

tcaas

T-CARRIER ADMINISTRATION SYSTEM

Reduce down time –
improve service on
metropolitan area
T-1 Carrier networks

An automated alarm
reporting, analyzing
and trouble
sectionalization system
with minicomputer
control



Western Electric



T-Carrier Administration System

**Reduces outage time
on metropolitan
T1 Carrier networks**

**Reduces maintenance
manpower**

With about 1 1/2 million message and special service trunks being provided today by T1 Carrier, the administration and maintenance of the T1 networks in metropolitan areas is becoming increasingly complex. With new developments such as the Digital Data System and Digroup Terminals for the No. 4 ESS coming along, the size and complexity of the networks will continue to grow and with them, the problem of maintainability. TCAS was developed to help keep the administration of these networks within manageable proportions. The concept of TCAS evolves from and expands upon the functions of the T-Carrier Restoration Control Centers (TRCC) currently employed or planned by a number of Bell Telephone Companies.

WHAT IT DOES—TCAS employs E2 or E2A* remote telemetry equipment at local, intermediate repeater and hub offices associated with the T1 network. Under the programmed control of a minicomputer central and associated TCAS software, critical alarms and statuses such as carrier group, fuse and bay alarms, maintenance line statuses etc. are automatically reported by each office in near real time via E-telemetry to a T-Carrier Administration Center—the heart of the TCAS system. The TCAS central automatically performs the following functions to enable the center to rapidly direct the restoration of service using available T1 maintenance lines.

- Analyzes incoming alarms in real time
- Sectionalizes system failures or intermittent span and terminal hits to a faulty span or terminal
- Monitors the status of maintenance lines in real time
- Identifies major route failures
- Makes routine periodic measurements of transmission performance of all monitored T1 lines
- Provides periodic management reports on the performance of the metropolitan T1 Carrier network

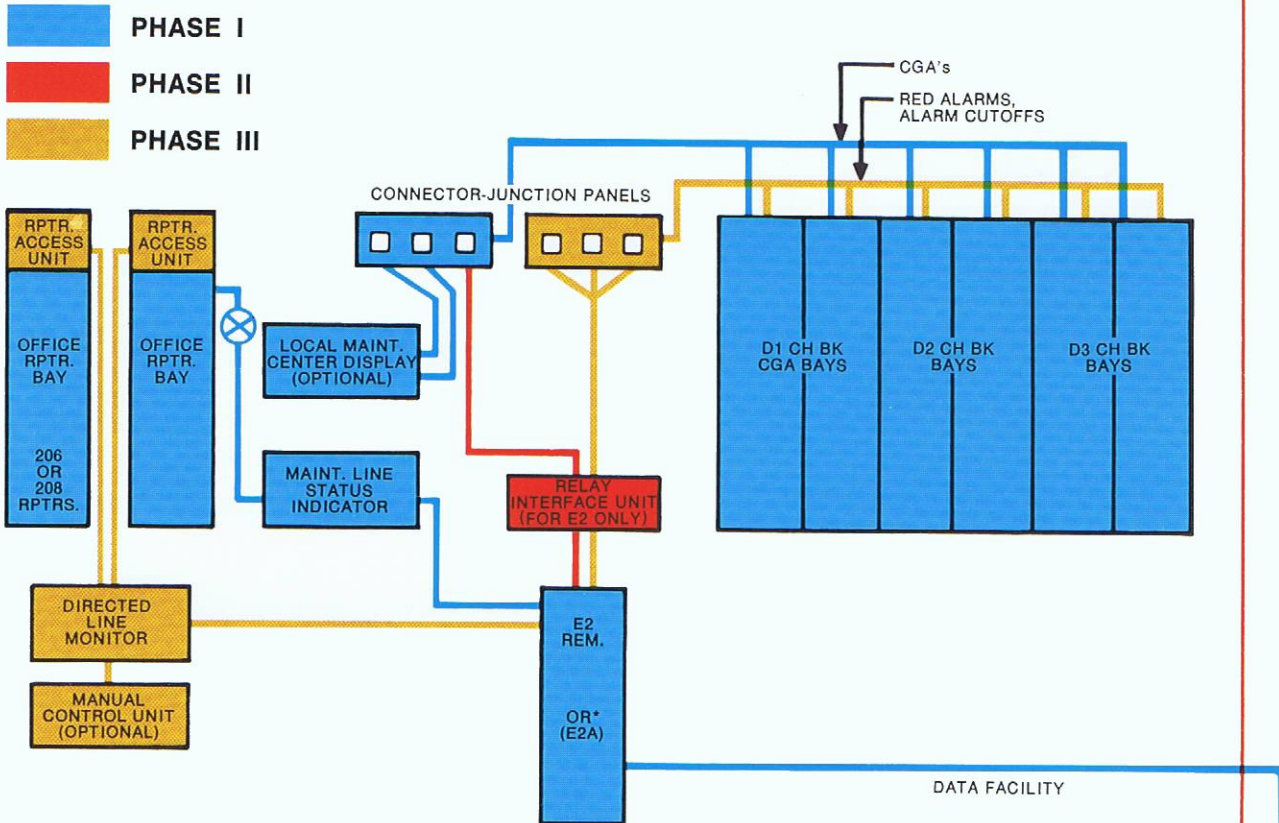
* E2A will be available for TCAS applications in 1976



