

**OPERATION AND MAINTENANCE
MAINTENANCE SUPPORT
HOT STANDBY
DR 6/11-135EC
DOCUMENT INTRODUCTION**

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This manual provides information necessary to support the operation and maintenance of the DR 6/11-135EC digital radio hot standby system. The manual is divided into sections by major tabs. Each section is separated by subtabs for locating the information quickly. A 9-digit number is assigned to the material under each tab so that the information can be reissued easily. The group of practices in this binder make up the Operation and Maintenance, Maintenance Support Hot Standby manual, AT&T 421-104-060.

This practice is reissued to revise the information on how to use the documents in this binder. The practice is used in binder 421-104-060.

PURPOSE OF DOCUMENT

The primary purpose of this manual is to provide the descriptive and technical support information necessary to understand the features and functional aspects of Hot Standby DR 6-30-135 and DR 11-40-135 Digital Radio Systems. This support information includes the following:

- Physical and functional description of the radio system and the radio, regenerator, and line terminal bays with all associated units.
- Faceplate information for all plug-in units. Callouts are used to identify controls, indicators, and jacks.

This manual also provides additional testing and diagnostic procedures that may occasionally be necessary for troubleshooting, restoring, and maintaining satisfactory system performance. These additional procedures, which are beyond the scope of the operation and maintenance

manuals normally used at each station, provide engineering and maintenance personnel with techniques for:

1. Troubleshooting subtle system performance problems, which are often difficult to isolate with the normal troubleshooting procedures since they generally do not result in failure locating alarms by the built-in alarm system. These procedures are generally referred to as "nonalarm" problems.
2. Determining transmission parameter adjustments necessitated by replacements or other changes impacting on critical transmission parameters. These procedures are similar and in many cases identical to the tests and adjustments performed at initial installation.
3. Replacing and repairing unusual equipment failures, such as shelves, backplane pins, and passive radio RF components.

ASSOCIATED DOCUMENTS

As shown in Fig. 1, the DR 6/11-135 Hot Standby documentation consists of this Maintenance Support manual and the following:

1. **Operation and Maintenance—Terminal Station:** One volume that provides the necessary operation, alarm-clearing, test, adjustment, and replacement information for a terminal station.
2. **Operation and Maintenance—Regenerator Station:** One volume that provides the necessary operations, alarm-clearing, test, adjustment, and replacement information for a regenerator station.
3. **Maintenance Center Operations (Alarm Center):** One volume that provides the alarm center operator with the necessary information to analyze alarms, initiate dispatch of technicians, and verify repair and restoration of service. Scan and control point explanations, remote system operations, and typical system arrangements are also provided.

Following is a list of drawings associated with the DR 6/11-135 hot standby radio systems:

Schematic Drawings

SD-7C415-01	DR 6-30/DR 11-40-135 System Application
SD-7C423-01	135EC Line Terminal
SD-7C424-01	135EC Digital Regenerator
SD-7C418-01	DR 6-30-135 Indoor Waveguide
SD-7C419-01	DR 11-40-135 Indoor Waveguide
SD-7C422-01	Fan Shelf
SD-7C428-01	DR 6-30-135 Transmitter-Receiver
SD-7C429-01	DR 6-30-135 Radio Frame
SD-7C430-01	DR 11-40-135 Radio Frame
SD-7C431-01	DR 11-40-135 Transmitter-Receiver

