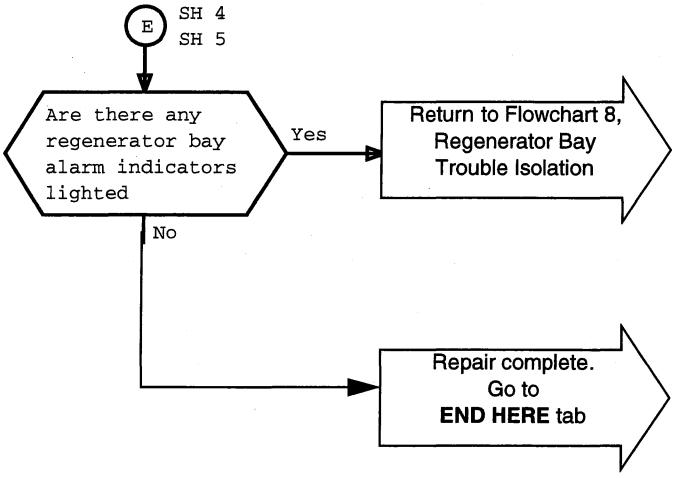
Flowchart 14. Regenerator Bay Signaling Fail Alarm-Clearing (Sheet 3 of 6)



Flowchart 14. Regenerator Bay Signaling Fail Alarm-Clearing (Sheet 4 of 6)



Flowchart 14. Regenerator Bay Signaling Fail Alarm-Clearing (Sheet 5 of 6)



Flowchart 14. Regenerator Bay Signaling Fail Alarm-Clearing (Sheet 6 of 6)

4 Additional Trouble Isolation

These flowcharts and instructions are used to isolate and repair troubles/problems encountered while performing DR 6/11 test procedures.

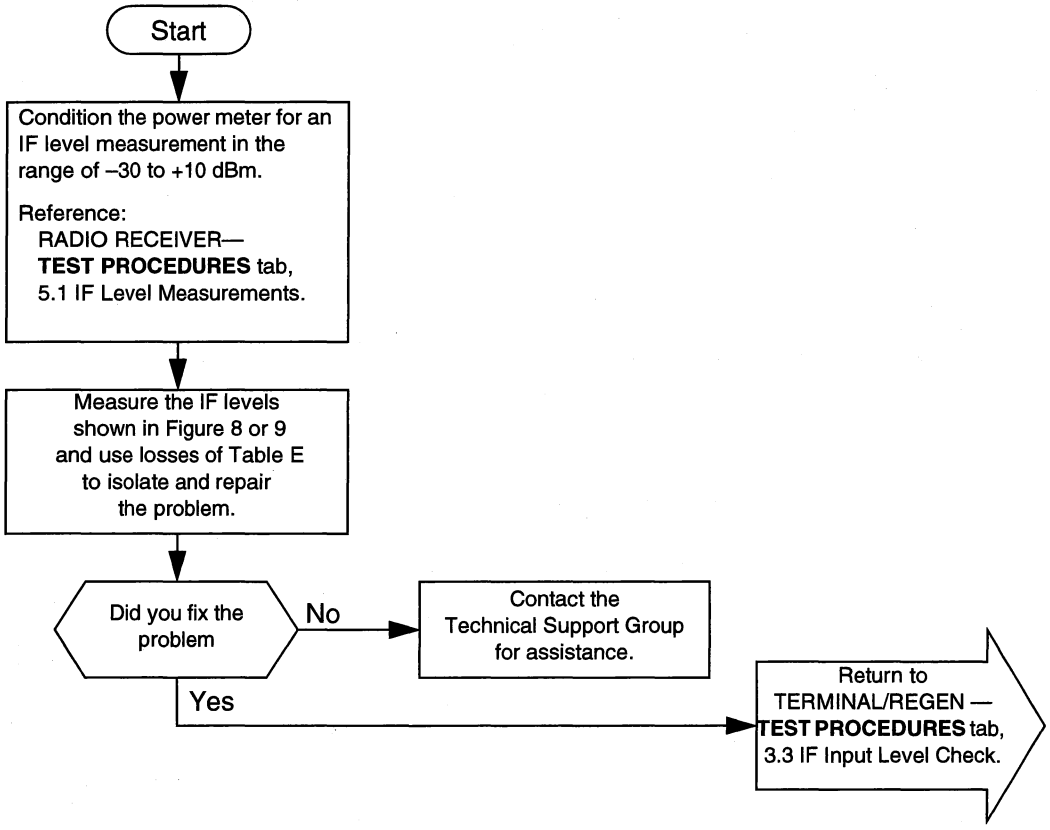
Figures 10 through 14 are located at the end of this section. Figure 10 illustrates one two-way digital radio channel and Figures 11 through 14 show common test configurations which are referenced from several of the trouble isolation flowcharts.

4.1 IF Level Problem

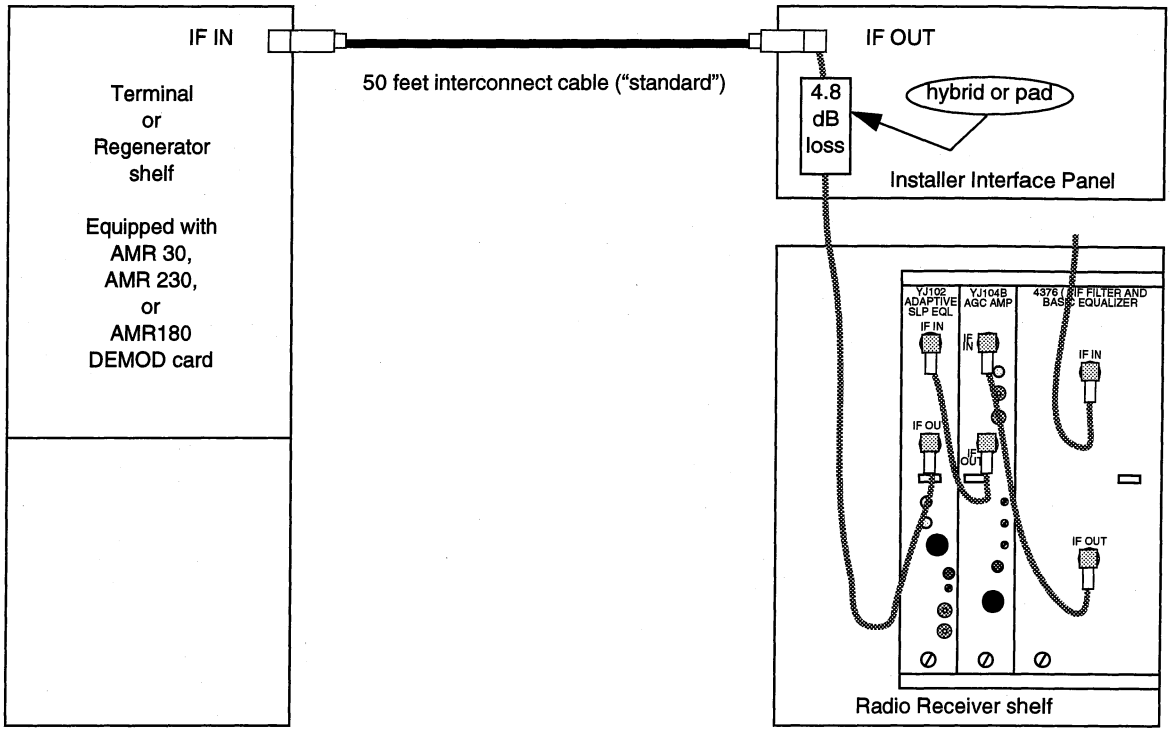
You were referred here from the **TEST PROCEDURES** tab, 3.3 IF Input Level Check, because the IF input level to a terminal receiver or regenerator does not meet requirements. The power meter should already be conditioned for an IF level measurement between –30 dBm and +10 dBm.

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

Use Flowchart 15 to isolate the level problem. A radio receiver alignment may be required to correct a problem isolated to the radio receiver.



Flowchart 15. IF Level Problem Isolation



Terminal or Regenerator IF IN

Requirement: –8.2 dBm ± 1.0 dB *

Installer Interface Panel IF OUT

Requirement: –7.1 dBm ± 0.5 dB

Adaptive Slope Equalizer IF OUT

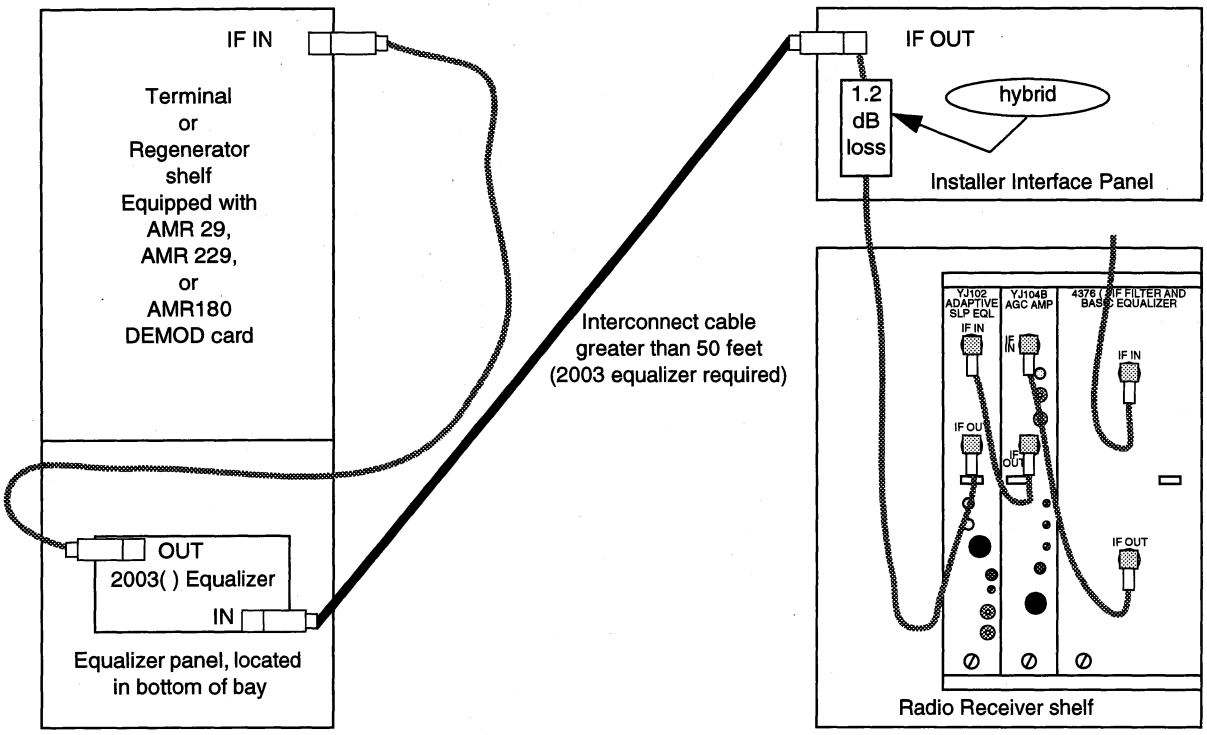
Requirement: –2.0 dBm ± 0.5 dB

AGC Amplifier IF OUT

Requirement: –2.0 dBm ± 0.2 dB

*The AMR 180 64QAM DEMOD card will work with –10.0 dBm ± 3.0 dB.