Implement in Three Phases

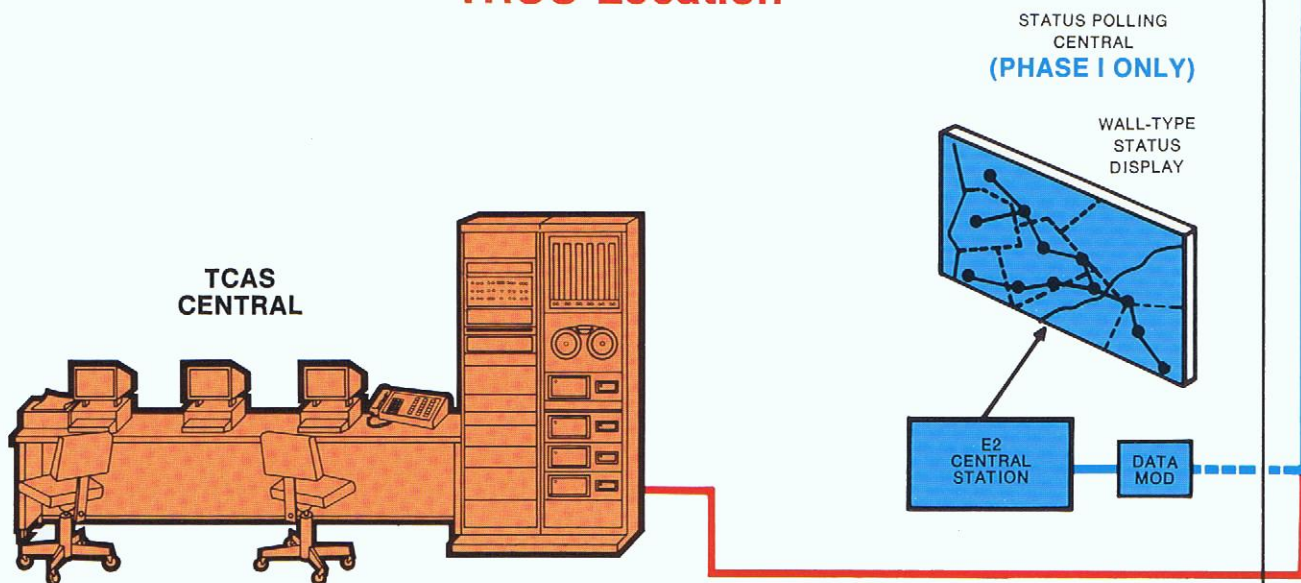
To be effective, TCAS must include a significant portion of both terminal and intermediate office locations comprising the metropolitan area T1 network. A plan has been developed to implement TCAS in three phases each of which provides both immediate and long range benefits but spreads the cost and effort out over several years. A great deal of consideration has been given in the system design to cutting the costs of engineering and installation through the use of simplified equipment coding, standard interconnection formats, connectorization and new E2 bay configurations.

