

## T CARRIER RESTORATION CONTROL CENTER (TRCC) ORGANIZATION AND RESPONSIBILITIES

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### 1. GENERAL

1.01 This section is issued to:

- (a) Describe the organization and operation of a T Carrier Restoration Control Center (TRCC)
- (b) Define the procedures to be followed when a T Carrier System fails
- (c) Define the responsibilities of the TRCC and all T Carrier offices being served by the TRCC
- (d) Describe the analysis procedures to be followed by the TRCC.

1.02 The TRCC is an administrative plant operations center established in a metropolitan area to work with the central offices it serves to provide rapid restoration of T Carrier Systems that have a failure in the repeated line.

1.03 The TRCC need not have direct line organizational control over the central offices and cable maintenance personnel, but it will coordinate these forces in restoring failed T systems. Therefore, the TRCC must be recognized and accepted by the field forces even before the center is established. All offices within the area of the TRCC should be visited by the TRCC staff who will outline the objectives of the center, and stress the cooperation required for successful operation.

### 2. DEFINITIONS

2.01 *Span line* is a combination of manhole and office repeaters between two central offices.

2.02 *Maintenance (Spare) line* is a combination of manhole and office repeaters between two central offices set aside for restoring service when span line failures occur. The System recommendation is one maintenance line per 24 T Carrier System (one per apparatus case for

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bidirectional repeaters and two per case for unidirectional repeaters).

**2.03 Backbone line** is a number of maintenance (spare) lines wired in tandem through intermediate offices from one terminal office to another. The backbone line can be used for restoring a failed system independent of the central office forces sectionalizing the trouble to the span in question. The number of backbone lines between two terminals depends upon the number of systems and/or the amount of system failures experienced in the route. The TRCC is responsible for deciding how many are initially required. Then, from their experience, the TRCC can determine if more backbones are needed in a given route or if new backbones are required in other routes.

**2.04 System Control Office** is the terminal office having the maintenance responsibilities for the system that terminates at its location. This designation is given on the Circuit Order and System Layout Record Card E4940.

**2.05 Span Control Office** is the central office having the maintenance responsibilities for clearing troubles in the span; generally, it is the transmitting office. This designation is given on the Span Record Card E4941.

**2.06 Side system** is the system using the other side of a unidirectional repeater in one or two cable sheath or the system using the other side of a central office 201-type repeater. **Extreme caution** must be used when working on a failed system to avoid disabling the side system.

**2.07 CGA Hits:** In T Carrier a line disturbance of 300 milliseconds or longer causes the Carrier Group Alarm (CGA) to operate. All calls in progress when the CGA operates are disconnected. There are registers associated with all but the very early vintage D1 that show how often the CGA of a particular system has operated. On the D3 bank, the Trunk Processing Units (TPU) perform the same function. Hits of less than 300 milliseconds cause the framing lights on the D banks to light but do not drop calls in progress or have registers associated with them.

**2.08 Outage time** used in compiling system outage figures begins when the TRCC learns that a system fails. Usually this would be when the control office notifies the TRCC. However, if

the control office does not notify, the TRCC could start figuring outage time when a noncontrol office or a customer makes them aware that a system has failed. The outage time ends when the system is patched to a backbone line or to a maintenance line.

**2.09 Bridging repeaters** is a specially designed central office repeater to be used when patching T lines so that service need not be interrupted when the regular line is returned to service, ie, when the backbone or maintenance patch is removed.

### 3. RESPONSIBILITIES

#### TRCC

**3.01** The TRCC is an administrative plant operations center established in a metropolitan area to work with the central offices it serves to provide rapid restoration of T Carrier Systems that have a failure in the repeatered line. In order to do this, the **TRCC must have complete control over the use of all backbone and maintenance lines.**

**3.02** The physical setup for the TRCC should be simple, but the following basic items are a necessity:

(a) Adequate record of systems ... span and terminal records for all systems it serves (Forms E4940 and E4941).

(b) Adequate telephone service

—Several lines on a trunk hunt basis so offices calling will not have trouble reaching the TRCC and some lines to be used for outgoing calls.

—Conferencing (add-on) features on the telephones so that the TRCC will be able to coordinate restoration activities between several locations.

(c) A wall map or diagram of the offices being served showing all spans and backbone routes that exist. Also, the ability to show on the map when backbone lines are in use.

(d) Provide 24-hour coverage.