Figure 8. IF Level Problem Isolation—50 Feet Interconnect Cable



Terminal or Regenerator IF IN

Requirement: –11.7 dBm ± 1.2 dB*

Installer Interface Panel IF OUT

Requirement: –3.5 dBm ± 0.5 dB

Adaptive Slope Equalizer IF OUT

Requirement: –2.0 dBm ± 0.5 dB

AGC Amplifier IF OUT

Requirement: –2.0 dBm ± 0.2 dB

*The AMR 180 64QAM DEMOD card will work with –10.0 dBm ± 3.0 dB.

Figure 9. IF Level Problem Isolation—Greater Than 50 Feet Interconnect Cable

Table E. Cable and Equalizer Requirements

Cable	Cable Loss (dB per 100 Feet)
728B	2.2
731B	3.0
KS-19224, L2	6.0

Cable Equalizer			Interconnect Cable (728B)		Cable Equalizer Plus Interconnect Cable *	
Code	Loss @ 70MHz (dB)	Slope @ 70 MHz ±12 MHz (dB)	Length (Ft.)	Loss @ 70MHz (dB)	Loss @ 70MHz (dB)	Slope @ 70 MHz ±12 MHz (dB)
2003W	6.0 ±0.2	+0.3 to +0.6	75	2.2 ±1.0	8.2 ±1.2	–0.1 to +0.3
2003Y	4.9 ±0.2	+0.5 to +0.8	125	3.3 ±1.0	8.2 ±1.2	–0.1 to +0.3
2003AA	3.8 ±0.2	+0.7 to +1.0	175	4.4 ±1.0	8.2 ±1.2	–0.1 to +0.3
2003AB	2.7 ±0.2	+1.0 to +1.3	225	5.5 ±1.0	8.2 ±1.2	–0.2 to +0.4
2003AC	1.6 ±0.2	+1.2 to +1.5	275	6.6 ±1.0	8.2 ±1.2	–0.2 to +0.4

* These requirements are for the interconnect cable and the cable equalizer only. The KS-19224, L2 "mini" coaxial cable connecting the equalizer to the digital equipment is not included.

4.2 Over-the-Air S/I Test Failure

You were referred here from the **TEST PROCEDURES** tab, 5.1 Over-the-Air S/I and EC Evaluation, because the signal-to-interference (S/I) test did not meet requirements. The receiving error performance for this channel is good under normal (unstressed) conditions.

The over-the-air S/I evaluation is one part of the check of the preceding radio transmitter for FCC compliance. The other parts of the check for the preceding radio transmitter include:

- Radio transmitter output power
- Radio transmitter microwave generator frequency
- Digital transmitter modulator carrier frequency
- Digital transmitter frame generator clock frequency.

Some possible causes of poor S/I are:

a. Radio transmitter linearity is bad.

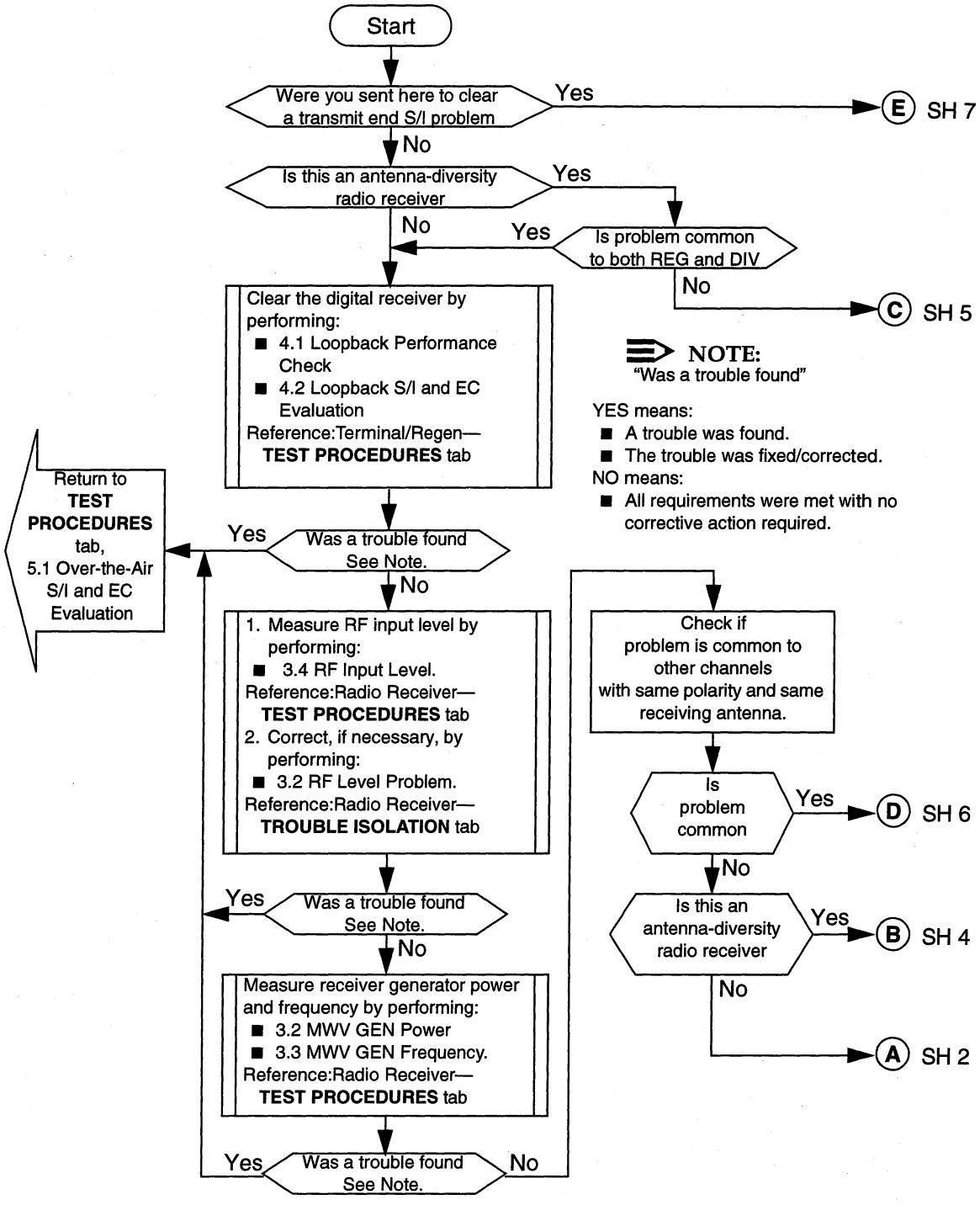
b. Radio transmitter is off frequency.

c. Radio receiver microwave generator is off frequency.

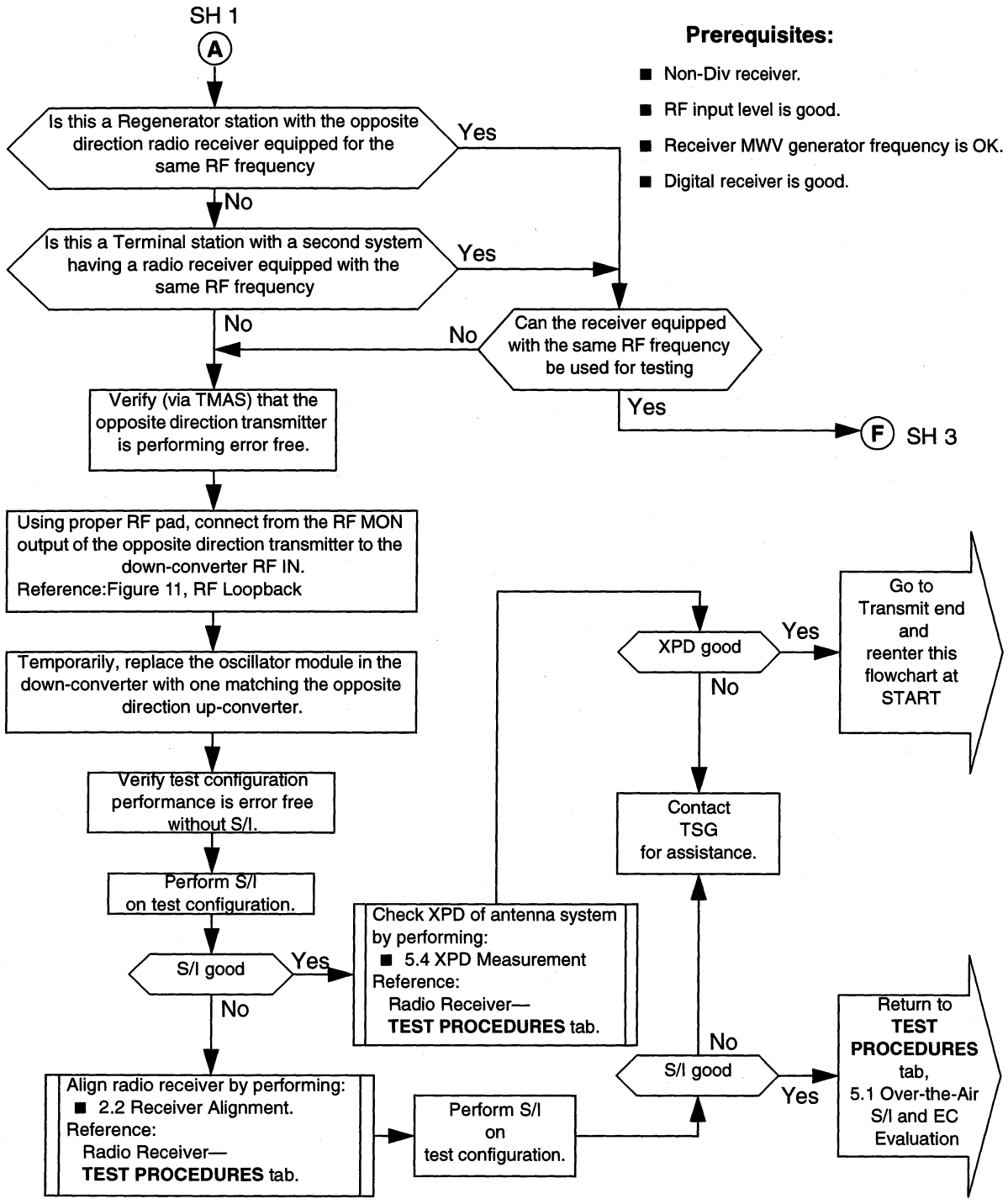
d. There is path interference due to an external system signal or poor cross-polarization discrimination (XPD).