Local Office



*E2A available for TCAS in 1976

TRCC Location



Phase I

**For a more
efficient
TRCC**

The T-Carrier Restoration Control Center administers a network of T1 maintenance and backbone lines which can be patched in as required to restore service between terminals connected to a faulty system. These lines are wired through selected intermediate and hub offices where their statuses are verified by daily loop testing and reported to the TRCC. In local T-Carrier offices, craftsmen responding to alarms must establish that the trouble is in the repeatered line before reporting it to the TRCC.

These activities require a great deal of telephone coordination, are time consuming and can contribute to delays in restoring service. In Phase I, some of the manual testing and reporting functions are centralized while others are automated in real time using the new Western Electric equipment units described below.

1. Local Maintenance Center Display (J98722C and D)

**IMPROVES ALARM
RESPONSE TIME BY
UP TO 15 MINUTES**

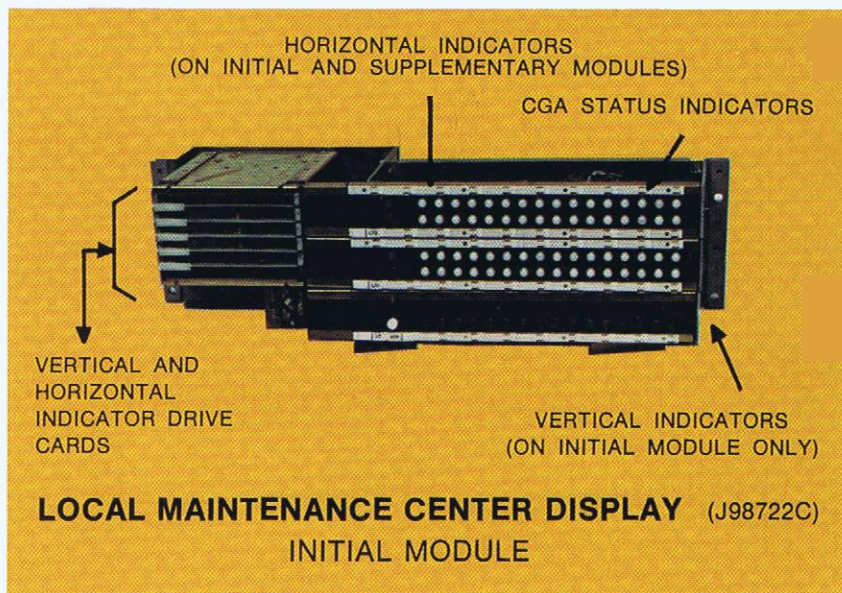
This is an optional unit which provides a centralized standard display of the Carrier Group Alarm status of each T-Carrier, DDS and other digital transmission system in an office. A fully equipped LMCD can accommodate 64 CGA's but can be partially equipped in units of 16. Green lamps at the left and bottom permit rapid identification of any steadily lit (system failure) or intermittent (hit) lamp in terms of its x and y coordinates. The unit provides simultaneous outputs to the office bay and aisle alarm systems to alert the craft personnel who, with a glance at the display, can quickly locate the alarmed terminal. Both the lamp and alarms remain on until cleared by operation of the Status Cutoff Key. Each module has a connectorized input compatible with the Connector-Junction Panel to reduce cabling costs. Supplementary Local Maintenance Center Display J98722D permits expansion to 576 T1 systems in a single J-coded bay.

