OPERATION AND MAINTENANCE
MAINTENANCE SUPPORT
DR 6-30-135 AND DR 11-40-135
DOCUMENT INTRODUCTION

CONTENTS PAGE

This manual is used to support the operation and maintenance of the DR 6-30-135 and DR 11-40-135 Digital Radio Systems. The manual is divided into sections by major tabs. Each section is separated by subtabs so that information can be located quickly. Also, the material under each tab has been assigned a 9-digit number so the information can be reissued easily.

This practice is reissued to combine AT&T Practices 421-101-003, 421-101-041, 421-104-003, and 421-104-041 and to replace the comment form with the customer comment sheet. This practice is used in binders 421-101-001, 421-101-060, 421-104-001, and 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 DR 6/11-135 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.

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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 that are often difficult to isolate because they do not cause an automatic alarm. These performance problems are referred to as "nonalarm" problems.
2. Determining transmission parameter adjustments after critical equipment has been replaced. These adjustments are similar to the tests and adjustments performed at initial installation.
3. Replacing and repairing equipment such as shelves, backplane pins, and passive radio RF components.

ASSOCIATED DOCUMENTS

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

1. **Operation and Maintenance—Terminal Station:** One volume that contains the operation, alarm-clearing, tests, adjustments, and replacement information for a terminal station.
2. **Operation and Maintenance—Regenerator Station:** One volume that contains the operations, alarm-clearing, tests, adjustments, 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 radio systems:

Schematic Drawings

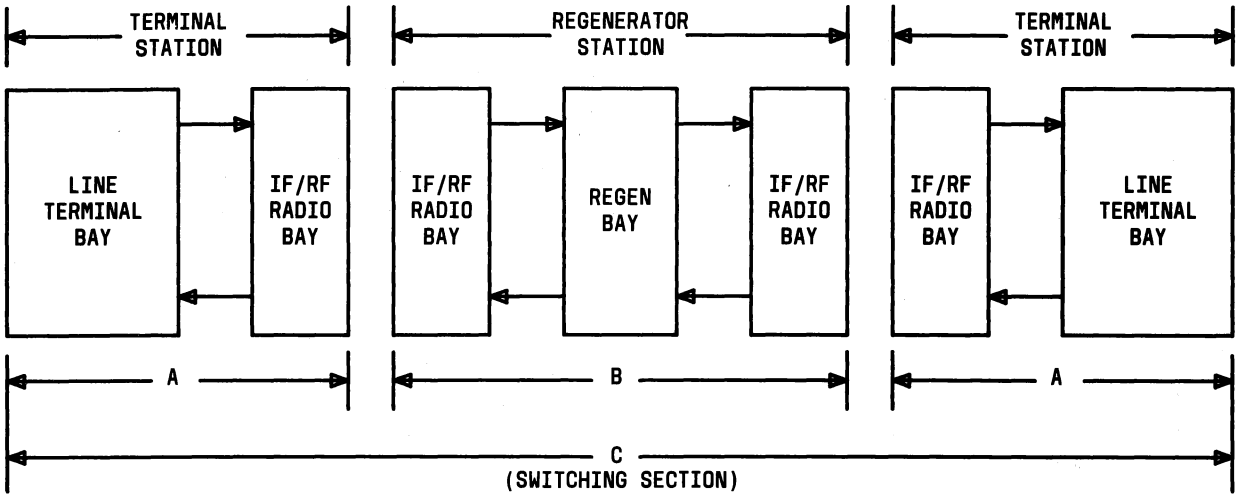
SD-7C415-01	DR 6-30/DR 11-40-135 System Application
SD-7C416-01	135A Line Terminal
SD-7C423-01	135EC Line Terminal
SD-7C417-01	135A Digital Regenerator
SD-7C424-01	135EC Digital Regenerator
SD-7C418-01	DR 6-30-135 Indoor Waveguide
SD-7C419-01	DR 11-40-135 Indoor Waveguide
SD-7C422-01	Fan Shelf
SD-7C428-01	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