Equipment Drawings

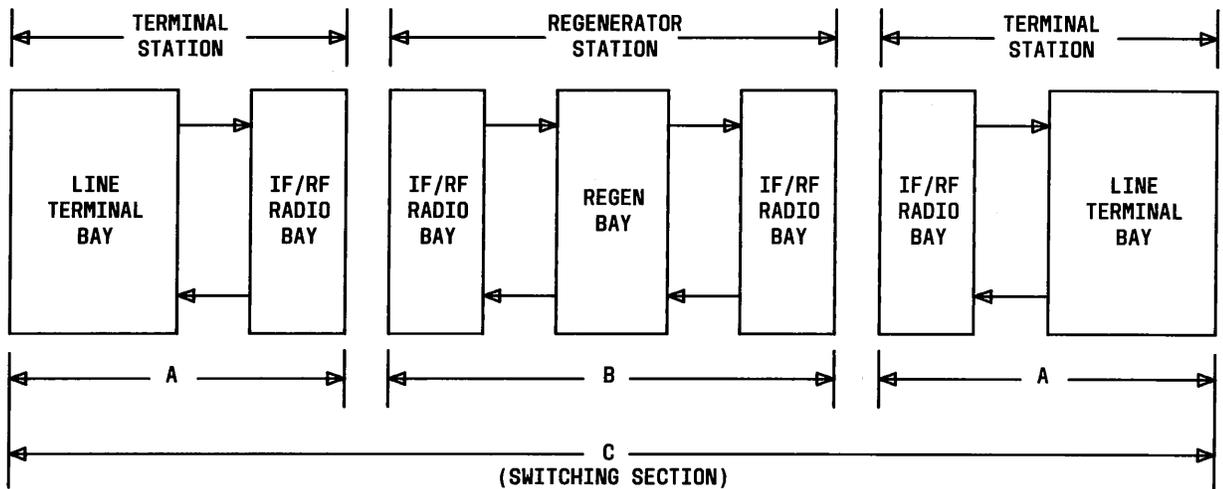
J98767C	135EC Line Terminal Bay
J98768C	135EC Digital Regenerator Bay
J98760A	DR 6-30-135 Transmitter-Receiver Bay

J98760B

DR 11-40-135 Transmitter-Receiver Bay

Miscellaneous Maintenance—Related Drawings

ED-8C530-10	DR 6-30/DR 11-40-135 Test Equipment and Tools Ordering Information
ED-8C531-10	DR 6-30/DR 11-40-135 Spare Parts
ED-1P128-12	DR 6-30/DR 11-40-135 Assignment of alarms, status indications and remote switches to E2A-type alarm processing remote bay.



COVERAGE REFERENCE	DOCUMENT IDENTIFICATION
A	OPERATION AND MAINTENANCE - TERMINAL STATION HOT STANDBY
B	OPERATION AND MAINTENANCE - REGENERATOR STATION HOT STANDBY
C	OPERATION AND MAINTENANCE - MAINTENANCE SUPPORT HOT STANDBY
C	MAINTENANCE CENTER OPERATIONS - SERIAL TELEMETRY HOT STANDBY

Fig. 1—DR 6/11-135 Documentation Plan

HOW TO USE DOCUMENTS

As shown in Fig. 2, documentation for the DR 6/11-135 hot standby system consists of four manuals that are designed to interact when required. Since most systems use centralized alarm-reporting, the terminal and regenerator operation and maintenance manuals are designed for this arrangement. Maintenance is on a demand basis directed by the Maintenance Center Operations (Alarm Center) manual. When an alarm is received at the alarm center, it is analyzed and a decision is reached to dispatch a technician to the appropriate station. The technician then uses the terminal or regenerator station operation and maintenance manual with the trouble-clearing philosophy shown in Fig. 3. An example of an alarm-clearing procedure is shown in Fig. 4.

When the centralized alarm-reporting arrangement is not used, maintenance personnel simply respond to the local office alarms of their specific station. For multiple hop systems where initial analysis indicates that the trouble may not be at their station, communications with maintenance personnel at other sites is necessary to isolate the actual trouble location. Once the trouble is located, the technician uses the terminal or regenerator station operation and maintenance manual with the trouble-clearing philosophy shown in Fig. 3.

As shown in Fig. 3, the trouble is first isolated to the terminal or regenerator, radio transmitter, or radio receiver trouble isolation procedure. The trouble isolation procedure directs the technician to an alarm-clearing procedure.