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

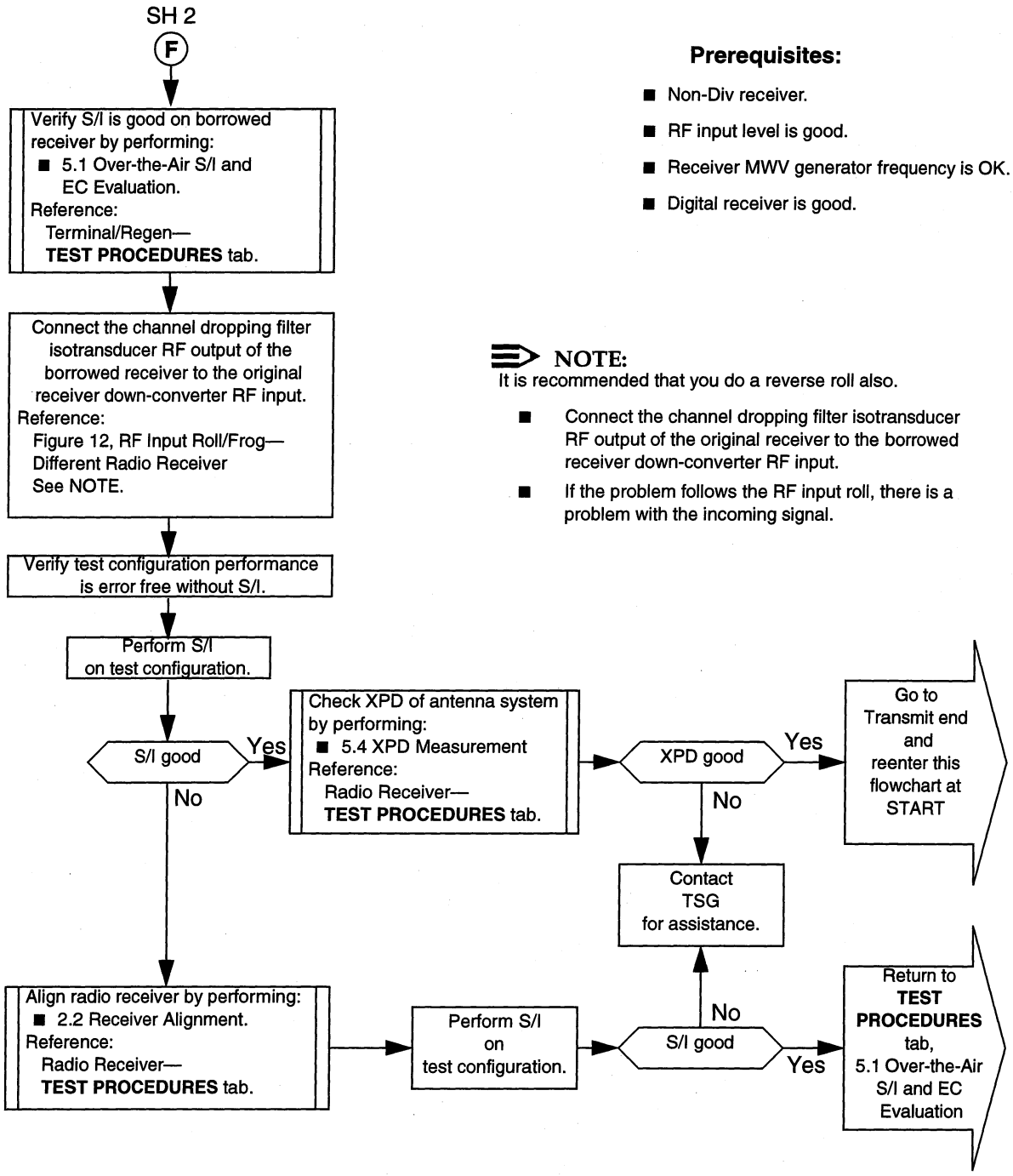
Use Flowchart 16 to isolate the problem.



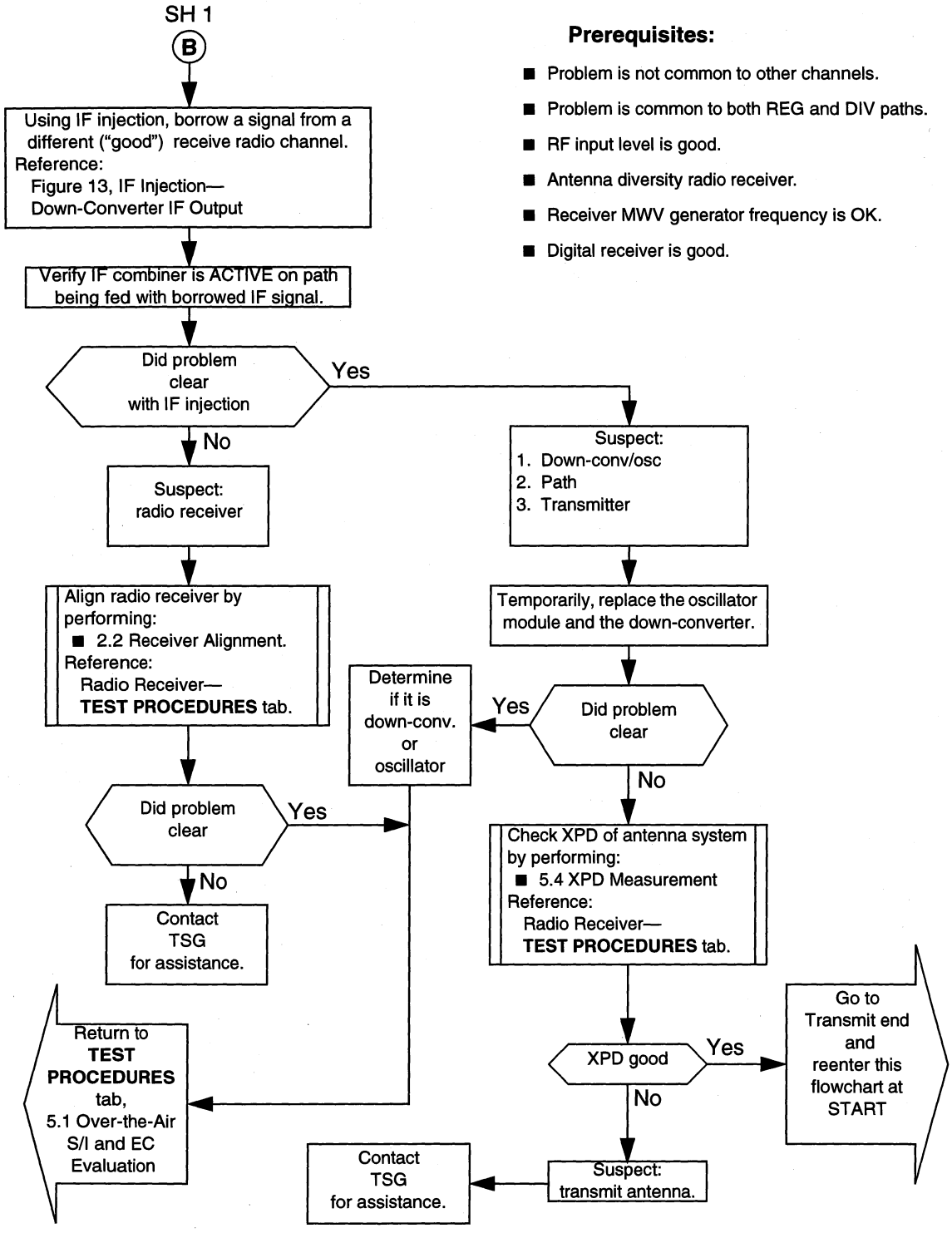
Flowchart 16. S/I Problem Isolation (Sheet 1 of 7)



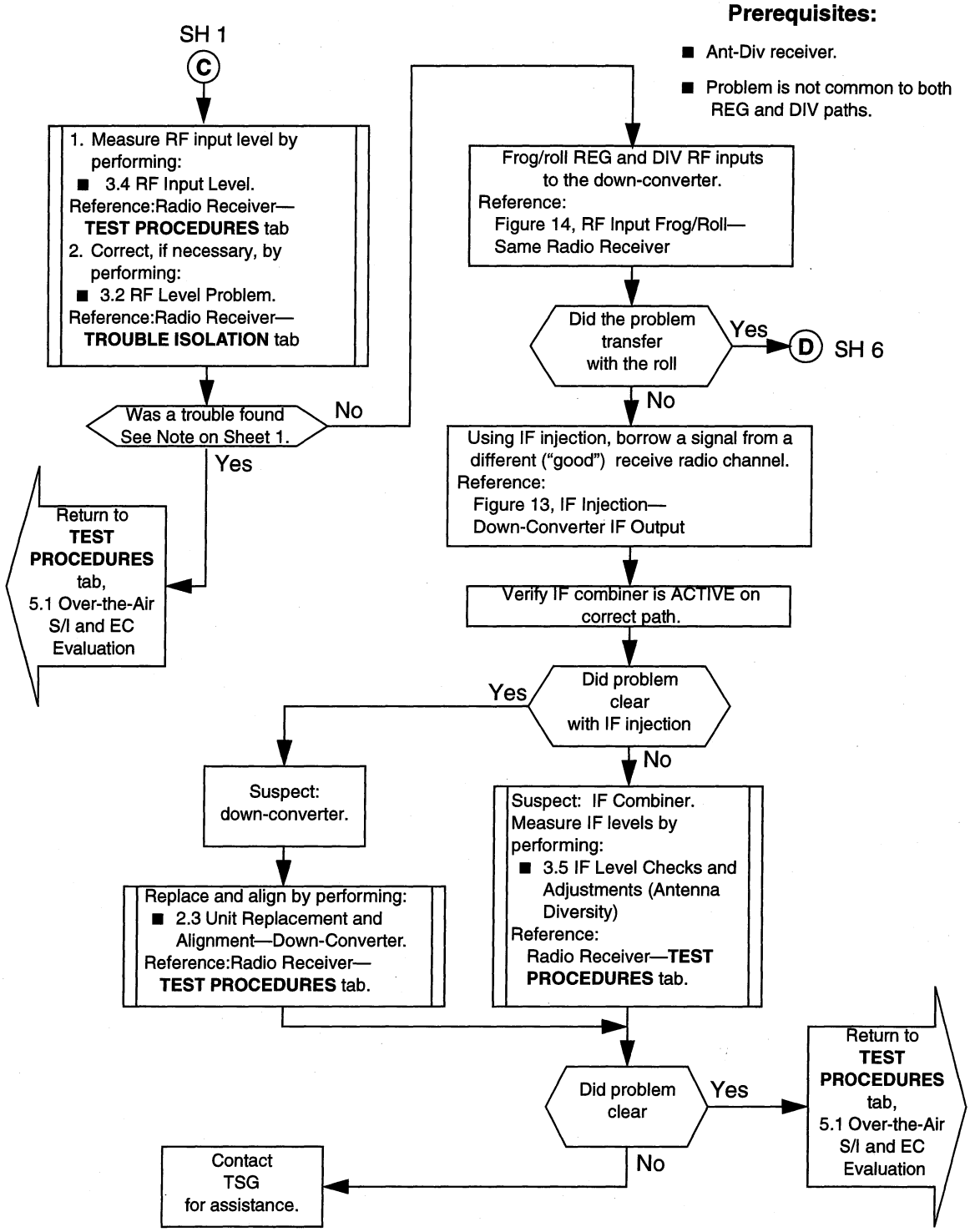
Flowchart 16. S/I Problem Isolation (Sheet 2 of 7)