**3.03** The TRCC should be staffed by experienced T Carrier people. One of the first responsibilities of the *TRCC is to survey the central offices it serves for:*

- (a) Test sets available and in working condition
- (b) Telephone jacks available near T repeater bays
- (c) Fault-locating lines in good condition
- (d) Sufficient local dial lines available and accessible to T installations
- (e) Sufficient interbay and interaisle patching or DSX-1 facilities to the maintenance lines
- (f) Bridging repeaters wired and used in all central offices ... one per maintenance line
- (g) Order wires in working condition
- (h) The number of systems up on patch and the reason.

If any of these items are not provided or maintained, it is the responsibility of the TRCC to contact Engineering, Traffic, or the line Plant Supervision to correct the condition promptly.

**3.04** The TRCC must *set initial time goals* for service restoration, return of backbone lines, and return to regular facilities. The TRCC should consult with the offices it serves so that the time limits set are attainable. These times can then be reduced or improved as administrative controls evolve. The System recommended goals are:

- (a) Restore all failed systems within 15 minutes by using backbone lines.
- (b) During a normal working day, restore all backbone lines in less than 4 hours by using the maintenance line in the span the trouble was sectionalized to.
- (c) If the outage occurs when the offices are not manned, restore all backbone lines by the morning of the next working day.
- (d) Restore all maintenance lines by the following working day. The TRCC will be the judge as to whether this time is extended, eg, if there

are sufficient maintenance lines available in the span and the construction crews are needed in other spans, the TRCC might extend this time to the second working day.

The TRCC must control the maintenance lines as well as the backbone lines in order to minimize the time required for the use of the backbone lines and also the number required. The number required between two terminals depends upon the number of systems and/or the amount of system failures experienced in the route. The TRCC will decide how many are initially required and then from their experience determine if more are needed in a given route or if new backbones are needed in other routes.

**3.05** To be able to know the state of the T Carrier network, the TRCC should keep track of splicing operations being performed in T cable sheaths and troubles that develop as a result of such work. The construction or cable maintenance foreman should notify the TRCC when a sheath opening number is issued on a cable containing T Carrier pairs. The TRCC can mark these locations on their wall map as a ready reference in the event that line troubles develop in these spans.

**3.06** The previous paragraphs give the reasoning that prompts this listing of TRCC responsibilities. In order to be successful, the TRCC should:

- (a) Have sole responsibility for the coordination and control of all backbone and maintenance lines.
- (b) Provide 24-hour coverage or its equivalent.
- (c) Assign backbone and maintenance line to any office needing them.
- (d) Maintain a ticket file of outages by case number. Figure 2 is a sample ticket.
- (e) Prepare a TRCC trouble log with detailed restoral information. Figure 3 is a sample log.
- (f) Post backbone line status on wall map.
- (g) Analyze span line troubles for trouble patterns.
- (h) Prepare monthly summaries. (See Fig. 4.)

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(i) Make certain that the System Control Office locates the defective span, and with the aid of the TRCC, clears the backbone line by using a single maintenance patch within the prescribed time limit using bridging repeaters, Section 365-226-500. If restoration and/or repair is not done within the time limit, the TRCC supervisor should have the authority to refer the problem to progressively higher levels of management at stipulated intervals until the trouble is cleared. It may also be necessary to patch the side system of a unidirectional repeater or the other side of repeater in bidirectional so that it is not overlooked when cable maintenance is dispatched to clear trouble.

(j) Make certain that the System Control Office and the construction and/or cable maintenance group clears the span trouble and returns the system to regular facilities within the time limit. To achieve this, the TRCC supervisor should have the authority to refer the problem to progressively higher levels of management at stipulated intervals until the trouble is cleared.

(k) Dispatch cable maintenance force to the span in trouble and to the manhole or pole where the central office force has determined the trouble is located.

(l) Make certain that the backbone and maintenance lines are in good condition. [See 3.08(f).]

### SYSTEM CONTROL OFFICE

**3.07** The control office will benefit the most from the establishment of a TRCC. A failed system will be restored to service by patching to a backbone line and will avoid the delay encountered in locating the trouble to a particular span. Therefore, the control office has a responsibility to (Fig. 1 is a flowchart on actions to be taken):

(a) Respond promptly to a T Carrier alarm. The control office person should go immediately to the D bank, and loop it to see if the terminal in that office is responsible for the alarm. If the terminal is not

(b) Call the noncontrol terminal office and have it looped to see if that terminal is in trouble. While both ends are on the line

(c) Call the TRCC. If one of the terminals is in trouble, the TRCC will log the information. However, if the trouble is in the repeatered line, the TRCC will immediately assign a backbone line or a restoration layout if one backbone is not sufficient to the failed system and coordinate the patch with both terminals to restore service.

