SWITCHING SYSTEMS MANAGEMENT

NO. 1 ELECTRONIC SWITCHING SYSTEM

ABNORMAL TRAFFIC/LOAD CONDITIONS

1. GENERAL

1.01 This section describes overload indications, methods of recognizing an overload condition, and control measures provided by the No. 1 Electronic Switching System (ESS). It provides administrative procedures and recommendations to control overloads.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

1.04 An abnormal load condition exists in a central office when the traffic load exceeds the capacity of the switching system equipment, resulting in customer service deterioration. *It is the network administrator's responsibility to assure proper utilization of facilities during abnormal conditions and to coordinate activities to minimize any adverse effect that these conditions may have on customer service.* Effective administration of service protection activities requires advance planning and close monitoring of the load and service data provided by the ESS.

1.05 Overload administration begins with an overload preplanning session. The office overload plans should be updated each year. This planning may include such items as:

- Actions to be taken when overload conditions occur

- Persons responsible for overload identification and initial actions

- People to notify in case of overloads

- Records to be prepared and maintained.

1.06 An easily identified book for abnormal traffic load reference should be maintained (Example: red binder). It should contain such items as:

- Present overload plans

- Past overload records

- Other references related to overload control.

2. SWITCHING NETWORK OVERLOADS

2.01 Switching network overloads occur under the following conditions:

- Traffic demands exceed the capacity of available network paths, trunks and/or service circuits.

- Call carrying capabilities of control processor are exceeded.

2.02 Customer service deterioration is indicated by excessively high indications of the following:

- Incoming Matching Loss (IML)

- Intraoffice Matching Loss (IAML)

- Dial Tone Delay (DTD)

- Blocked Dial Tone (BDT)

- Overflow (OVFL).

2.03 Load imbalance in the network can add to service deterioration during an overload. The portion of the network with the heavier load, due to an imbalance, will encounter more severe blockage. Shortages of trunks and/or service circuits can result in repeated attempts to complete a call, placing a heavier load on the call processing capabilities of the system.

2.04 Central control overloads are the result of the failure of the central control (CC) to cycle through all classes of base level work (E-E visitation rate) within the required time interval. This can be caused by a number of conditions, some due to traffic overloads and others due to equipment failure or program problems or any combination of these.

2.05 A 5-minute traffic check triggers a response if the E-E cycles were less than 2000 during the last 5-minute interval. This indicates a heavy real-time load on the CC.

2.06 A minor CC overload exists when the E-E cycle time averaged over 3 E-E cycles is greater than 1.67 seconds.

2.07 A major CC overload exists when the E-E cycle time averaged over 3 E-E cycles is greater than 2.67 seconds.

3. OVERLOAD CONTROLS

A. Central Control

3.01 There are three call processing overload controls. Each one is more severe than the previous one. They are as follows:

(1) A 5-minute traffic check response

(2) Minor CC overload response

(3) Major CC overload response

3.02 When the 5-minute traffic check monitors a heavy real-time load on the central processor, the following action is taken automatically.

- Restore-verify tests are inhibited.

- False cross and ground tests are inhibited.

- Prints TØCO2 message (RVI, FGI, HVL).

3.03 When a minor CC overload occurs, in addition to the above steps, the following action is taken automatically.

- Rate of processing line originations is reduced.

- Prints TØC02 Message (MNO).

3.04 When a major CC overload occurs, in addition to the above steps, the following actions are taken automatically.

- Retrials of trunk hunts are inhibited.

- In a CC office, line scanning is inhibited.

- In an SP office, unloading of the line service request hopper is inhibited.

- Prints TØC02 message (MJO).

B.   Network Management Controls

3.05 The network management controls are intended to improve the utilization of facilities during an overload, to control congestion, and to help prevent overload of tandem switching systems.

3.06 By the use of this feature, selected calls which have little or no change of completion, due to network congestion, can be regulated at the end office.

3.07 The congestion may appear as a lack of trunk facilities. Increased alternate routing is then necessary to complete calls, using more links of the network. This alternate routing can then cause congestion at the tandem office. Without control, the situation will result in increased network congestion, misuse of network facilities, and poor customer service.

