



DR 6/11-135A and 135EC 1×N Frequency Diversity Operation and Maintenance Service Protection

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1 General

The information in this section is used to ensure that service is protected before making repairs or performing any service-affecting tests. This information will help the user determine what manual operations are required to properly protect service. Refer to the **OPERATIONS** tab to determine how to make the manual operations and for an explanation of what action takes place.

The DR 6/11-135 Digital Radio System is equipped with automatic protection switching equipment that will, when necessary, transfer the affected regular channel payload signal to a parallel protection channel.

**NOTE:**

An automatic switch must always be reinforced with an equivalent manual switch before performing any service-affecting repairs or tests.

Two types of automatic switches can occur.

- a. **Automatic Line Switch:** The most commonly occurring switch. It is executed at 10^{-6} Bit Error Rate (BER) due to fading on any hop or equipment failures between the output of the FRAME GEN unit in a transmitting-end terminal and the input to the LINE SW unit in a receiving-end terminal. Section Cyclic Redundancy Check (CRC) errors are counted for this BER. Section CRC errors are a measurement of performance before Error Correction (EC) has been applied.
- b. **Automatic Span Switch:** It is executed at 10^{-4} BER due to an equipment failure up to the output of the FRAME GEN unit in a transmitting-end terminal and after the input to the LINE SW unit in a receiving-end terminal. DS3 parity errors are counted for this BER. DS3 parity errors are a measurement of performance after EC has been applied.

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 Service Protection Prior to Repair

Repair or routine maintenance (except in-service tests) will usually require manual operations in order to properly protect service. Figure 1 shows the normal equipment path with no (automatic or manual) switches operated. Repair to the fan shelf does not require any manual operations.

2.1 Maintenance on a Failed Regular Channel

Normally, any regular channel transmission failure is automatically protected by a *line* or *span* switch. Proper service protection is accomplished by reinforcing the automatic switch with the appropriate manual switch.

The correct manual switch is determined by which indicators are lighted on the following units:

- PROT STAT
- CHAN STAT
- TRMT STAT
- LINE SW
- VMR & CODER.

The following steps will help determine the correct manual switch.

1. Refer to 1 in the Line Number column of Tables A and B, then to the appropriate Transmitting End or Receiving End column, and determine if an automatic *line* or automatic *span* switch exists.
2. Perform the appropriate *line* or *span* manual switch operation.

Reference: **OPERATIONS** tab—
2 Manual Protection Switching Operations

3. Refer to 2 in the Line Number column of Table A or B to verify that the appropriate MAN SW indicator lights.

Figures 2 and 3 show the switched signal paths and identify the equipment that can be repaired once the manual *line* or *span* switch has been operated (see **Caution**).



CAUTION:

*To prevent service interruptions, refer to the Terminal/Regenerator—**REPLACEMENT PROCEDURES** tab before replacing any units in a line terminal bay. There may be additional manual protection switching operations necessary to properly protect service.*

Table A. Line Switch Indications

Line Number	Condition	Transmitting End		Receiving End	
		Unit	Indicator	Unit	Indicator
1	Automatic Line Switch	TRMT STAT	PROTECTION BRIDGED TO CHANNEL displays failed channel number	PROT STAT	LINE SW TRMT SW
				CHAN STAT (failed channel)	SW FAIL
				LINE SW *	LINE SW
2	Reinforced with manual Line Switch †	TRMT STAT	MAN SW ‡	PROT STAT	MAN SW

*The LINE SW units are located on the digital shelf of the failed regular channel.

†These indicators would be lighted in addition to the automatic LINE switch indications.

‡This indication only lights when manual operation is performed at transmitting end.

Table B. Span Switch Indications

Line Number	Condition	Transmitting End		Receiving End	
		Unit	Indicator	Unit	Indicator
1	Automatic Span Switch	TRMT STAT	PROTECTION BRIDGED TO CHANNEL displays failed channel number SPAN SW	PROT STAT	SPAN SW TRMT SW
				CHAN STAT (failed channel)	SW FAIL
				VMR & CODER*	SPAN SW
2	Reinforced with manual Span Switch †	TRMT STAT	MAN SW ‡	PROT STAT	MAN SW

*The VMR & CODER units (up to three) located on the digital terminal shelf of the failed regular channel and on the protection channel will indicate SPAN switch.