J98758A	135A FD Line Terminal Bay
J98758B	135A FD Line Terminal Growth Bay
J98759A	135A FD Digital Regenerator Bay
J98759B	135A FD Digital Regenerator Growth Bay
J98767A	135EC FD Line Terminal Bay
J98767B	135EC FD Line Terminal Growth Bay
J98768A	135EC FD Digital Regenerator Bay
J98768B	135EC FD Digital Regenerator Growth Bay
J98758C	135A HS Line Terminal Bay
J98759C	135A HS Digital Regenerator Bay
J98767C	135EC HS Line Terminal Bay
J98768C	135EC HS 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
B	OPERATION AND MAINTENANCE - REGENERATOR STATION
C	OPERATION AND MAINTENANCE - MAINTENANCE SUPPORT
C	MAINTENANCE CENTER OPERATIONS

Fig. 1. DR 6/11-135 Documentation Plan

HOW TO USE DOCUMENTS

As shown in Fig. 2, documentation for the DR 6/11-135 system consists of four manuals that reference each other. 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 "Tests 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 (Tests 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.

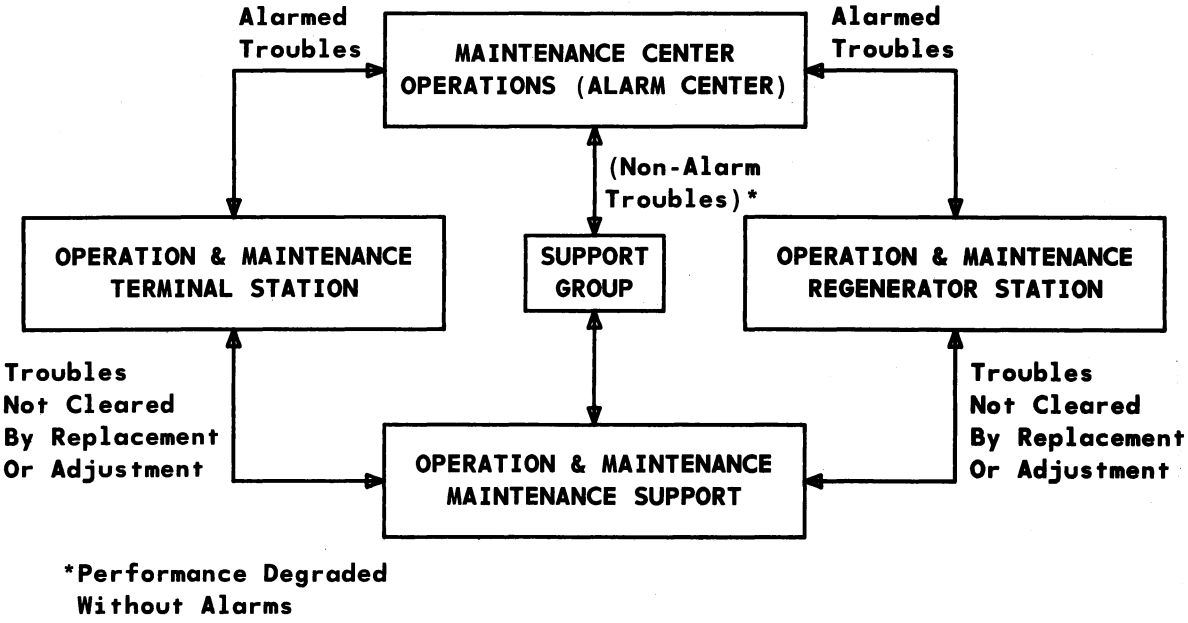


Fig. 2. Relationships Between Operation and Maintenance Manuals

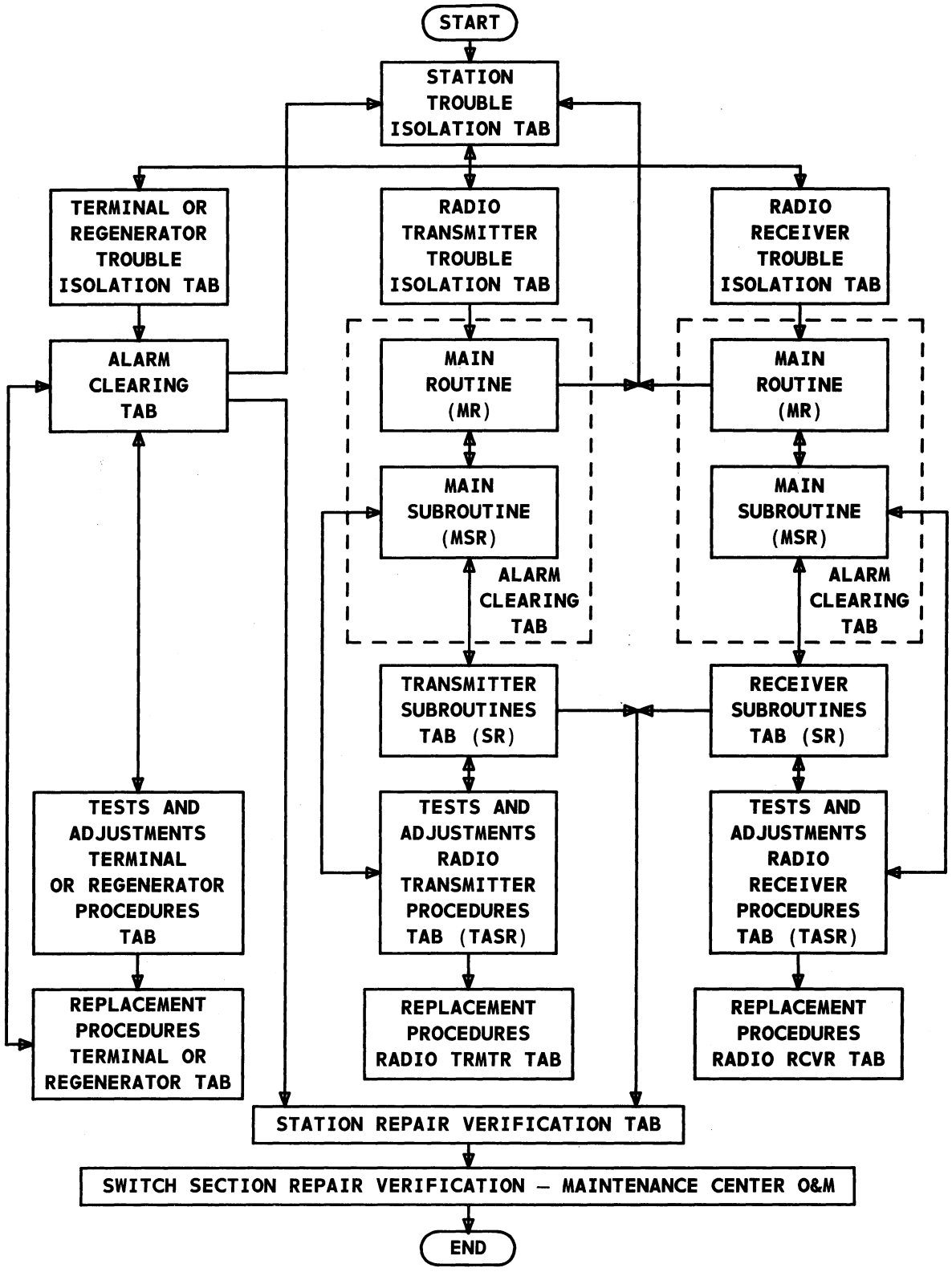


Fig. 3. Station Trouble-Clearing Process for Alarmed Conditions