**Note:** Bridging repeaters should be used whenever a patch is made so that service need not be interrupted when the regular line is returned to service.

(d) Isolate the trouble to a particular span within the 4-hour limit.

(e) When the trouble has been located, call the TRCC and under their control, arrange the release of the backbone line and assignment of a maintenance line in that span.

(f) Direct the Span Control Office to patch the system that is on the backbone line to the maintenance line using bridging repeaters, Section 365-226-500. Remind them to tag the patch.

(g) Call the TRCC when the maintenance line can be released.

(h) Make certain that the Span Control Office clears the span trouble and that the system is returned to its assigned facilities within the time limit. If this is not done, refer the problem to the TRCC, who should have the authority to escalate the problem to a successively higher level of management.

(i) Make certain that order wires, fault-locating lines, bridging repeaters, and test sets are available and in working condition.

### 3.08 The Span Control Office must:

(a) Use maintenance lines only after receiving the TRCC case number from the System Control Office.

(b) Use bridging repeaters and tag all patches.

(c) Immediately fault locate the trouble in the span line. See Section 365-227-500.

- (d) Make certain that trouble is outside the central office before referring it to construction and/or cable maintenance forces.
- (e) Initiate trouble clearing procedures and follow up to make certain that the system is returned to its assigned facilities within the time limit. If this is not done, refer the problem to TRCC who should have the authority to escalate the problem to successively higher levels of management.
- (f) Test backbone and maintenance lines daily for errors, continuity, and noise and report results to the TRCC.
- (g) Supply digital signal on all idle lines in the transmit direction and a termination in the receive direction. See Section 365-227-500.
- (h) Make certain that order wires, fault-locating lines, bridging repeaters, and test sets are available and in working condition.

#### INTERMEDIATE AND NONCONTROL OFFICES

- 3.09 Intermediate and noncontrol offices must work closely with the TRCC and System and Span Control Offices in order to make the best use of backbone and maintenance lines for rapid restoration of failed systems.
- 3.10 Intermediate and noncontrol offices must use bridging repeaters when patching so that circuits or trunks are not disconnected when the failed system is returned to regular facilities. Also, they must tag patches carefully so that systems are not interrupted in error.
- 3.11 Backbone lines must be protected at all intermediate points by the use of plugs or plastic designation strips. These should be placed in all backbone *line access* jacks.
- 3.12 The intermediate and noncontrol offices should never use maintenance or backbone lines unless they are given a TRCC case number. The TRCC will provide assistance to these offices if they require it.
- 3.13 Each office must supply digital signal on all idle lines in the transmit direction and a termination in the receive direction. See Section 365-227-500.

#### CONSTRUCTION OR CABLE MAINTENANCE

- 3.14 The work force which clears troubles in the cable and manhole apparatus case is referred to as cable maintenance in this section. A representative of this group should be a permanent member of the TRCC staff in order to keep track of splicing operations that could cause failures to T systems.
  - 3.15 The cable maintenance member in the TRCC staff also will dispatch forces promptly to the field to repair span troubles so that systems on maintenance lines can be restored to regular facilities within objective times. Dedicated T Carrier maintenance teams in the field provide the best assignment.
  - 3.16 The cable maintenance staff member will also check to determine that the trouble was accurately fault located by the central office, the 0 ring has been replaced in the apparatus case, and the air pressure read. This would prevent problems and/or indicate the need for craft training.
  - 3.17 The cable maintenance staff member would determine job priority, if there are a number of service outages, which require repair in the offices served by the TRCC.
- #### 4. TROUBLE ANALYSIS
- 4.01 As mentioned previously, the TRCC should record every failure that occurs in the systems terminating or going through the offices it serves. In this way, the TRCC will be in the best position to analyze what programs should be initiated to improve T Carrier service. Therefore, a trouble ticket with detailed information is an important responsibility of the TRCC. (See Fig. 2.)
  - 4.02 The cause of the failures and how they can be prevented from recurring is part of the daily job of the TRCC team. The TRCC trouble tickets, log, and monthly reports will show patterns that can be of great assistance in solving common problems.
  - 4.03 Analysis will show certain spans and certain systems are responsible for a large percentage of the outages. It will be the responsibility of the TRCC to present the data to the group that would initiate cable splice rebuilding or request system realignment. The TRCC will also become

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aware by referring to their record that some offices or craft need additional training.