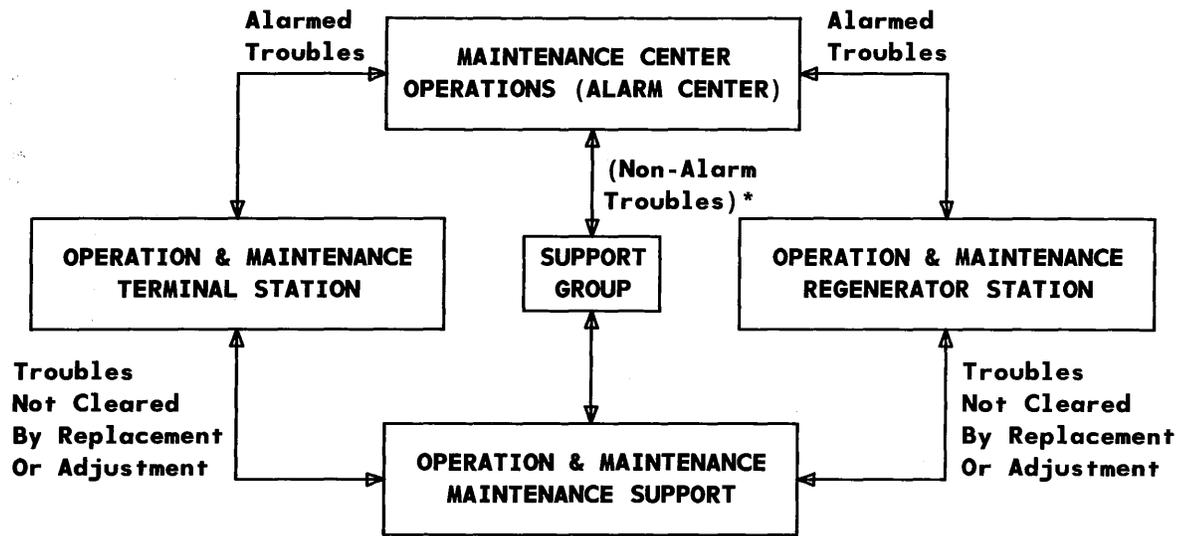
The terminal or regenerator alarm-clearing procedure may direct the technician to the "Test and Adjustments" tab or the "Replacement Procedures" tab.

The radio transmitter and receiver alarm-clearing procedures are made up of MRs (main routines), MSRs (main subroutines), and SRs (subroutines). The MRs and the MSRs direct the technician to the transmitter or receiver subroutines tab as required. When necessary, these routines refer the technician to the TASRs (Test and Adjustments Subroutines) or to the Replacement Procedures.

When referred from an MR, MSR, or SR to another routine, record where you left the first routine to ensure that you return to the proper place when directed.

After the trouble is cleared, station and switch section verification procedures are required.

When degraded performance is known to exist but does not generate a localizing alarm, the technician should go to the Maintenance Support manual for assistance in clearing the nonalarm condition. The Maintenance Support manual also contains equipment, functional, and circuit pack descriptions and other information that supports the overall operation and maintenance functions.