3.08 The network management feature provides selective code cancellation, trunk group controls, dynamic overload control, network management measurements, and receiver attachment delay report.

3.09 It is not possible to prescribe the exact conditions under which overload controls should be applied. In many cases, the condition will be a unique occurrence so that previous experience does not exist to serve as a guide. Each situation will require the balanced consideration of such items as cause (if known), time of day, and relationship to busy period.

3.10 In general, the decision to use controls should be based on those factors which affect a local office, the toll network, or on prevailing conditions and a knowledge of the type of customers assigned to the control feature.

3.11 A detailed description of the network management feature is contained in Dial Facilities Management Practices (DFMPs), Division H, Section 6d(2), Operational Features—Network Management. Responsibilities are covered in DFMP, Division I, Section 1, Network Management Responsibilities.

C.   Line Load Control

3.12 Line load control (LLC) is a means by which originating service may be denied to certain classes of subscribers while preferentially allowing originating service to a select group. Those lines that are permitted to originate calls are designated as essential service (Class A). *It is recommended that not more than 6.25 percent of the No. 1 ESS lines be designated as essential service (set card EVL).*

3.13 The arrangement in No. 1 ESS provides for the activation and deactivation of the LLC program by means of a teletypewriter message. These messages are valid on either the network administration or maintenance teletypewriter.

3.14 Once active, the LLC program in turn activates the dial tone speed test program. The dial tone speed test program makes a dial tone speed test every 4 seconds. (A dial tone speed test failure is one which does not result in

a connection to an idle customer digit receiver within 3 seconds.) The dial tone speed tests together with the amount of network blocking are used to determine what action should be taken by the LLC program.

3.15 There are two possible conditions of the LLC program. They are:

(1) *INHIBITED:* The LLC program is off at all times and all lines are given the same relative treatment under all conditions.

(2) *ALLOWED:* The LLC program is capable of giving preferential treatment depending on the mode within this condition. The two modes of the allowed condition are:

- *AUTOMATIC:* In this mode the LLC program will take no action unless the dial tone speed program encounters three successive dial tone delays greater than 11 seconds. Then the program will automatically go into a state equivalent to the *forced-on* mode.

- *ON:* In this mode the LLC program is in the *forced-on* state and will deny originating service to some or all nonessential lines if the system exceeds certain performance standards (three successive dial tone speed delays of 3 seconds or more or incoming network blockage greater than or at 10 percent).

A more detailed description of the operation of the LLC program may be found in DFMP, Division H, Section 6d(1), Operational Features—Line Load Control.

4. LINE LOAD CONTROL GUIDELINES

A. When To Use Line Load Control

4.01 There may be situations in which it will be desirable to force the activation of the LLC program. Conversely, there may also be situations in which it will be desirable to inhibit the LLC.

4.02 The traffic control activation is flexible in the system so that local decisions can be made to manually override the activation or deactivation decisions of the program. To assist in such local decisions, the teletypewriter reporting

arrangements have been provided. Teletypewriter input and output messages are discussed in Parts 10 and 11 of this section.

B. Recommended Normal State of Line Load Control

4.03 The following procedures should be used for LLC in No. 1 ESS offices under normal machine operation in order to allow for proper managerial direction:

- *The LLC shall be in the off mode in all attended offices, including those offices remotely monitored.*

- The LLC shall be in the *automatic* mode in all unattended offices during the unattended periods.

4.04 When the system takes an emergency action, there is a period of time during which if no calls are processed, a backlog of work is created. When call processing is resumed, the surge of work would overload the system. The automatic overload control program prevents this surge from harming the system, but it can increase the dial tone delay on all lines. To minimize this delay, the first scan of lines after the emergency action will look for originations on essential lines. The state of LLC after the first scan of lines will be determined by the parameter set card LLCS. *It is recommended that this set card specify that after a system reinitialization, line load control be set to the inhibit (OFF) condition.*

4.05 If this set card specifies another condition, it may be necessary for the network administrator or the maintenance supervisor to insert the LLC-INH message after phase action.