**4.04** In each of the above examples, it will be necessary for the TRCC to contact other Plant groups to solve the problem. In still other cases, the TRCC might have to contact other departments to provide assistance with order wires, telephones, etc.

**4.05** Particular attention should be given to the number of outages that the TRCC was unable to patch and the reason. These outages might show the need for new and additional backbone lines or reflect the lack of interbay patching facilities. The backbone lines are the heart of the TRCC because failed systems can be patched promptly instead of waiting for the isolation of trouble to a particular span.

### 5. EXPANDED TRCC

#### ESTABLISHING NEW SYSTEMS

**5.01** Although the primary purpose of a TRCC is to serve as a center which directs the rapid restoration of T Carrier Systems that have failed, there are many other functions that should be performed. After the TRCC has been in operation for a period of time, it can coordinate the installation of new systems. The TRCC can set up schedules and work with offices that are having trouble getting the systems in service.

#### T CARRIER ADMINISTRATION SYSTEM (TCAS)

**5.02** The administrative procedures set up by a TRCC will simplify the introduction of a T

Carrier Administration System (TCAS). The TRCC would then become the center of TCAS and will receive alarms, status lamps, and controls of the D bank remotely via a telemetry system.

**5.03** TCAS can improve the effectiveness of a TRCC operation by providing the TRCC with system status on a real-time basis and, in addition, rapid trouble sectionalization. The features provided by TCAS include:

- (a) Real-time monitoring of the status of all systems connected to TCAS
- (b) Status of all maintenance and backbone lines connected to TCAS
- (c) Automatic sectionalization of individual system failures to the defective terminal or span line (TCAS—Phase III).
- (d) Pattern analysis of a number of system failures due to the same cause
- (e) Early detection of intermittent systems, thereby minimizing the effect these systems could have on service over a longer period
- (f) Mechanized data base of T Carrier Systems and the means for maintaining accurate records
- (g) The ability to generate reports on the performance of the T Carrier network.