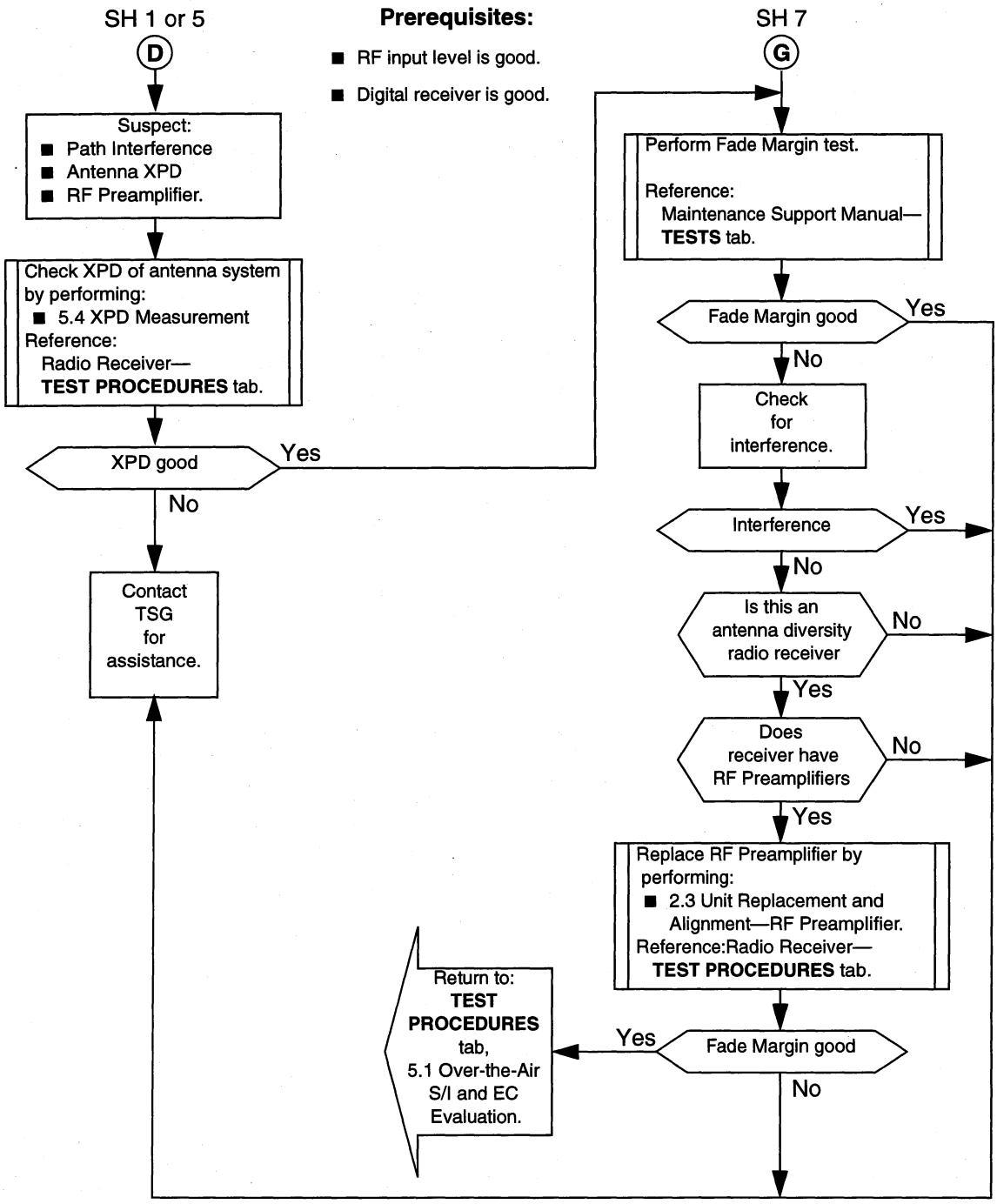
Flowchart 16. S/I Problem Isolation (Sheet 3 of 7)



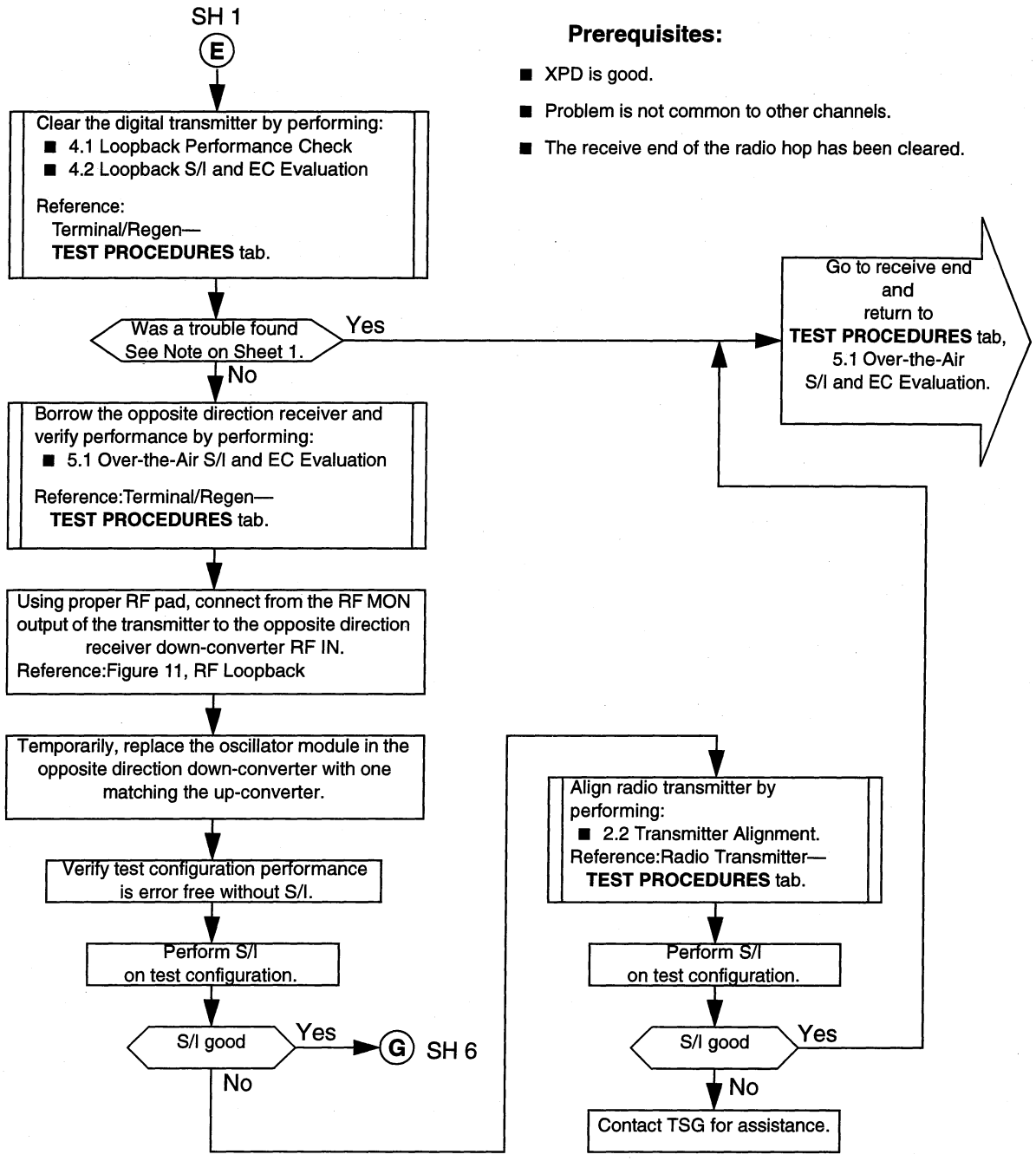
Flowchart 16. S/I Problem Isolation (Sheet 4 of 7)



Flowchart 16. S/I Problem Isolation (Sheet 5 of 7)



Flowchart 16. S/I Problem Isolation (Sheet 6 of 7)



Flowchart 16. S/I Problem Isolation (Sheet 7 of 7)

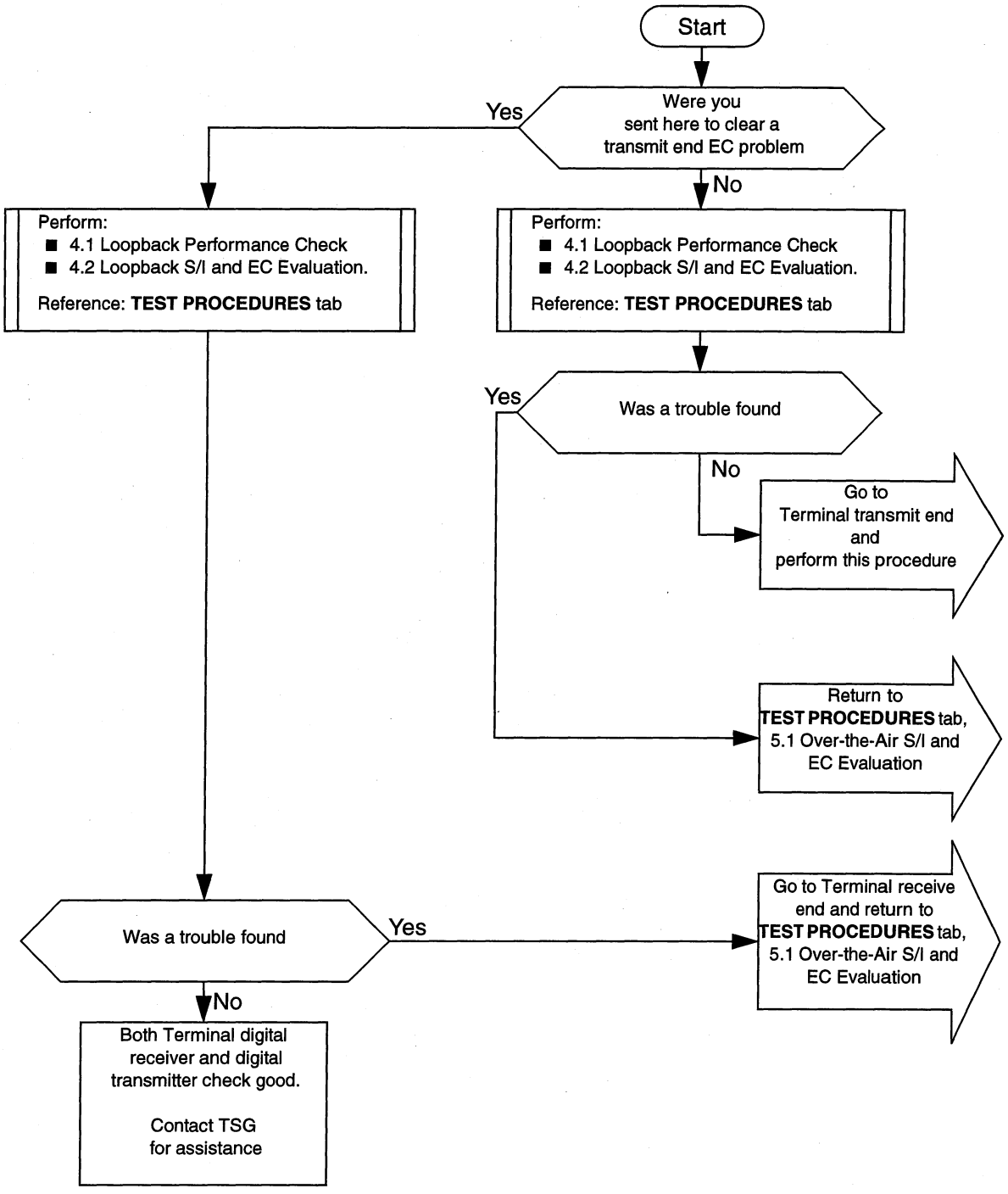
4.3 Over-the-Air EC Test Failure

You were referred here from the **TEST PROCEDURES** tab, 5.1 Over-the-Air S/I and EC Evaluation, because the error correction evaluation failed. The receiving error performance for this channel is good under normal (unstressed) conditions.