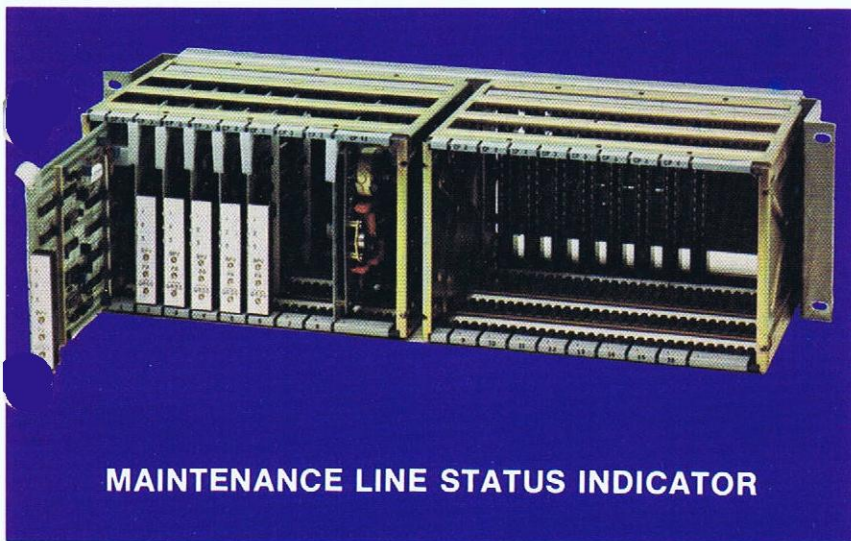
2. Maintenance Line Status Indicator (MLSI)

**MONITORS MAINTENANCE
AND BACKBONE LINES
FULL TIME—ELIMINATES
DAILY LOOP TESTING**

When installed at intermediate and hub offices, the Maintenance Line Status Indicator performs line monitoring on a full time basis. It continually checks the bipolar violation and pulse density rates of each maintenance and backbone line appearing in the office and provides visual status indications to the craft forces. There will no longer be any need for craftsmen to spend valuable time looping and testing—they see the status continuously in real time rather than just once a day. The indications may be remotored to the TRCC via E-Telemetry. Two types of plug-in detector can be used with the MLSI

- Bipolar violation and Pulse Density (BPV-PD) detector
 - For 206-Type Repeatered Lines
 - For Offices with DSX-1 Cross Connect
- Quasi- Random Signal Source (QRSS) detector
 - For use in addition to BPV-PD on 201-Type Repeatered Lines. Lines must be driven by a QRSS source so that if any portion is patched to a valid channel bank signal by craft forces, the seizure will be immediately detected.





MAINTENANCE LINE STATUS INDICATOR

3. E2 Telemetry Equipment

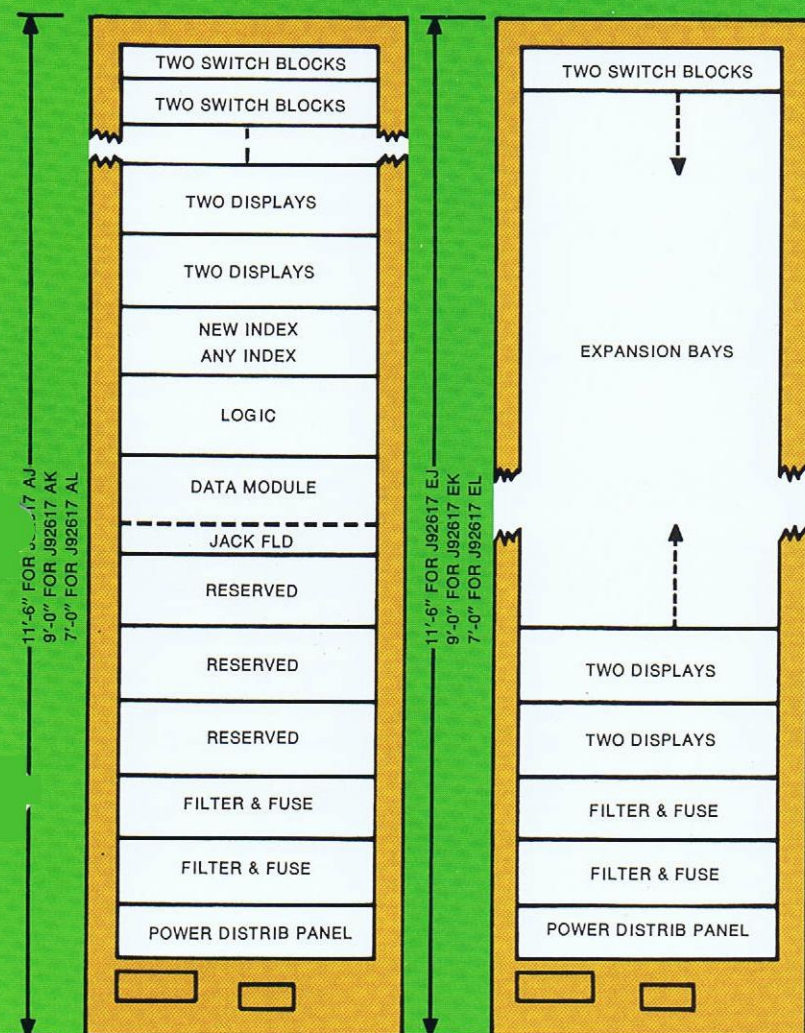
E2 ALARM POLLING REMOTES (AT MLSI OFFICES)