†These indicators would be lighted in addition to the automatic SPAN switch indications.

‡This indication only lights when manual operation is performed at transmitting end.

2.2 Maintenance on a Good Regular Channel

Manual service protection is required for service-affecting tests during routine maintenance and for equipment changes in working regular channels. Normally, each service-affecting test or replacement procedure calls for the correct manual protection switching operation required to protect service. If in doubt, refer to Figure 2 or 3 to determine if a manual *line* or manual *span* switch is needed.

**NOTE:**

If the affected equipment is a radio or a regenerator, perform a manual *line* switch.

**CAUTION:**

To prevent service interruptions, refer to the Terminal/Regenerator—REPLACEMENT PROCEDURES tab before replacing any units in a line terminal bay. There may be additional manual protection switching operations necessary to properly protect service.

2.3 Maintenance on the Protection Channel

Manual service protection is required for service-affecting tests during routine maintenance and for equipment changes on the protection channel. This is done by performing a protection channel lockout for the appropriate receiving or transmitting direction. Figure 4 identifies the equipment that can be repaired or tested once the protection channel lockout is operated.

**CAUTION:**

Before replacing any protection channel unit in the line terminal bay, perform a protection channel lockout for the appropriate direction of transmission.

2.4 Maintenance on the Control and Service Channel Shelf

**CAUTION:**

*Before removing any control or logic plug-in unit or the POWER UNIT, the system **must be** in a normal nonswitched state. If the system requires a protection switch, attempt to clear the trouble before changing any control and service channel plug-in units. Otherwise, a **service failure** may result since a switch will normally be taken down upon removal of control or logic circuits.*

Repair that involves replacement of the SC MULDM, SC EXPN, or the (TERM or REGEN) OW units does not require any special precautions. However, replacement of any other control or logic plug-in unit (color-coded green) or the POWER UNIT requires an orderly plug-in removal and replacement sequence. Refer to the TERMINAL/REGENERATOR—**REPLACEMENT PROCEDURES** tab for the proper procedure.

3 Service Failure Alarm

An SRV ALM indicator on a CHAN STAT unit at the receiving-end terminal station indicates that a regular channel has failed and was not protected by the automatic protection switching equipment. This condition can be caused by atmospheric conditions (3.1), manual operations (3.2) that inhibit the protection channel availability, or a double equipment failure (3.3) within the switching section.

3.1 Atmospheric Conditions

Simultaneous fading on more than one channel can affect the signal transmission enough to cause a service alarm. This condition is likely if the service alarm clears and then reappears a number of times within a few minutes. Judgment is required to determine if the service alarm is the result of atmospheric conditions or equipment related trouble.

3.2 Manual Operations

The protection channel is not available if any of the following manual operations exist:

- Manual *line* or *span* switch of a regular channel to protection as indicated by an SW indicator on the associated CHAN STAT unit and LINE SW or SPAN SW indicator on the PROT STAT unit
- Manual lockout of the protection channel as indicated by the LOCK OUT indicator on the PROT STAT unit
- Manual access switch as indicated by the ACCESS SW indicator on the PROT STAT unit with the ACCESS PRMT indicator off.

The reason for any of these manual operations should be determined. Then, if allowed, make the protection channel available by performing the appropriate manual reset operation.

3.3 Double Equipment Failure

Double equipment failures that will cause a service alarm are as follows:

- Both a regular channel and the protection channel have a transmission failure simultaneously, as indicated by a FAIL indicator on both the PROT STAT unit and a CHAN STAT unit.
- Two regular channels have a transmission failure simultaneously as indicated by two FAIL indicators on the associated CHAN STAT unit(s).
- A regular channel has a transmission failure and the switch signaling or switch control equipment has a failure as indicated by a FAIL indicator on a CHAN STAT unit accompanied by a SIG FAIL indicator on the TRMT STAT unit at this receiving-end station and/or a DIAGNOSTIC CODE displayed in the RCV STAT unit at either terminal station.