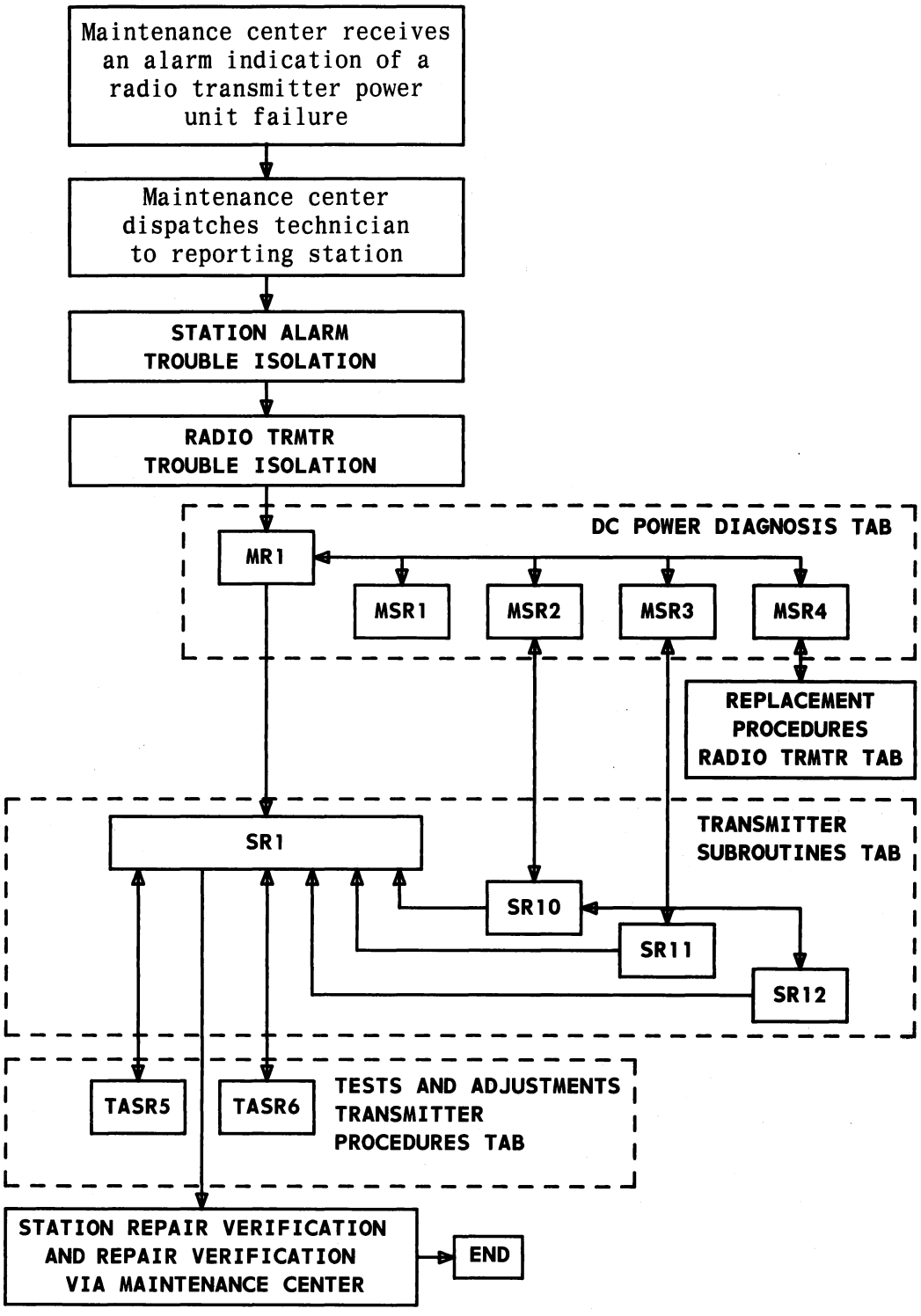


Fig. 4. Example of Alarm-Clearing Sequence for Transmitter Power Unit Failure

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: Due to RF radiation, looking directly into an unterminated waveguide port or open waveguide run when a signal is present may cause eye damage.

Caution 1: Ensure service is protected prior to repair. See Service Protection Prior to Repair.

Caution 2: Service interruption of operating channels may occur when working around in-service equipment.

Warning 1: To prevent ESD (electrostatic discharge) damage to a plug-in unit, ensure that all ESD procedures are followed when handling and storing circuit packs.

Warning 2: Backplane or circuit pack connector damage may occur during replacement unless the plug-in unit replacement procedures are followed.

Warning 3: To prevent connector damage, a torque wrench at proper rating must be used to tighten all radio SMA connectors.

Warning 4: 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 CHANNEL FAILURE

When a regular channel fails, the service it normally carries is automatically switched to the protection (FD)/standby (HS) channel. Before beginning repair in such a case, reinforce the automatic switch with a manual switch.

PROTECTION CHANNEL FAILURE

When the protection/standby channel fails, a regular channel failure for the associated direction is inhibited from switching to the failed channel. Prior to repair, manually lock out the protection channel.

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

ELECTROSTATIC DISCHARGE (ESD)

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 statically 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 of electronic equipment by ESD is caused when a statically charged object, usually 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.

CUSTOMER FEEDBACK

If you have any comments, please fill out the customer comment sheet at the back of this section. Your comments will help us improve the quality and usefulness of our documentation. This comment sheet does not require postage and is the preferred method of communicating with AT&T about this manual.

If the comment sheet is missing or your comments are too detailed to fit on the sheet, you may write us at the following address:

AT&T
ATTN: Radio Department
2400 Reynolda Road
Winston-Salem, NC 27106-4606.

Comments will be acknowledged within 30 days. Thank you in advance for your comments.