Operates in status polling mode during Phase I (No change required for later operation in alarm polling mode)

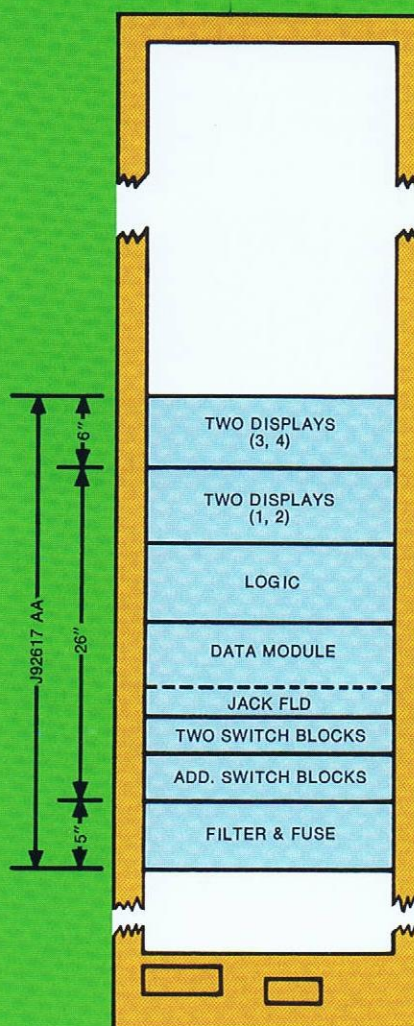
Transmits MLSI status indications to TRCC

Eliminates voice reporting

ALARM REPORTING REMOTE BAYS



ALARM REPORTING REMOTE UNIT



E2 STATUS POLLING CENTRAL (AT TRCC)

Continuously polls E2 remotes for
MLSI indications

Shows line statuses on your own
wall-mounted display board (or *Local
Maintenance Center Display Unit*)

NEW COST REDUCTIONS FOR E2 ENGINEERING AND INSTALLATION

- **SIMPLIFIED EQUIPMENT CODING**—provides all system features (including circuit packs) for the alarm reporting application on a list basis
- **E2 ALARM REPORTING BAYS**—prewired and factory tested to eliminate all installer wiring within the bay
- **CONNECTOR JUNCTION PANEL (J98722A)**—provides "standard interconnection format" with significant savings in E2 cabling and display assignment costs. Terminates small pair complements from monitored equipment on six

terminal blocks factory wired to three multipin connectors for 32-pair cables to E2