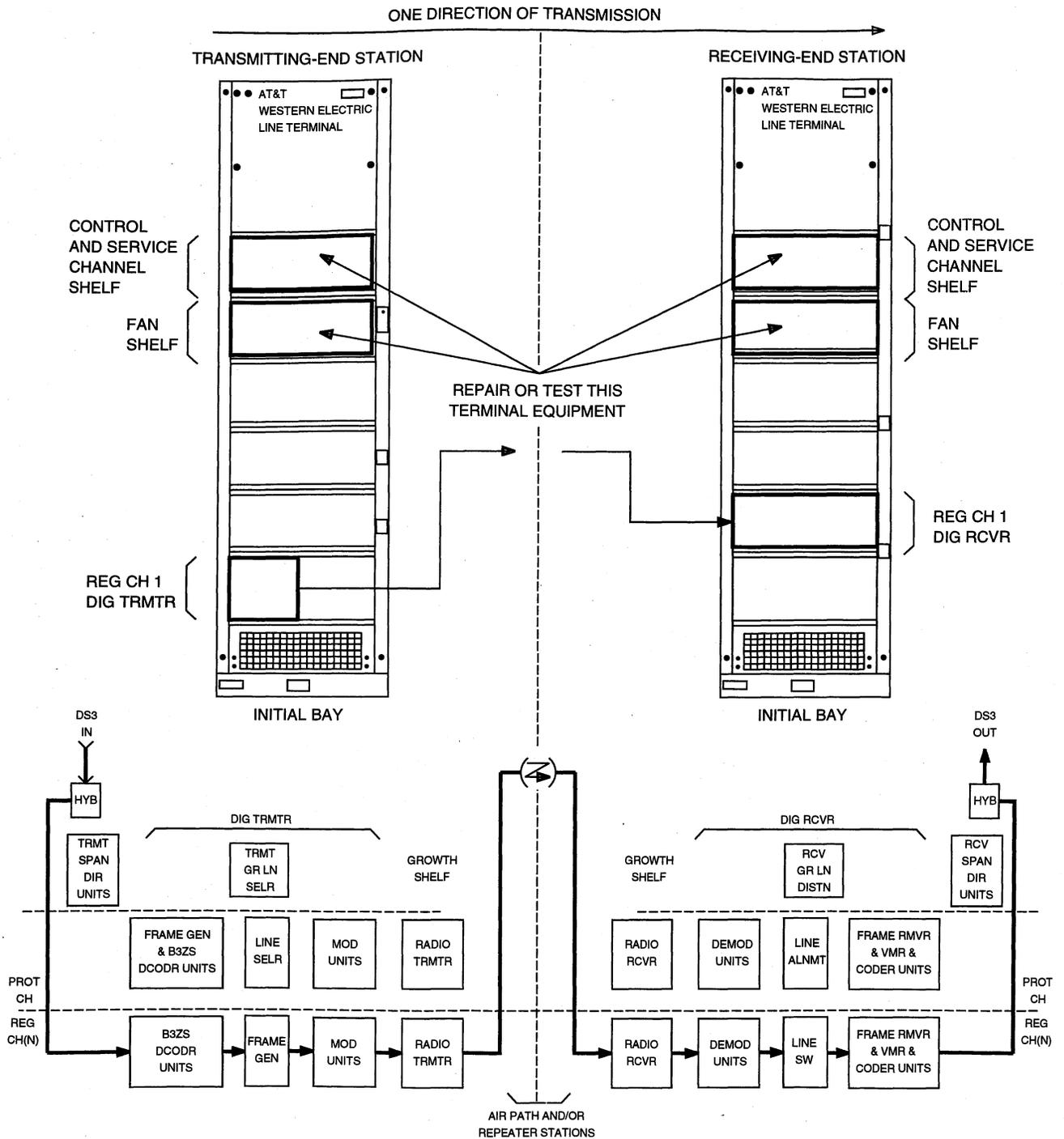


Figure 1. Normal Equipment Path with No Switches Operated