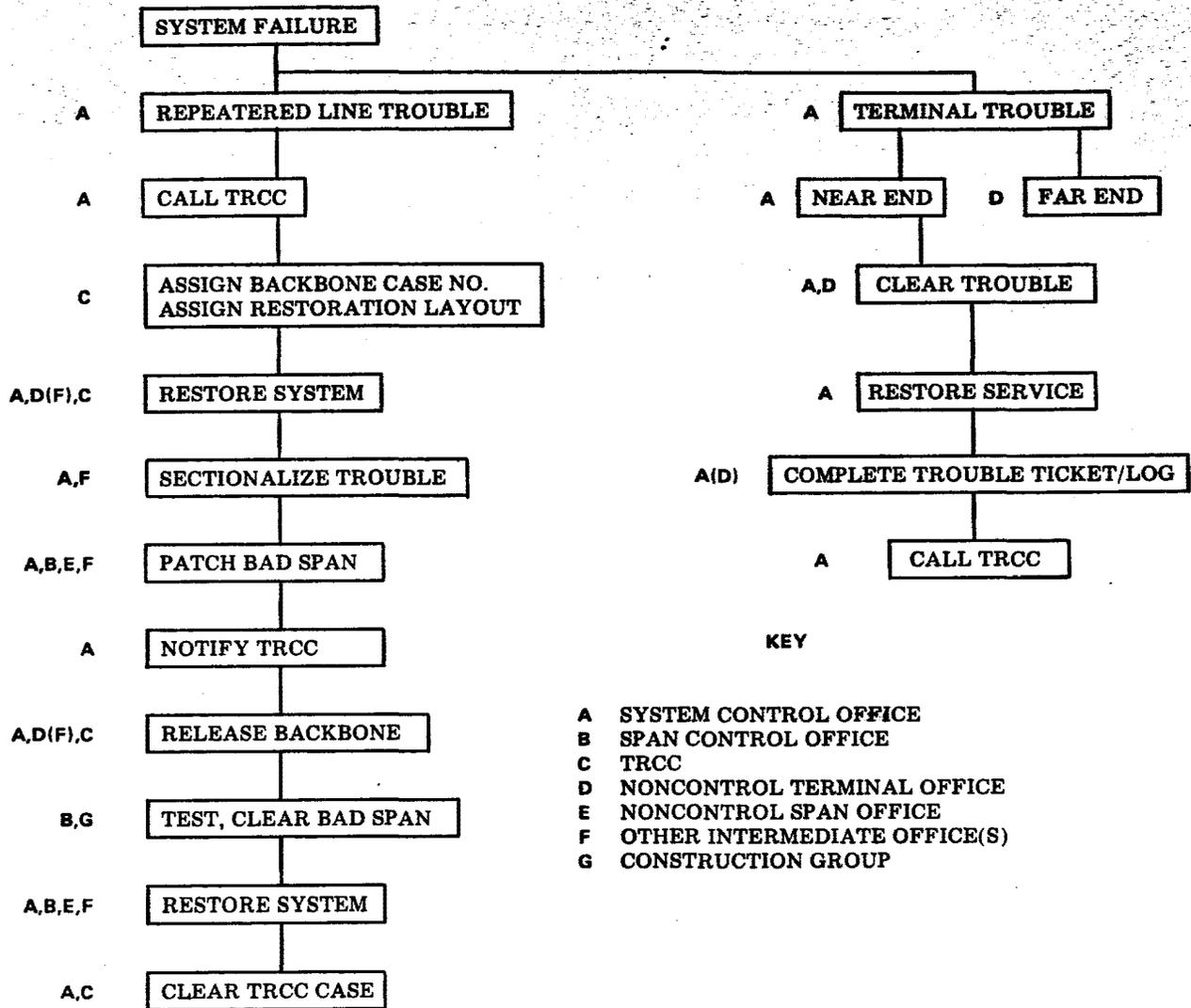


Fig. 1—Flowchart of Procedures for System Restoration

TRCC CARRIER ACTIVITY					
CASE NO.	FAILURE <input type="checkbox"/>	REC BY			
	ROUTINE <input type="checkbox"/>				
REPORTED		DATE	TIME		
FROM	BY				
SYSTEM				FAIL TIME	
TBL RPT _____					
FAIL TO _____					
MAKE GOOD	BB/ML	DATE	TIME	BY	
SYSTEM CONTROL		TEL NO			
SIDE SYSTEM				CASE NO	
TBL LOC	SPAN	DATE	TIME	BY	
MOVE TO	ML	DATE	TIME	BY	
TBL REF	OFFICE TO	DATE	TIME	BY	
TROUBLE TEST					
LOC	CASE	SLOT	RPTR	NET	OPTN
BY	DATE	TIME	TBL REF	TO	TIME
TBL FND _____					
BY	DATE	TIME	OUTAGE SYS    TBL		
MAKE REG	BY	DATE	TIME	TBL CODE	

Fig. 2—TRCC Trouble Ticket



T CARRIER RESTORATION CONTROL CENTER (TRCC)

CITY	STATE	MONTH	YEAR
1.	Number of systems served by TRCC.	_____	1.
2.	Number of backbone lines working.	_____	2.
3.	Number of TCXR system outages reported to TRCC during month.	_____	3.
4.	Number of these outages TRCC was able to patch on backbones.	_____	4.
5.	Total outage time (in minutes) of systems that TRCC patched on backbones.	_____	5.
6.	Average outage time (in minutes) of systems that TRCC patched on backbones. (Line 5 ÷ Line 4)	_____	6.
7.	Number of TCXR system outages reported that TRCC did <u>not</u> patch on backbones. (Line 3 - Line 4)	_____	7.
Reason (Numbers in Lines 7a to 7f should equal number in Line 7)			
7a.	Terminal Trouble	_____	7a.
7b.	Power Supply Trouble	_____	7b.
7c.	Backbone line not available	_____	7c.
7d.	Restored before patch was made	_____	7d.
7e.	Maintenance line patch used	_____	7e.
7f.		_____	7f.
8.	Total outage time (in minutes) of systems that TRCC did <u>not</u> patch on backbones.	_____	8.
9.	Average outage time (in minutes) of systems that TRCC did <u>not</u> patch on backbones. (Line 8 ÷ Line 7)	_____	9.
NAME		TELEPHONE NO.	

Please return to A. M. Wedlock - 195 Broadway - Room 1926B - N.Y.C. 10007. By the 20th of the following month, e.g., June results by July 20.

Fig. 4—TRCC Monthly Summary