4.06 *The decision to activate the LLC program into the on or automatic mode should involve a consideration of the consequences of such action.* Under normal circumstances, when there are few dial tone delays, activating the LLC program has only minimal effect on any lines. However, when dial tone delays occur with the LLC program in an *allow* state, the LLC program may deny dial tone service to nonessential lines in an attempt to bring the dial tone delays down to a nominal 3 seconds on subscribers assigned to essential levels. This significantly degrades service to nonessential

customers in order to provide improved service to essential customers. *These actions can only be justified under emergency or disaster conditions providing the dial tone delays are excessively long.*

4.07 *An office should not be permitted to automatically mask out some subscribers due to a temporary surge in traffic.* If there was a focused incoming overload, eg, telethon, sports events, etc, the denial of service to originating customers is not warranted. If the overload persists, and it is determined to be emergency or disaster related, control measures might be justified.

4.08 The customers which compose the Class A category include many types of essential lines. A large majority of these are assigned as essential lines to provide necessary services under an emergency or disaster condition, eg, defense, public safety, doctors, etc. Service provided to this group of subscribers should normally be uniform and consistent with the levels of service rendered by the entity. [Essential lines (Class A) customers are noted on ESS 1101, 1102 and 1103 Forms maintained by the network administrator.]

4.09 It should also be recognized that ESS takes certain alleviating steps as the load reaches certain thresholds, even without LLC activated. For example, certain diagnostic routines are cancelled, scan rates are reduced, etc. Such actions often permit temporary overloads to be handled more effectively without human intervention. *However, it is a management decision as to when to provide preferential treatment to a group of subscribers.* Refer to GL 72-10-195, No. 1 ESS Line Load Control, for additional information.

5. ABNORMAL LOAD IDENTIFICATION

5.01 The cause of an abnormal load should be identified as soon as possible. Failure to correctly identify the cause invariably results in improper administrative response to the situation. Abnormal load conditions may be caused by a variety of conditions such as:

- Telethons

- Severe weather

- Disasters

- Civil disturbance

- Events of national interest

- Severe utility failures.

5.02 Specific time and extent of the overload and system response can be determined by analyzing the TC15 traffic reports $T\emptyset C01$ and $T\emptyset C02$ messages and perhaps some trunking and engineering data on the network administration teletypewriter.

5.03 Refer to Attachments A and B for examples of abnormal traffic loads.

- The example in Attachment A is indicative of a probable receiver overload rather than an SP or CC overload.

- The example in Attachment B is indicative of a typical reaction during an SP overload.

6. OVERLOAD DATA ANALYSIS

6.01 Real-time analysis will be required for the duration of the overload to evaluate the performance of the system. Based on this analysis, traffic control actions may be modified as required. The TC15 report data plus the $T\emptyset C01$ and $T\emptyset C02$ printouts provide the data for analysis.

6.02 Trunks or service circuits out of service due to maintenance should be held to a minimum. This can be assured by close monitoring of the maintenance CCS usage shown on the H and C printouts.

6.03 Overload records will provide useful data for evaluation of what administrative action was (or was not) taken and for preplanning for possible similar future overloads.

6.04 It is recommended that the following records be retained:

- TC15 reports (or summaries)

- Teletypewriter activity logs

- Office performance graphs

- C and H printouts (or summaries, Example PATROL)

- Administrative actions taken

- Other related data.

7. OFFICE PERFORMANCE GRAPHING

7.01 A graphical representation of office performance should be made periodically by plotting items listed on the TC15 report. The items plotted should include originating plus incoming (0 + I) peg count, dial tone delays, line scan completions and main program cycles (E-E).

7.02 The periodic graphing of selected TC15 information is useful for several reasons.

- Allows the network administrator to see how the office performs under various load conditions.

- Provides a record that may be used for future estimates and comparisons.

- Shows the effectiveness of any control actions taken during abnormal conditions.

7.03 Several statements can be made following analysis of graphed information. These are:

(a) As originating plus incoming peg count increases, E-E and line scan peg counts should decrease. This is because the amount of work at each base level class is greater as calling volume increases.