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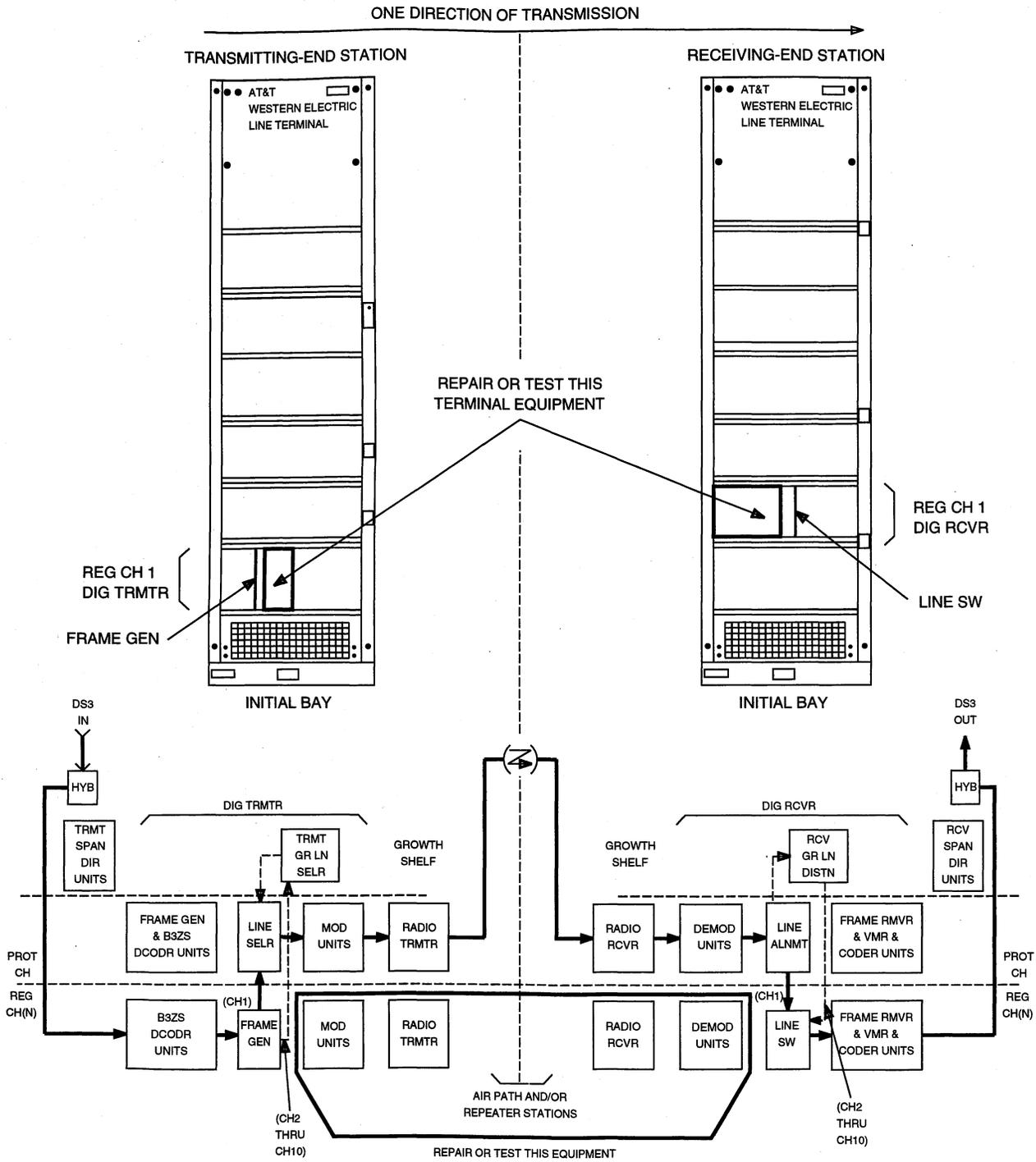