***Performance Degraded Without Alarms**

Fig. 2—Relationships Between Operation and Maintenance Manuals

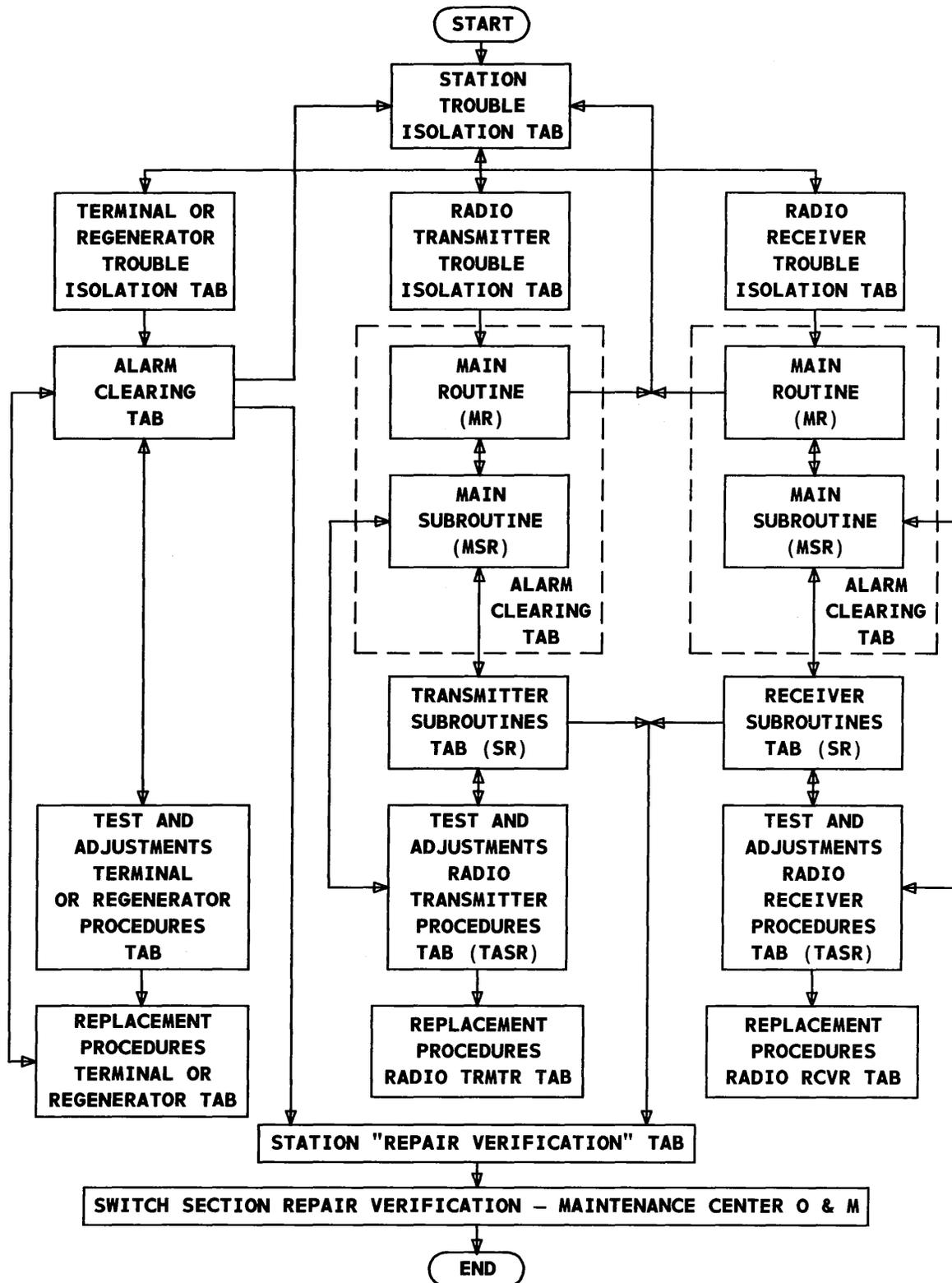


Fig. 3—Station Trouble-Clearing Process for Alarmed Conditions

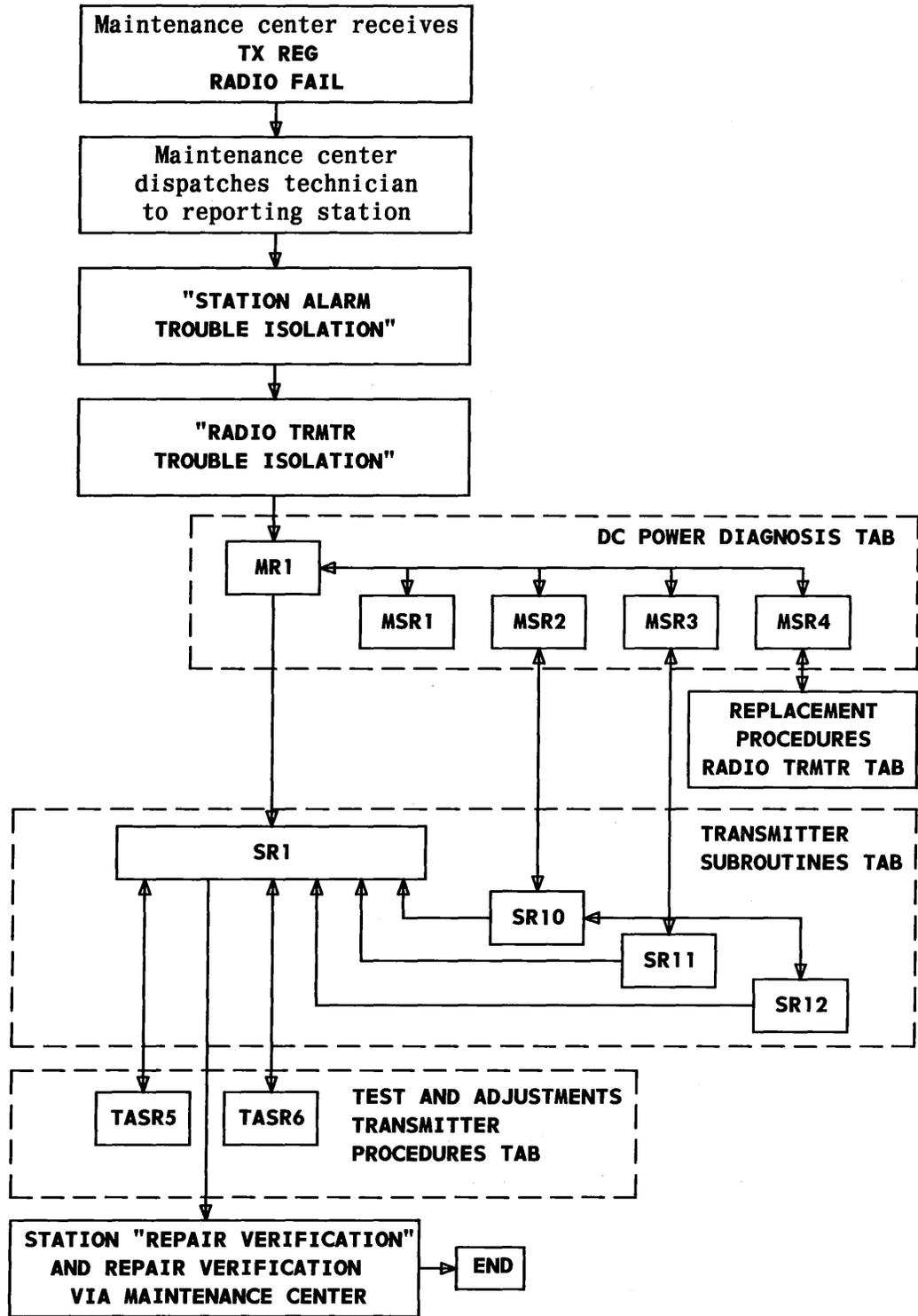


Fig. 4—Example of Alarm-Clearing Sequence for Transmitter Power Unit Failure

ADMONISHMENTS

Admonishments are provided to assure safety of personnel, to avoid service interruptions, and to avoid equipment damage. The admonishments used in this document are defined below.

- DANGER—When there is a possibility of personal injury
- CAUTION—When there is a possibility of service interruption
- WARNING—When there is a possibility of equipment damage.

The following general admonishments should be observed whenever maintenance is performed on this equipment.

DANGER: Never look directly into an unterminated waveguide port or open waveguide run when a signal is present; otherwise, eye damage may occur due to RF radiation.

Caution: Ensure service is protected prior to repair. See "Service Protection Prior to Repair."

Caution: Service interruption of operating channels may occur when working around in-service equipment.

Warning: To prevent ESD (electrostatic discharge) from damaging a plug-in unit, ensure that all ESD procedures are followed during handling and storage of circuit packs.

Warning: Backplane or circuit pack connector damage may occur during replacement unless the plug-in unit replacement procedures are followed.