CONNECTOR-JUNCTION PANEL



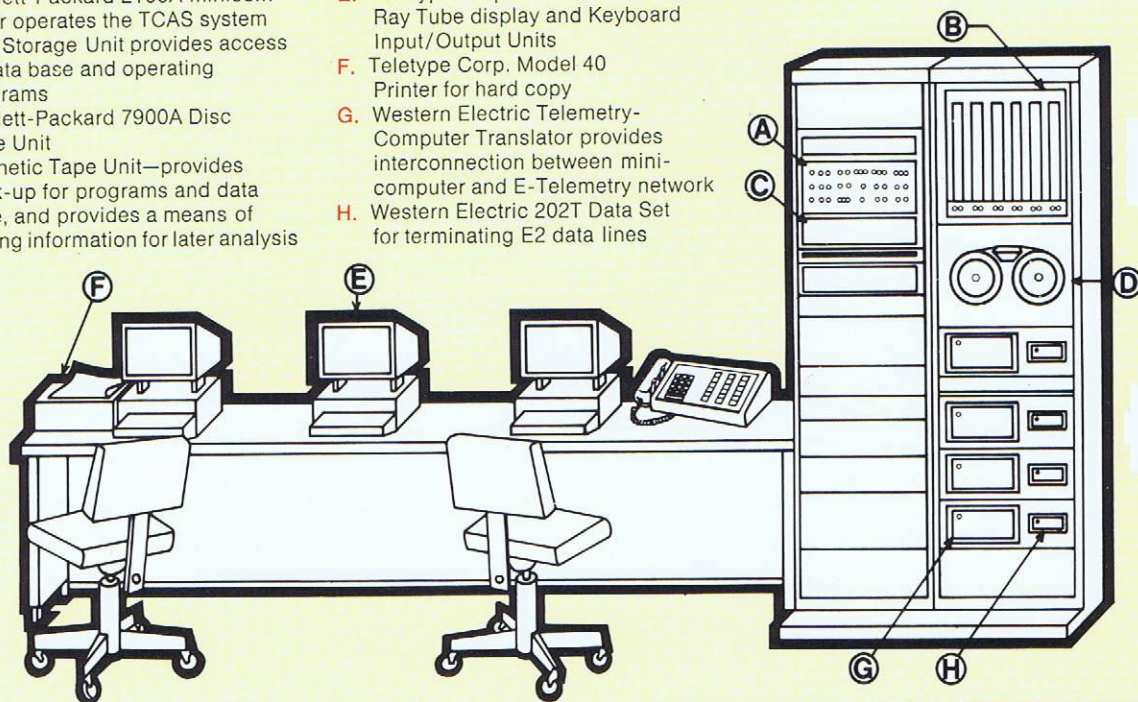
Phase II

Automated Central and CGA Reporting

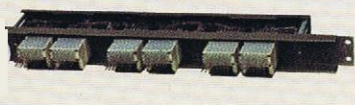
In Phase II, Carrier Group Alarms from D1, D2 and D3 Channel Banks in the selected offices are remoted to the TRCC via E-Telemetry. Relay Interface Unit J98722B is available to provide the isolated contacts required to connect D1 CGA and Red alarms to E2. The E2 Central is replaced by an automated TCAS Central using a minicomputer to

THE TCAS CENTRAL Hardware

- A. Hewlett-Packard 2100A minicomputer operates the TCAS system
- B. Disc Storage Unit provides access to data base and operating programs
- C. Hewlett-Packard 7900A Disc Drive Unit
- D. Magnetic Tape Unit—provides back-up for programs and data base, and provides a means of storing information for later analysis
- E. Teletype Corp. Model 40 Cathode Ray Tube display and Keyboard Input/Output Units
- F. Teletype Corp. Model 40 Printer for hard copy
- G. Western Electric Telemetry-Computer Translator provides interconnection between minicomputer and E-Telemetry network
- H. Western Electric 202T Data Set for terminating E2 data lines



RELAY INTERFACE UNIT



control the system operation and peripheral equipment. The automated Central operates in the alarm polling mode, receives digital system alarms and maintenance line statuses from the offices in real time and detects major span outage patterns.