Figure 2. Equipment Protected with Manual Line Switch Operated

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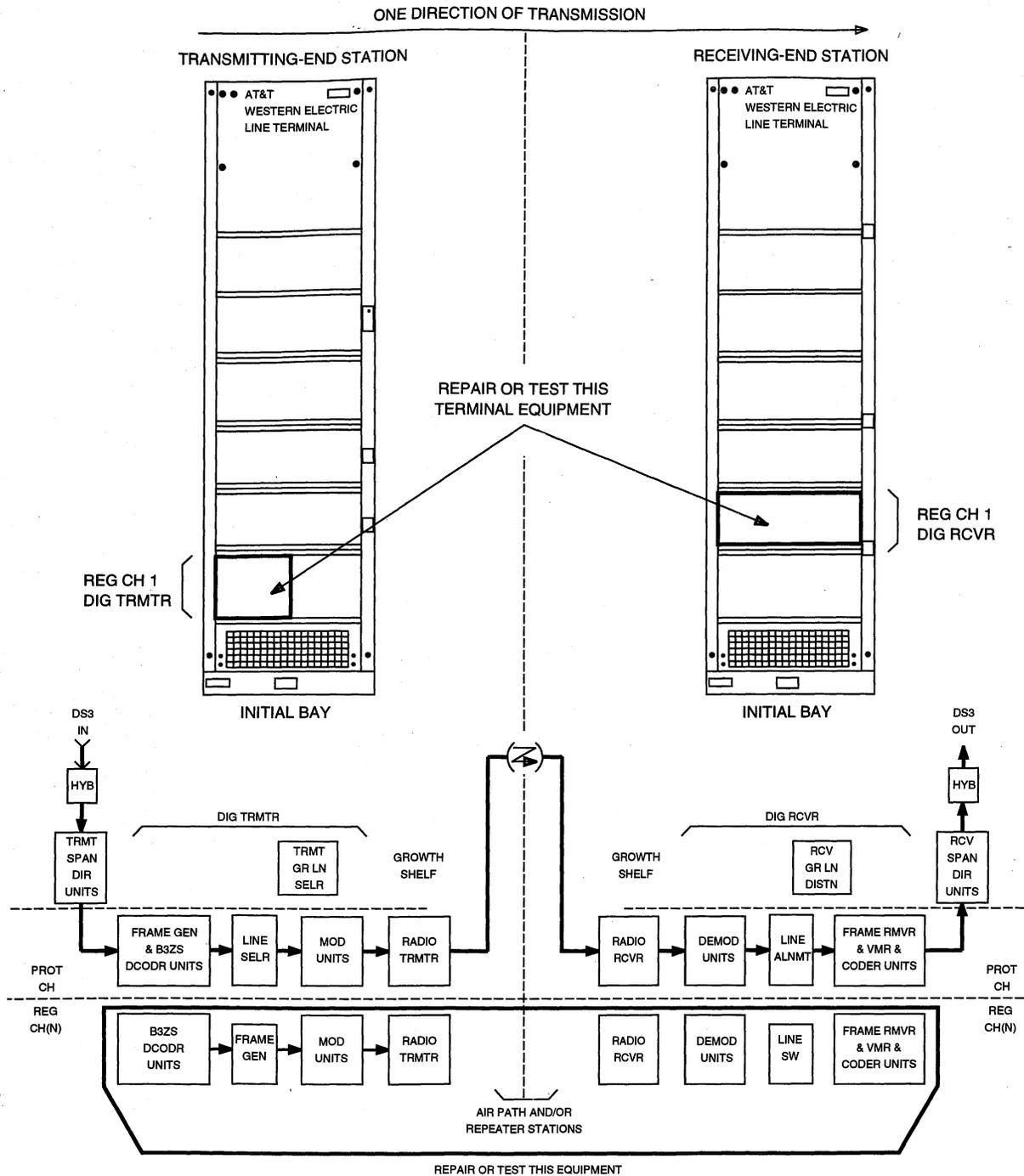