(b) When line scan completions and E-E visits begin dropping below certain levels, dial tone delays increase significantly.

7.04 A summary of TC15 data should be prepared prior to the start of graphing. This establishes the plot-points required for the graphs.

7.05 Office conditions that should be considered for graphing are:

- Busy Hours—Normal Load

- Busy Hours—Heavy Load

- Busy Hours—Abnormal Load.

7.06 Following an abnormal traffic load, an additional graph may be prepared to show the relationship between originating calls versus dial tone speed and incoming calls versus incoming matching loss. Items which should be plotted are: originating calls, incoming calls, 3-second dial tone delays, 11-second dial tone delays, and the time traffic control actions were taken if required.

7.07 Attachments A and B contain examples of graphing abnormal traffic load conditions.

8. TELETYPEWRITER

8.01 Teletypewriters (TTYs) are used as the primary means of communication between administrative personnel and the No. 1 ESS machine. These TTYs are used to input certain information to the No. 1 ESS, as well as for reporting traffic data and other status items.

8.02 The network administration TTY channel enables the network administrator to collect traffic measurement data, implement traffic controls, and interrogate memory.

8.03 The network management TTY channel, available with CTX-6 and later generic programs, enables the network management center to request system action pertaining to network congestion data, to implement network controls, and provides the facilities for the system to report back on these actions. If this channel is not provided in CTX-6 and later offices, the network management functions apply to the network administration channel.

9. TELETYPEWRITER ACTIVITY LOG—ESS 1405 FORM

9.01 The TTY traffic and overload messages are useful tools for the network administrator to identify and evaluate the effect of an overload condition on the system. The body of these messages is variable and consists of a list of abbreviations for the various overload conditions reported. Only currently active overload conditions and active traffic controls will be printed.

9.02 The ESS 1405 Form, Teletypewriter Activity Log, is used to record the input and output messages, including traffic or network controls that were implemented.

9.03 A TTY activity log sheet, per channel should be prepared monthly. The previous log sheet(s) should be filed as determined by local practice. If the network administration channel furnishes both traffic data and network management information, a separate log sheet should be provided for each general type, ie, a log sheet for network administration messages and a log sheet for network management messages. A line has been provided on the form heading for entering the name of the channel that the log sheet represents (ie, NET ADM TTY 01, NET ADM TTY 02, or NET MGT TTY).

9.04 Figures 1 and 2 illustrate typical entries on the ESS 1405 TTY activity log.

10. TELETYPEWRITER INPUT MESSAGES

10.01 The following TTY input messages will be associated with the traffic and overload control programs. Except where noted these messages will be accepted from the maintenance, the remote maintenance, and the network administration TTYs. Refer to Input Message Manual IM-1A001 for additional details.

10.02 *LLC-ALLØW-* aa.

- aa = AU, allow the *automatic* mode. In this mode, three successive failures of the extended (11-second) dial tone speed tests will activate the LLC program.

- aa = ON, force the system into the *ON* mode, where the LLC program is always active. In this mode, the LLC program can deny service to some line groups after three successive failures of the regular (3-second) DTS tests.

10.03 *LLC-INH-.* Inhibit the LLC program and thus put it into the *off* mode where all lines receive equal service.

10.04 *DT-INH-.* Turn off (inhibit) the dial tone speed tests. This message can be used to turn off the dial tone speed tests whenever the dial tone speed tests are determined to be affecting call processing due to trouble. This must not be done without an extreme condition in the machine. It will be accepted as input only from the maintenance and remote maintenance TTYs. The DT-INH-. message should be used with caution because it

inhibits the LLC program placing it in the OFF mode and thus it cannot be utilized in the allow modes if an emergency required it.

10.05 *DT-ALLØW-.* Allow the dial tone speed tests to be resumed. The LLC will return to the mode specified by the last LLC- input message. Since the dial tone speed tests are normally on, this message would be necessary only after a DT-INH-. message.

10.06 *LLC-MASK-PRNT.* Print the LLC mask by means of the LC02 TTY output message.