Problems with error correction are either at the transmit digital terminal or the receive digital terminal.

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

Use Flowchart 17 to isolate the problem.



Flowchart 17. EC Problem Isolation

4.4 Over-the-Air PD Test Failure

You were referred here from the **TEST PROCEDURES** tab, 5.2 Over-the-Air Propagation Distortion Checks, because one of the following Propagation Distortion (PD) tests did not meet requirements.

- Adaptive Slope Equalizer (ASE) Test
- Transversal Equalizer Test
- Digital Receiver Recovery Test.

The receiving error performance for this channel is good under normal (unstressed) conditions.

Some possible causes for the Adaptive Slope Equalizer (ASE) Test failure are:

a. Adaptive Slope Equalizer (ASE) in radio receiver is defective or not adjusted properly.

b. The radio channel has residual amplitude slope due to a problem.

Some possible causes for the Transversal Equalizer and Digital Receiver Recovery tests failures are:

a. Transversal Equalizer in digital receiver is defective.

b. A microwave generator is off frequency.

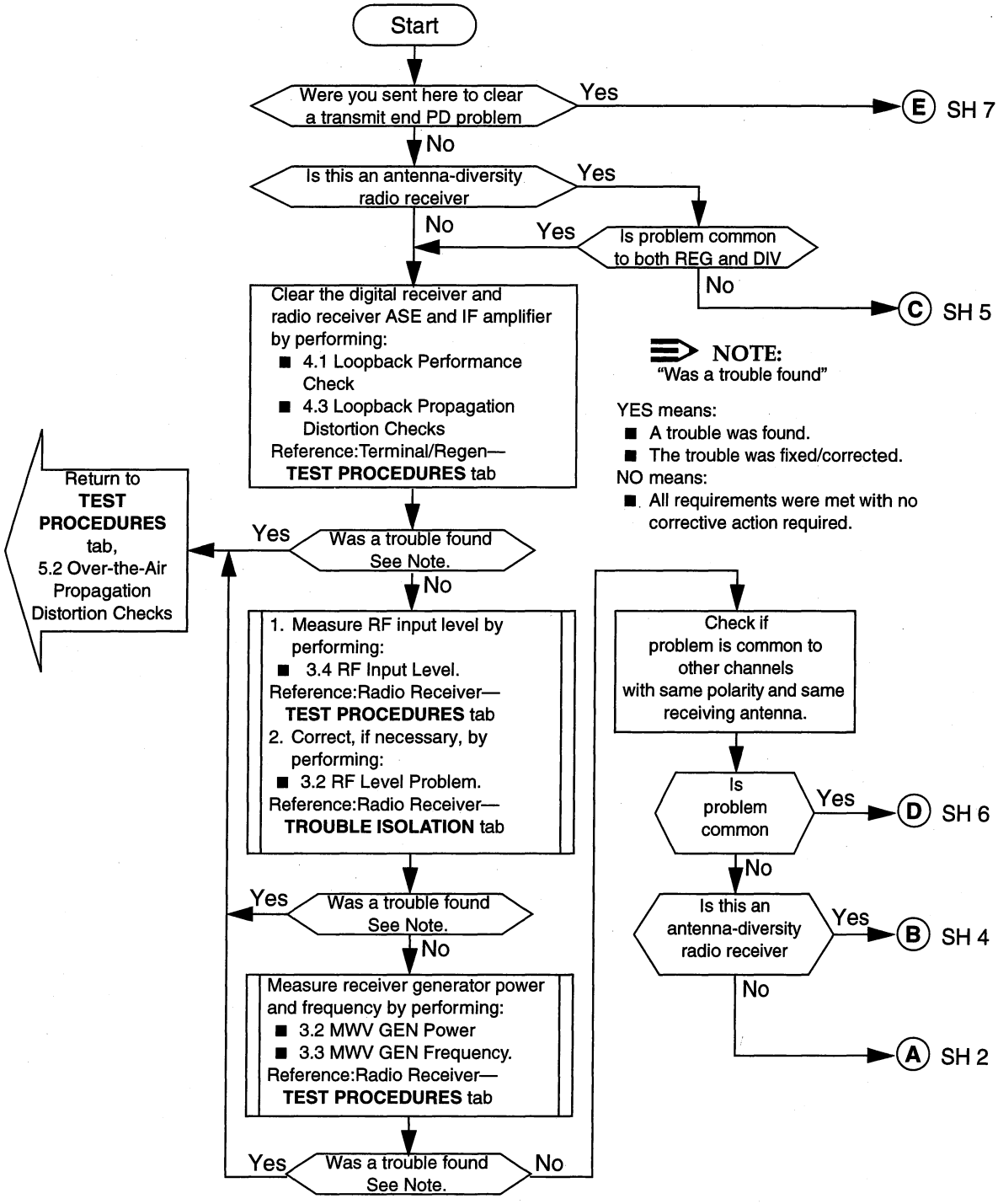
c. An IF level problem into the digital receiver.

d. A digital receiver problem.

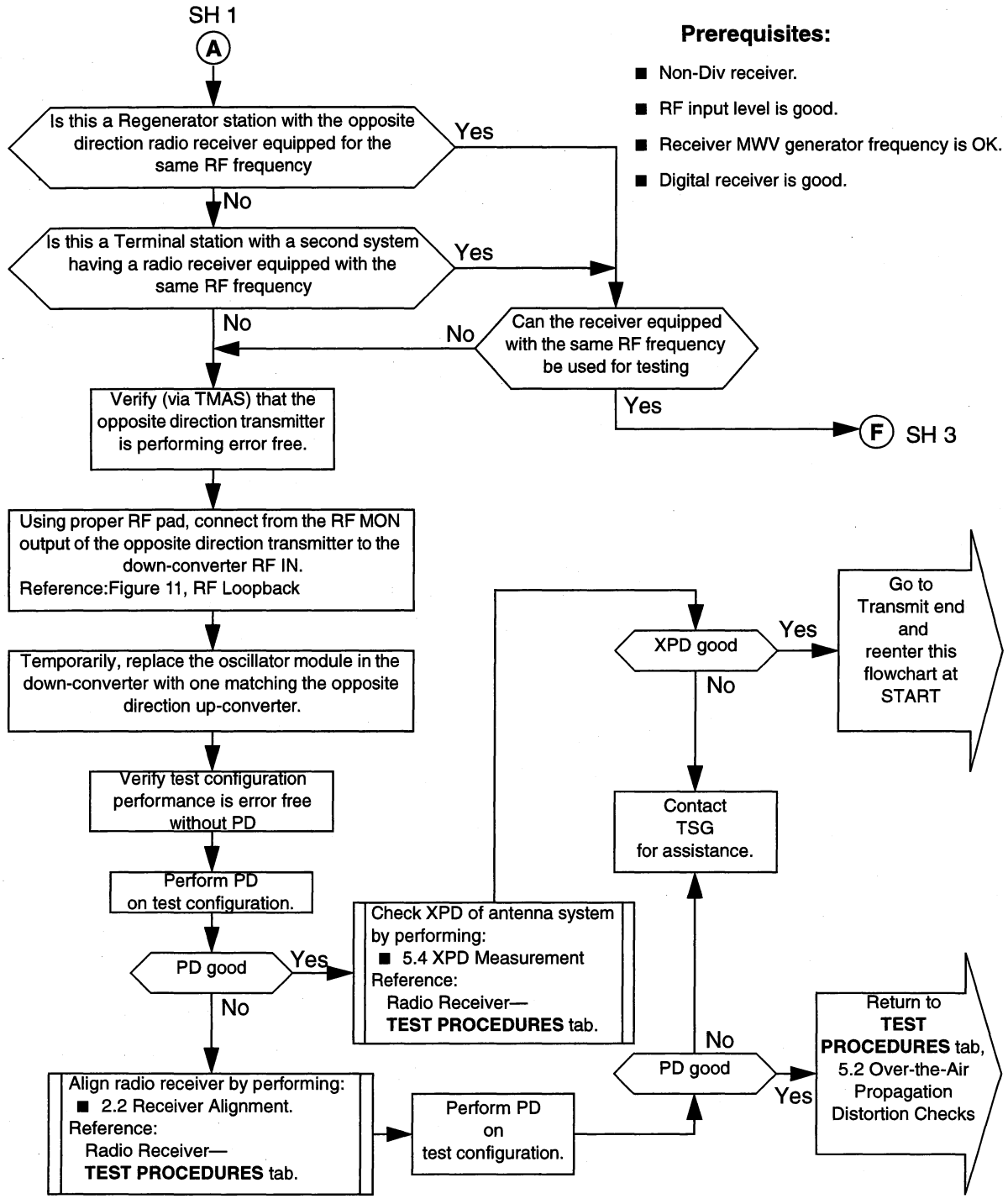
e. A digital transmitter problem.