Figure 3. Equipment Protected with Manual Span Switch Operated

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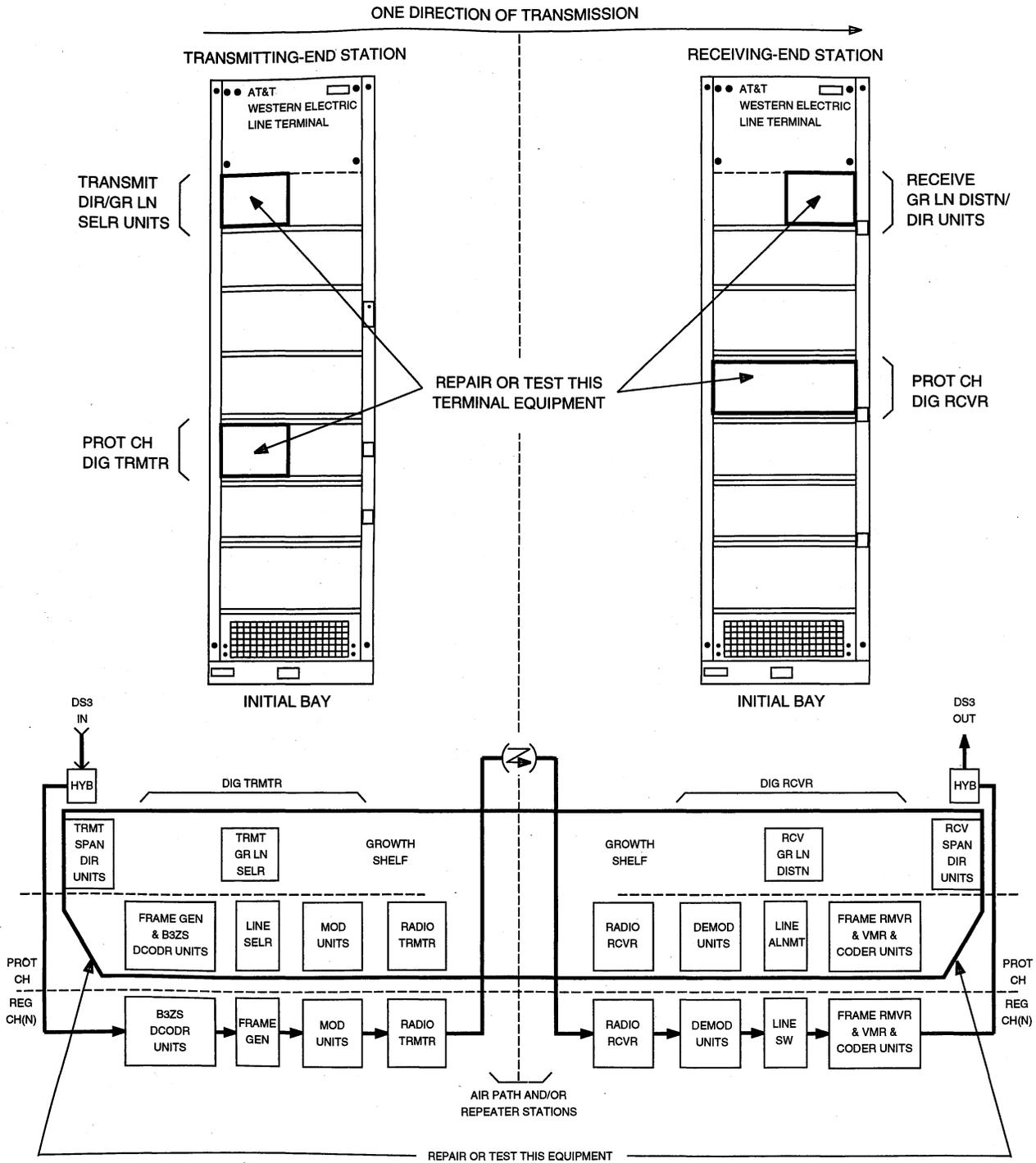


Figure 4. Equipment Protected with Protection Lockout Operated

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