10.07 *TØC-STATUS-.* Print the current status of the traffic controls and overload controls and report any currently active overload condition by means of the TØC01 output message.

10.08 *LS-QUARTER-a b b.* This message controls the printing of the TC15. The two variable fields are *a* and *bb*. They are defined as follows:

- *a = T,* message input from the network administration TTY

- *a = M,* message input from the maintenance TTY

- *bb = ØN,* print TC15 immediately and every quarter-hour thereafter

- *bb = ØF,* cancel request to print TC15.

10.09 *PLNT-MEAS-aaa.* Request a printout of the plant measurement counts on the network administration TTY. It is suggested that this may be useful for following machine phase actions, and for determining when it is appropriate to request plant to T-Read the EA SAVE area if the network administration TTY is not included in the daily printing of the PM01.

10.10 *TC-TIME-aa.* Request from the maintenance or network administration TTYs to change a traffic measurement schedule. Refer to DFMP, Division H, Section 6i(1), Traffic Measurements, General, for a definition of each routine on the ESS 1402 Form.

10.11 *TC-WØRK-SET aa, bb.* Request from the maintenance or network administration

TTYs to perform an immediate print out of a specified measurement schedule. These print out functions are:

aa	bb	FUNCTION
02	12	Schedule D
02	15	Schedule H
02	16	Schedule C
02	17	Schedule W
03	13	Traffic Map

11. TELETYPEWRITER OUTPUT MESSAGES

11.01 The following TTY output messages are associated with the traffic and overload control programs. They will be printed on the maintenance, the remote maintenance and the network administration TTYs. Only the message headings are listed and described here. These headings may contain a 2-digit prefix indicating the "minutes past the hour" that the printout occurs. A 6-digit suffix will follow the printout name. This is a "office identifier" as indicated by the traffic engineer in the E8056 questionnaire. For details refer to Output Message Manual OM-1A001.

11.02 *LC01.* The body of this message will indicate that the LLC program has started to deny service to some nonessential groups of lines (FGD = first group denied), or that following a denial, LLC has restored all groups to service (AGR = all groups restored).

11.03 *LC02.* This message will be printed in response to the LLC-MASK-PRNT. input message. The body of this message is the binary mask used by the LLC program to indicate which groups of lines are permitted dial tone service. Ones in the mask represent line groups which have service at the moment and zeros represent groups to which dial tone service is temporarily denied.

11.04 *TC15 (Traffic Counts-15).* This message is printed every 15 minutes on the quarter-hour and lists various traffic and system measurements for the preceding 15 minutes. The number of extended dial tone speed tests failures are included in the body of the TC15 message.

The TC15 messages can be turned on or off by means of the LS-QUARTER messages. However, it is recommended that the TC15 be *on* at all times. The TC15 messages will be printed whenever there is a receiver overload. After an emergency action the TC15 may have to be reactivated. The TC15 measurements are listed in Fig. 3.

11.05 *TØ C01:* This message will report overloads and the status of various overload and traffic controls. The body is variable in length and consists of a list of abbreviations for the various conditions reported. Only currently active overload conditions and active traffic controls are to be printed. The TØC01 messages will be printed for any one of the following reasons.

(1) The TØC01 output message has been requested by the TØC-STATUS. TTY input message.

(2) An overload condition which has not previously been reported during this quarter-hour has been encountered by the system. If the overload condition is one considered serious by the program, an office alarm or the TTY bells will also be rung.

(3) The traffic controls have changed state in response to a TTY input message.

(4) The quarter-hour traffic printout is due and there is an overload condition.

Refer to Fig. 4 for the TØC01 output message format.

11.06 *TØ C02:* This message is used to report overload conditions and also the status of the overload and traffic controls. The TØC02 message is almost the same as the TØC01 message. The TØC01 message is used to initially report serious conditions while the TØC02 is used to report less serious or routine conditions or to periodically report persisting abnormal conditions.

11.07 The TØC02 message will be printed under any of the following conditions:

(1) The first occurrence within a quarter-hour of an abnormal overload condition not serious enough to warrant a T0C01 output message.