Warning: A torque wrench at proper rating must be used to tighten all radio SMA connectors to prevent connector damage.

Warning: All test apparatus must be properly supported to prevent connector damage due to strain on the connectors.

SERVICE PROTECTION PRIOR TO REPAIR

Action taken to protect service depends on the equipment and the type of repair. Most repair activity will cause interruption to a transmission path. Normally, the alarm center personnel will analyze the condition of the equipment and initiate the appropriate remote commands to protect service. However, the technician at a terminal or regenerator location can manually initiate local commands to protect service.

Before repairing any transmission path, verify with the remote alarm center or via local indications that the remote or local service protection operations have been successful.

REGULAR EQUIPMENT FAILURE

When the regular equipment fails, the service it normally carries is automatically switched to the standby equipment. Before beginning repair in such a case, an automatic switch should be reinforced with a manual switch.

PROTECTION EQUIPMENT FAILURE

When the standby equipment fails, any regular equipment failure for the associated direction is inhibited from switching to the failed standby equipment. Prior to repair, the protection channel should be manually locked out.

It is recommended that the standby equipment for the opposite direction not be locked out so it will be available for any regular equipment failures for that direction of transmission. The opposite direction standby equipment may take "hits" during repair activity, but regular equipment service will not be affected unless a switch has occurred during the maintenance process.

ELECTROSTATIC DISCHARGE

A static charge of several thousand volts can be produced by friction and retained by the human body. A person can retain a charge by walking across a carpeted floor during low humidity conditions. The static discharge occurs when the static charged person nearly touches another person, a metal of a different potential, or a grounded object. While static charging is the oldest known and easiest way to produce electricity, it is still considered a natural phenomenon with extremely complex characteristics depending on material composition, reactions on different materials, environment, and conditions of contact. Damage or degradation to electronic equipment by ESD is caused when a statically charged object, predominantly a person, makes direct or near contact (discharge) with the equipment. It can also be caused by noncontact (induction) from a surrounding electric field. Electronic devices can accumulate a static charge during transport or even while in storage. Total isolation or shielding of people or equipment and circuits to protect against ESD is not yet possible.

Under some circumstances, circuit packs, particularly those containing integrated circuits, can be damaged by the discharge of static electricity. Static electricity also can disrupt the operation of central office equipment and minicomputers.

METHODS FOR PREVENTING CIRCUIT PACK DAMAGE CAUSED BY STATIC ELECTRICITY

Static electricity is not likely to damage circuit packs in operating equipment; however, there is a risk when replacing, shipping, installing, and repairing these circuit packs. Use the following methods to help prevent static electricity damage:

- Immediately before inserting, removing, or handling circuit packs, obtain and wear a conductive wrist strap connected to ground.
- Always hold the circuit pack only by its outermost top and bottom edges and by its faceplate or latch.
- Do not remove the circuit pack from its antistatic container until ready to insert it in a frame.
- Return circuit packs in antistatic protective packaging if circuit packs contain integrated circuits. Packs should be returned in antistatic packaging whether or not spare circuits are packaged in antistatic materials.

- When repairing circuit packs, use a grounded soldering iron and/or desoldering tool. The technician should wear a conductive wrist strap connected to ground.
- Keep ordinary plastic away from the immediate vicinity of electronic equipment. Avoid contact of integrated circuits with ungrounded plastics, metals, or human hands.

ISSUING ORGANIZATION

Published by the AT&T Documentation Management Organization.

COMMENT FORMS

Comments concerning any problems with the content, usability, and adequacy of the Maintenance Support manual would be appreciated. Please give specific part/section identification, paragraph reference, or problem area, as applicable, and the correction or suggested improvement.

Comments submitted by: _____ Date: _____

Location _____

Send to:

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 2400 Reynolda Road
 Winston-Salem, NC 27106
 ATTN: Radio Department

TAB	SECTION NUMBER	PARAGRAPH REFERENCE OR PROBLEM AREA	CORRECTION OR SUGGESTED IMPROVEMENT
			Comment(s) continued on reverse side.

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