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

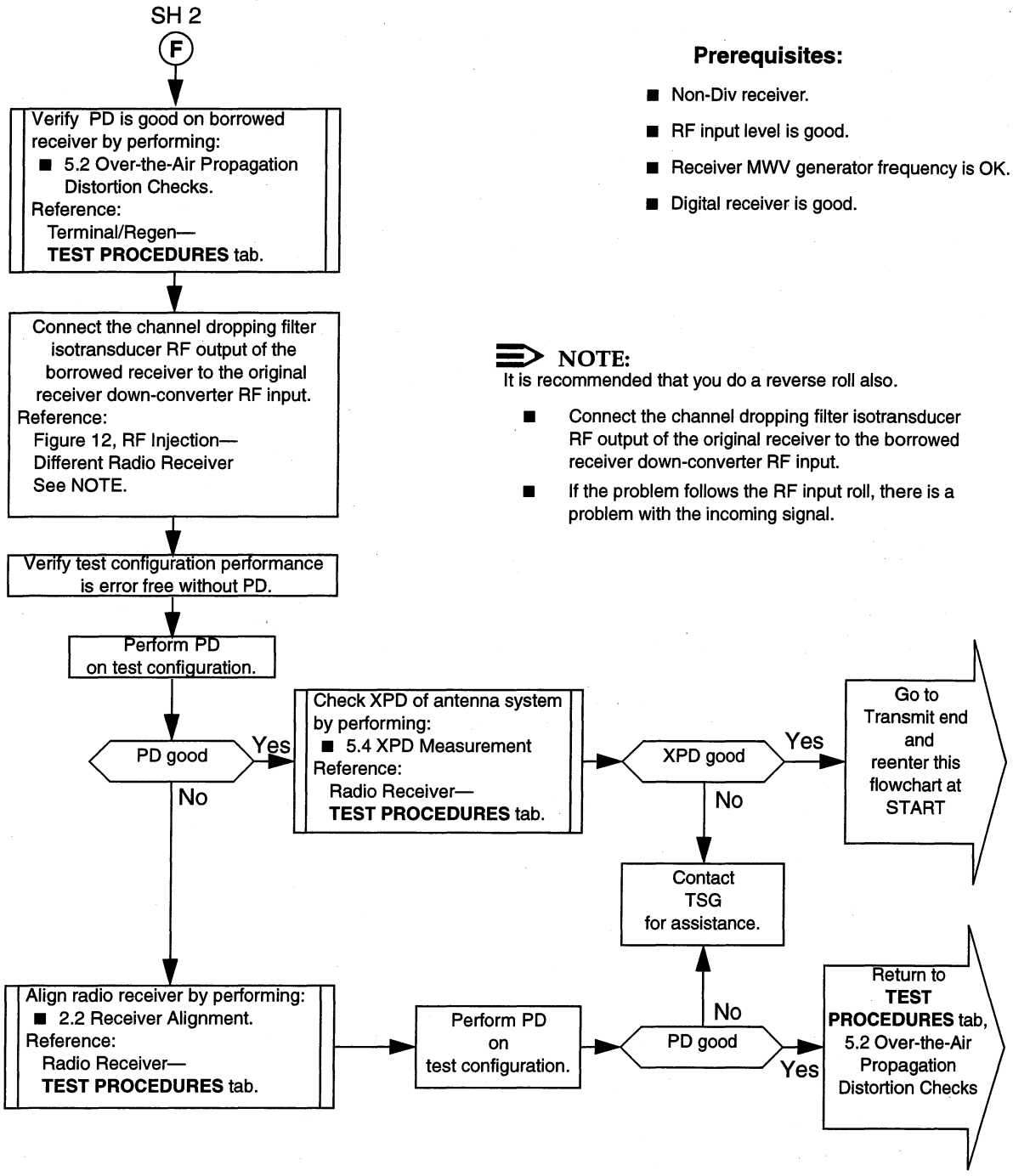
Use Flowchart 18 to isolate the PD problem.



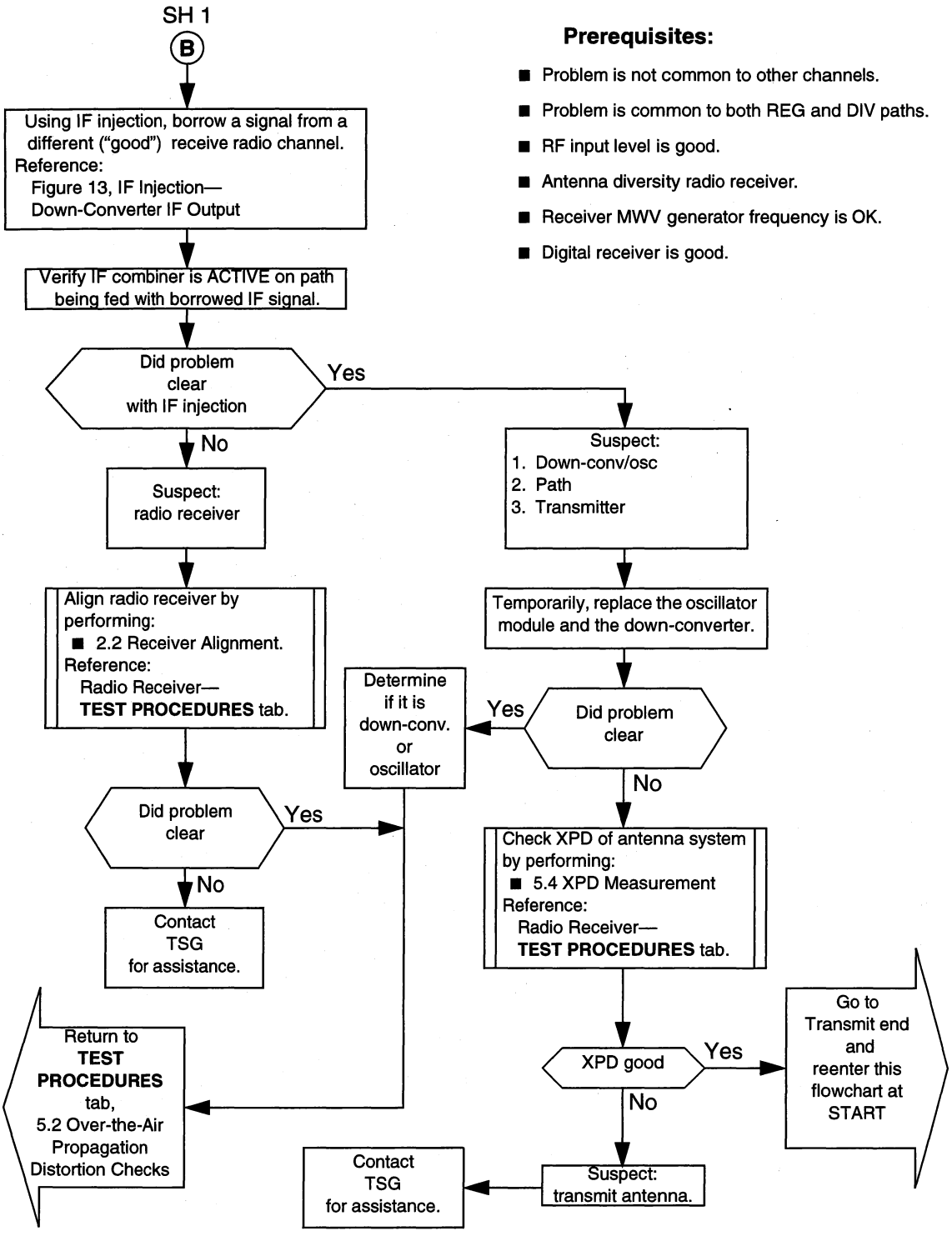
Flowchart 18. PD Problem Isolation (Sheet 1 of 7)



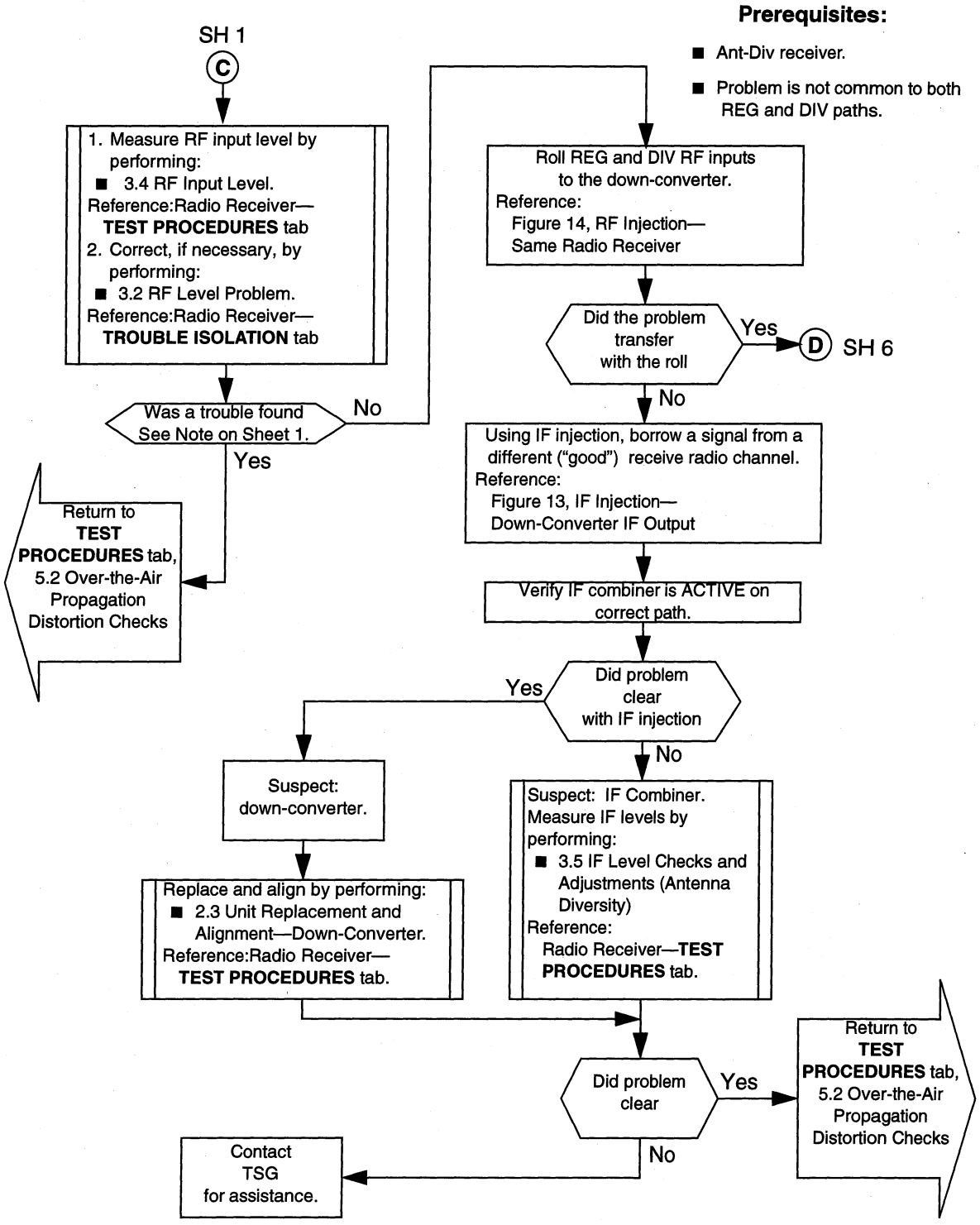
Flowchart 18. PD Problem Isolation (Sheet 2 of 7)