Software

PHASE II

- Hewlett-Packard Real-Time Executive (RTE) program for system operation
- Alarm detection, analysis, patterning programs
- Alarm message and report generation programs
- Data base generation, updating and administration programs

PHASE III

Phase II programs plus

- Automatic trouble sectionalization program
- Automatic computer-to-computer interaction with other centralized maintenance centers
- Periodic performance evaluation program
- Additional management reports
- Automatic alarm cutoff capability

Phase III

Automatic trouble sectionalization

Phase III of TCAS remotes the channel bank red alarms and alarm cutoffs to the TCAS center and provides the software for automatic trouble sectionalizing. The latter is accomplished by the use of DIRECTED LINE MONITORS and REPEATER ACCESS UNITS which provide the Central with the ability to access and measure the performance of any T-Carrier line section at its associated office repeater. They are normally installed in those offices already equipped with E-Telemetry. The measurements provide the data for rapid trouble isolation and facilitate service restoral using maintenance lines rather than backbones.

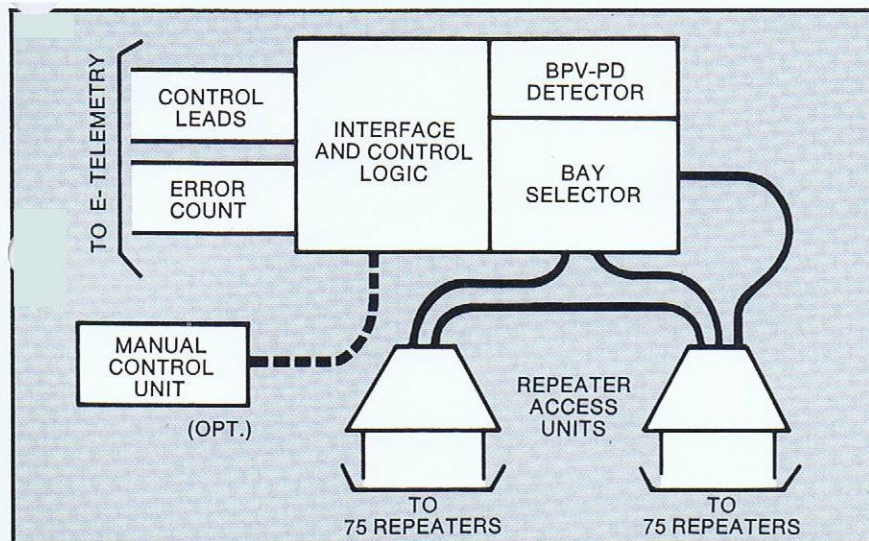
Directed Line Monitor (DLM)

- Measures bipolar violation and pulse density rates at input or output of office repeater
- Includes switching logic for connecting monitor to bay specified by sectionalization program
- Returns bipolar violation rate and error free seconds to Central via E-Telemetry

Repeater Access Unit (RAU)

- Provides second stage of switching, bridges DLM across terminals of office repeater whose shelf and position in the shelf is specified by program
- May be field or factory installed
- Permits complete flexibility of accessing a system since reassignment only requires a change in the data base

DIRECTED LINE MONITOR AND REPEATER ACCESS UNIT



Putting it all together

With the implementation of DLM's and RAU's, the T-Carrier Administration Center will have acquired the capability of alarm detection, analysis and sectionalization for a substantial portion of the T-Carrier network that terminates or passes through these offices. To complete the implementation of TCAS, the same arrangements are expanded to other offices to obtain more complete coverage of the network. This expansion will normally take place over a period of several years and utilize the E2A Remotes which will be available for TCAS applications early in 1976.

WESTERN ELECTRIC continues to stand ready to assist you in meeting your requirements for transmission systems of all types. For additional information or technical assistance, please contact the Service Consultant, Transmission Products, serving your State or Region.

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REFERENCES:

DL #3063 Planning Information
for TCAS
EL 2549 E2 Alarm Reporting
Application
DL #3078 E2A Telemetry System
Planning Information

PECC Merrimack Valley
Manufacturing Burlington, N.C.
PRODUCT INFORMATION
ORGANIZATION