(2) Changes in the status of the traffic controls. (Some of these changes result in TØC01 outputs.)

(3) On the quarter-hour if there is an abnormal condition.

(4) In response to a TØC-STATUS-. input message from the maintenance or network administration TTY.

Refer to Fig. 5 for the TØC02 output message format.

11.08 *PM01:* Printed every morning at 2:30 am. (Under control of the variable routing message [TTY-MLTCHAN-], the PM01 can be directed to the network administration TTY as a standard printout.) This printout will indicate the emergency actions (EAs) by level for the last 24 hours. Refer to IM-1A001 Input Message Manual.

12. SUMMARY OF ADMINISTRATIVE RESPONSIBILITIES

12.01 It is the network administrator's responsibility to assure proper utilization of facilities during abnormal conditions and to coordinate activities to minimize any adverse effect that these conditions may have on customer service.

12.02 Provide effective administration of service protection activities. This requires advance planning and close monitoring of the load and service data provided by the ESS.

12.03 Schedule an overload preplanning session to update office overload plans each year. This planning may include such items as:

• Actions to be taken when overload conditions occur

• Persons responsible for overload identification and initial actions

• People to notify in case of overloads

• Records to be prepared and maintained.

12.04 Provide an easily identified book for abnormal traffic load reference. (Example: red binder). It should contain such items as:

• Present overload plans

• Past overload records

• Other references related to overload control.

12.05 Be aware of indicators of customer service deterioration. They include excessively high indications of the following.

• Incoming Matching Loss (IML)

• Intraoffice Matching Loss (IAML)

• Dial Tone Delays (DTD)

• Blocked Dial Tone (BDT)

• Overflows (OVFL).

12.06 Monitor overload controls. There are three call processing overload controls. Each one is more severe than the previous one. They are as follows:

(1) A 5-minute traffic check

(2) Minor CC overload

(3) Major CC overload.

The responses to these controls are printed on the network administration TTY. They should be recorded on the TTY activity log, Form ESS 1405 for further analysis.

12.07 Be aware of network management control capabilities and network management responsibilities.

• A detailed description of the network management feature is contained in DFMP, Division H, Section 6d(2)

• Network management responsibilities are covered in DFMP, Division I, Section 1, Network Management Responsibilities.

12.08 Be aware of LLC operation and administrative recommendations such as:

• It is recommended that not more than 6.25 percent of the No. 1 ESS lines be designated as essential service (set card EVL).

• Recommended normal state of LLC.

(1) The LLC shall be in the *off* mode in all attended offices, including those offices remotely monitored.

(2) The LLC shall be in the **automatic** mode in all unattended offices during the unattended periods.

- It is recommended that this set card specify that after a system reinitialization, LLC be set to the inhibit (OFF) condition. If this set card specifies another condition, it may be necessary for the network administrator or the maintenance supervisor to insert the LLC-INH message after phase action.

- The decision to activate the LLC program into the **on** or **automatic** mode should involve a consideration of the consequences of such action. These actions can only be justified under emergency or disaster conditions providing that the dial tone delays are excessively long.

- *It is a management decision as to when to provide preferential treatment to a group of subscribers.* Refer to GL 72-10-195, No. 1 ESS Line Load Control, for additional information.

12.09 Be aware of abnormal load conditions. They can be caused by a variety of conditions such as:

- Telethons

- Severe weather

- Disasters

- Civil disturbance

- Events of national interest

- Severe utility failures.

12.10 Analyze the TC15 report data plus the TØC01 and TØC02 printouts. It is recommended that the following records be retained.

- TC15 reports (or summaries)

- TTY activity logs

- Office performance graphs

- C and H printouts (or summaries, example, Program for Administrative Traffic Reports on Line [PATROL])

- Administrative actions taken

- Other related data.

Note: If an overload is expected or in progress, a C and/or H printout should be requested to obtain additional information. This data may be used for analysis during and after the overload.

12.11 Prepare graphs as required for the following:

- Busy Hours—Normal Load

- Busy Hours—Heavy Load

- Busy Hours—Abnormal Load.