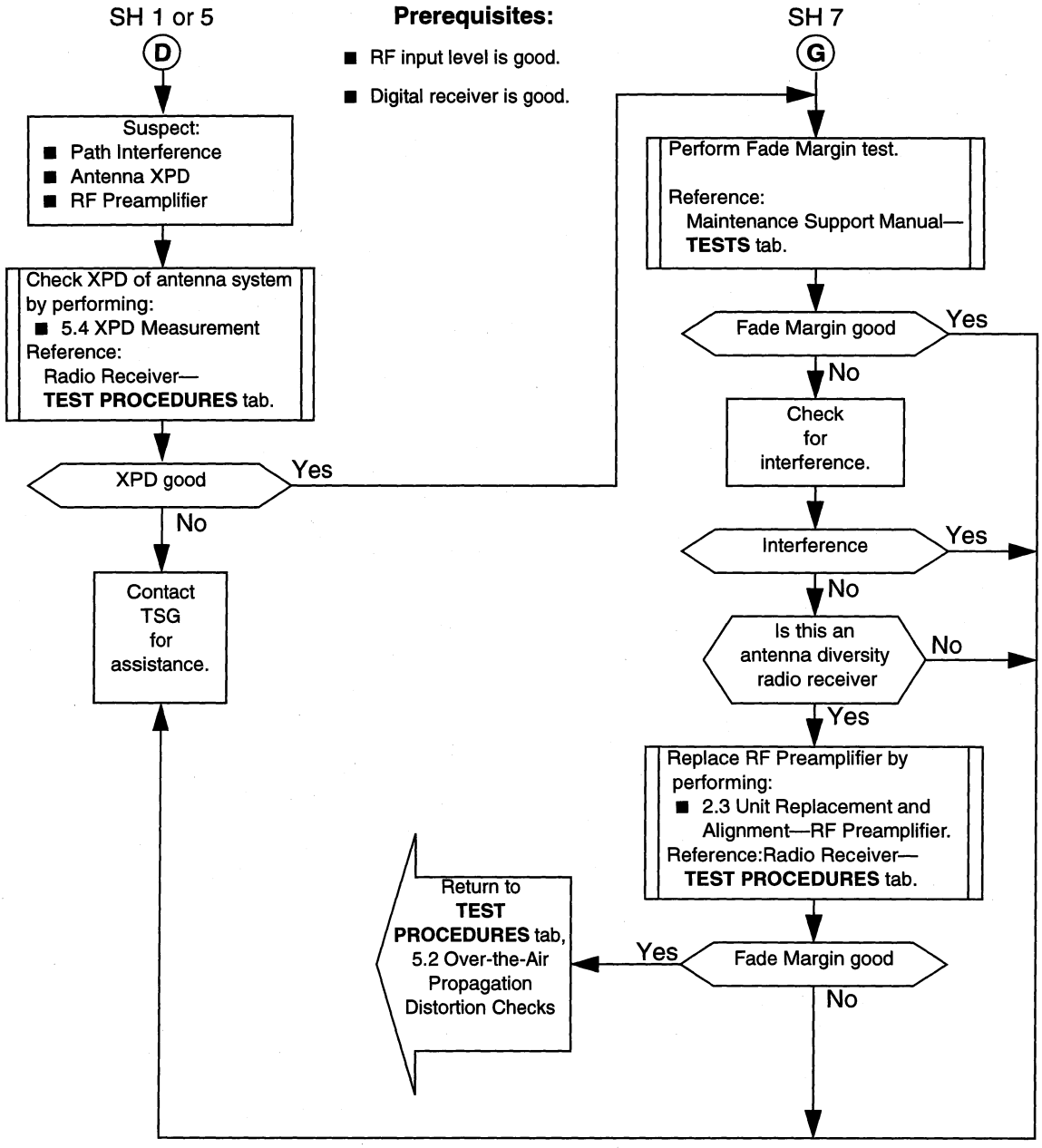
Flowchart 18. PD Problem Isolation (Sheet 3 of 7)



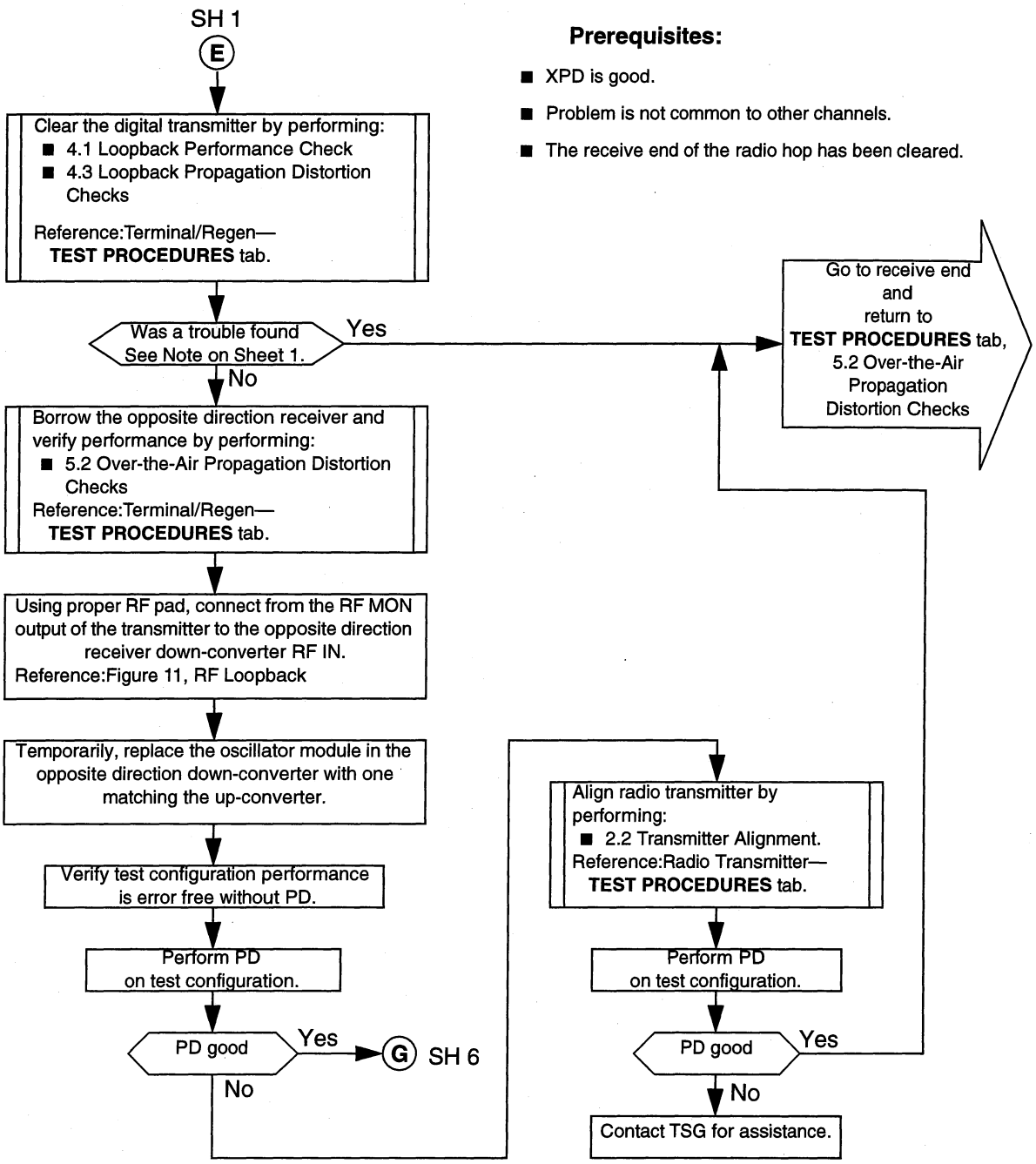
Flowchart 18. PD Problem Isolation (Sheet 4 of 7)



Flowchart 18. PD Problem Isolation (Sheet 5 of 7)



Flowchart 18. PD Problem Isolation (Sheet 6 of 7)



Flowchart 18. PD Problem Isolation (Sheet 7 of 7)

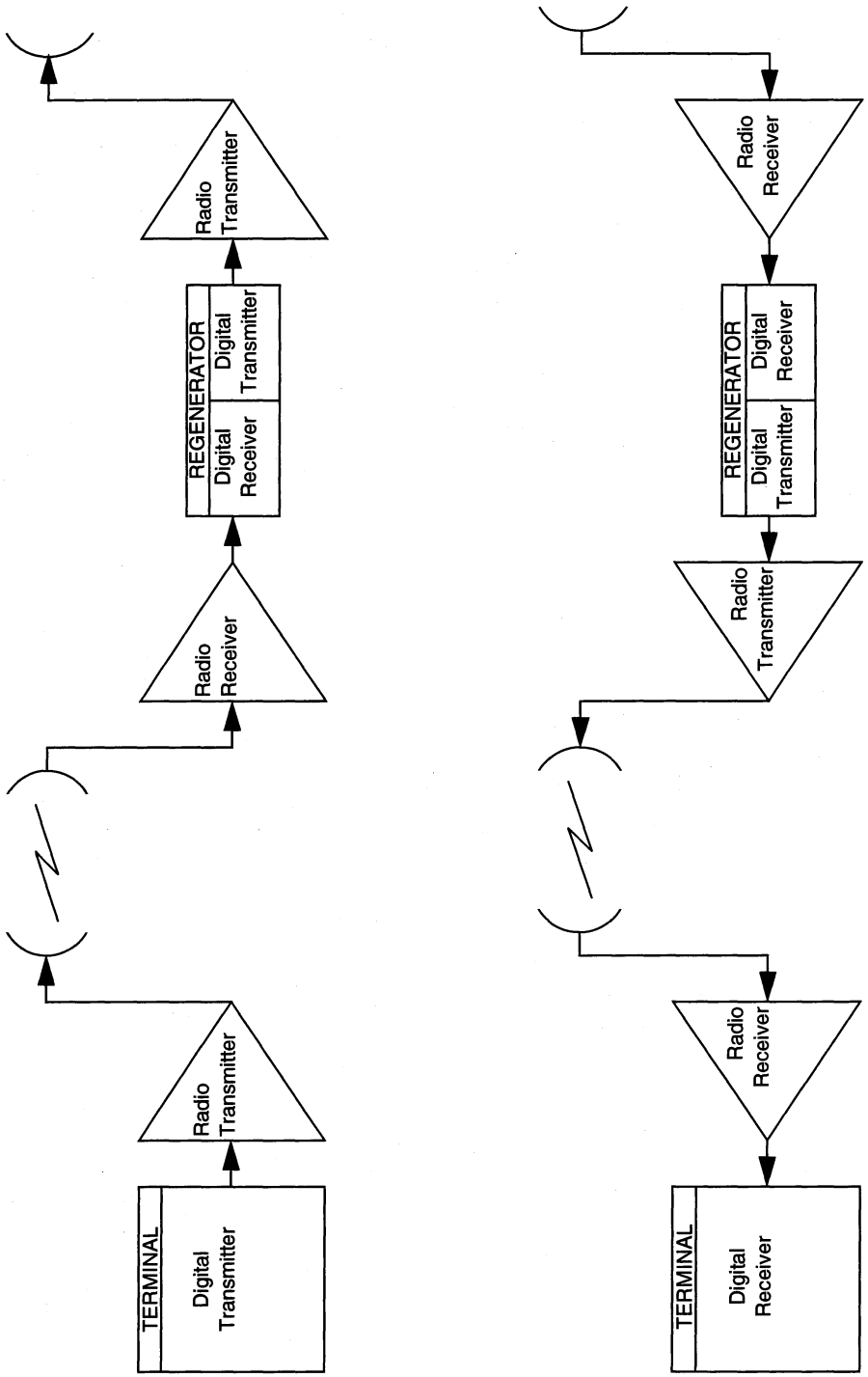


Figure 10. One Two-Way Digital Radio Channel

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

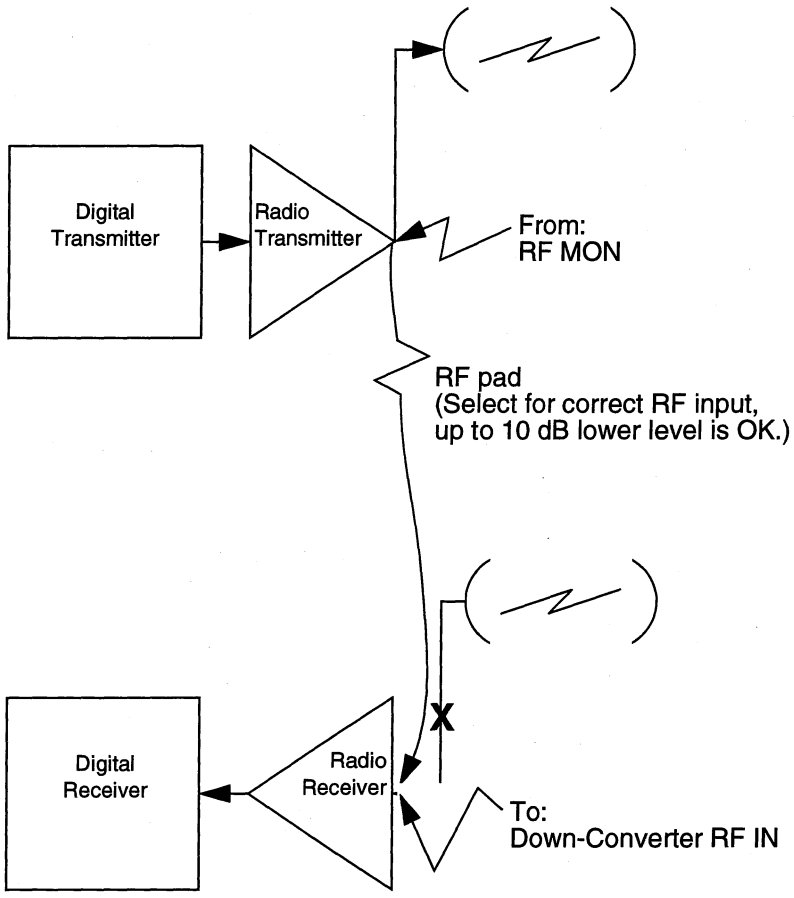


Figure 11. RF Loopback

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

NOTE:
Both radio receivers are equipped for the same RF center frequency.

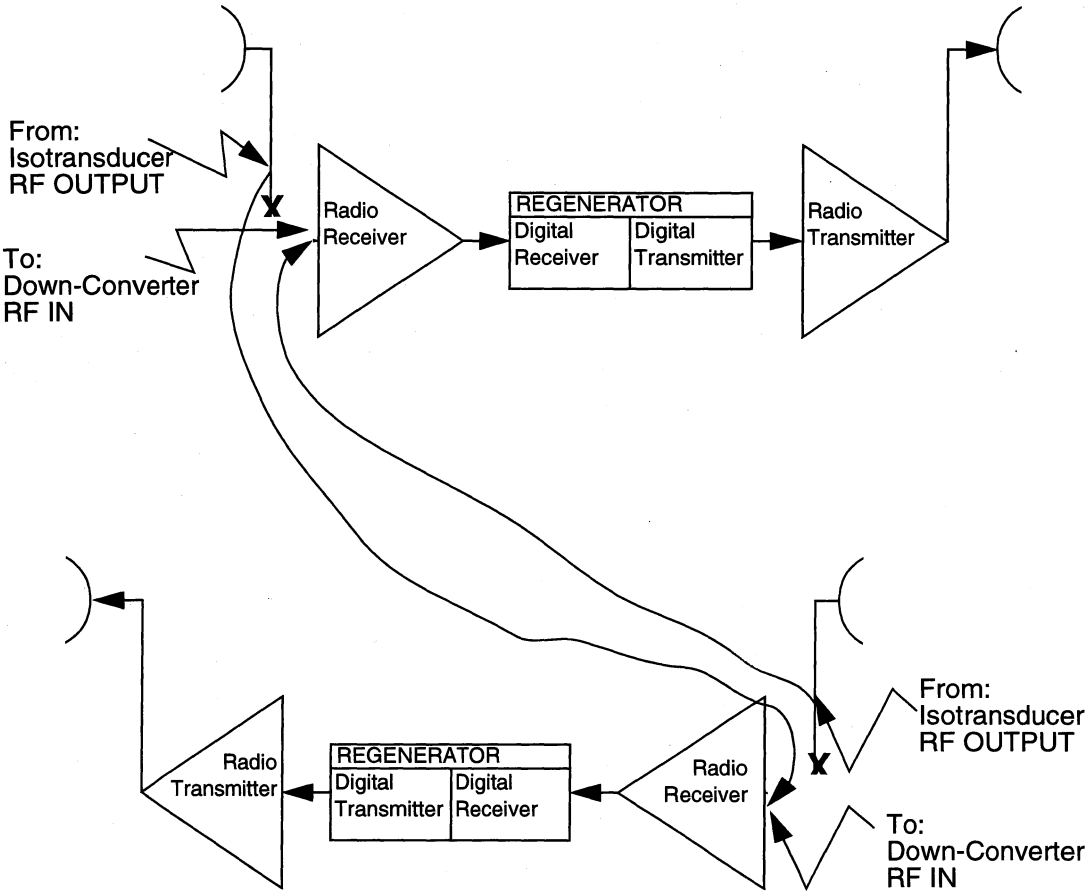


Figure 12. RF Injection—Different Radio Receiver

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.

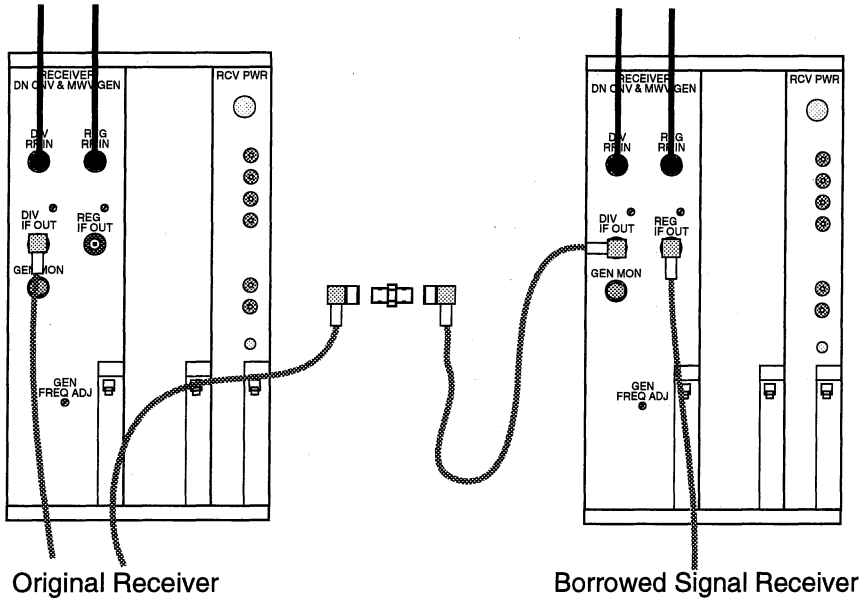
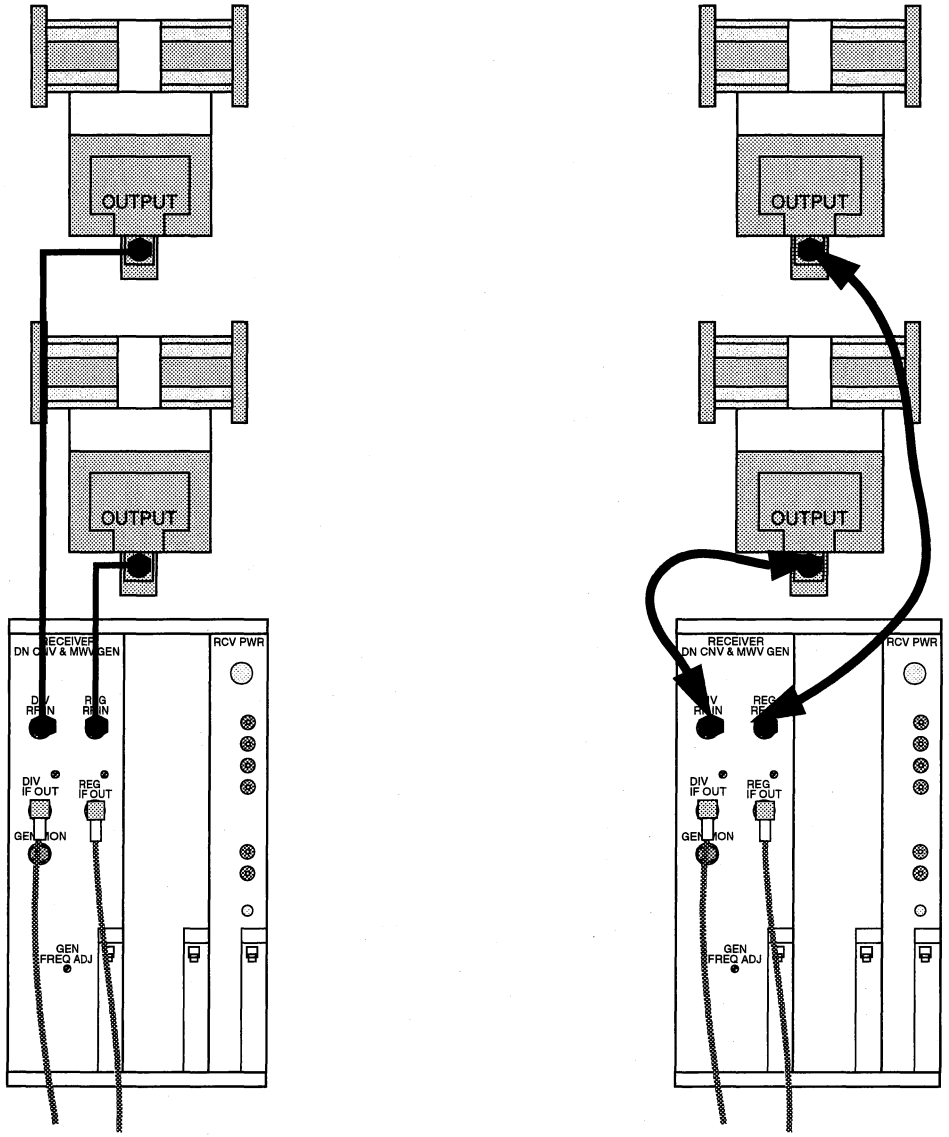


Figure 13. IF Injection—Down-Converter IF Output

CAUTION:
To prevent service interruptions, ensure that service is protected before removing cables.



Receiver—Normal

Receiver—Rolled Inputs

Figure 14. RF Injection—Same Radio Receiver