Note: Following an abnormal traffic load, an additional graph may be prepared to show the relationship between originating calls versus dial tone speed and incoming calls versus incoming matching loss.

12.12 Maintain the ESS 1405 Form, Teletypewriter Activity Log. It is used to record the input and output messages, including traffic or network controls that were implemented.

- A TTY activity log sheet, per channel, should be prepared monthly.

- The previous log sheet(s) should be filed as determined by local practice.

ESS 1405(04)TG-1A

NET ADM TTY - 01

DATE_____

TEL CO_____
BASE_____ CONT GR _____

TELETYPEWRITER ACTIVITY LOG

ESS UNIT____ DISTRICT CG-O ____   MONTH _MAY_

ITEM	DATE	TIME	INPUT MESSAGE INITIATED				OUTPUT MESSAGE RECEIVED		REMARKS
			ACTIVATE	DATE	TIME	DEACTIVATE	DESCRIPTION	DISPOSITION	
00	5/1	1045	LLC-ARLOW-OR	5/1	1200	LCC-INH-	TOC 01	LON	CABLE DAMAGE
01									
02	5/10	345	TC-TIME-05						SPL STUDY "C" BLOCK
03	5/10	346	TC-TIME-16						5/11 TO 5/18
04									
05				5/13	700	TC-TIME-05			RESTORED TO
06				5/13	700	TC-TIME-16			REG. "C" SKED
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Fig. 1—Network Administration Log—Typical Entries (9.04)

ESS 1405(04)TG-1A

TEL CO_____

BASE _____ CONT GR _____

NET MGT TTY

DATE_____

TELETYPEWRITER ACTIVITY LOG

ESS UNIT_____ DISTRICT CG-O _____

MONTH MAY

ITEM	DATE	TIME	INPUT MESSAGE INITIATED				OUTPUT MESSAGE RECEIVED		REMARKS
			ACTIVATE	DATE	TIME	DEACTIVATE	DESCRIPTION	DISPOSITION	
00	5/10	1300							TELETHON TO 578-2000
01	5/10	1300	NMG-TRAFFIC				NM10	XMTR TIMEOUTS	
02	5/10	1308	CB-ACT 578-2000						BLOCK 10090
03	5/10	1330	NMG-TRAFFIC				NM10	TIMECUTS LESS	
04				5/10	1335	CB-REM 578-2000			RESTORED
05									
06									
07									
08									
09									
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Fig. 2—Network Management Log—Typical Entries (9.04)

CTX-3, CTX-4, CTX-5 and CTX-6 Programs:

TC15 OUTPUT MESSAGE FORMAT

TC15 aaaaaa bbbbb cccc
dddddd eeeee fffff ggggg hhhhh
iiiiii jjjjjj kkkkk llllll mmmmmm
nnnnnn

EXPLANATION OF VARIABLE FIELD

All readings are for the last clock quarter hour.

aaaaaa = Office identification

bbbb = M Requested by maintenance teletypewriter
= T Requested by traffic teletypewriter
= L Requested by line load control program
= O Requested by overload program
= Can be any combination of above sources (MT, OL, LOTM, etc)

cccc = CDPR Customer dial pulse receive queue overflow
= CTTR Customer TOUCH-TONE receiver queue overflow
= M Multifrequency receiver queue overflow
= RV Revertive pulse receiver queue overflow
= TT Trunk combination TOUCH-TONE and dial pulse receiver queue overflow
= DPR Trunk dial pulse receiver queue overflow
= MISC There has been a system reinitialization within the last 15 minutes
= No overflow exists

dddddd = Total originating calls

eeeeee = Total incoming calls

ffffff = Total incoming calls that have overflowed due to matching loss (IML)

ggggg = Dial tone speed test initiations from dial pulse lines

hhhhh = Dial tone speed test initiations from TOUCH-TONE lines

iiiiii = Dial pulse line dial tone delays greater than 3 seconds

jjjjjj = TOUCH-TONE line dial tone delays greater than 3 seconds

kkkkkk = Total main program cycles (E-to-E)

llllll = Line scan completion (in office without a signal processor this count is always 000000) (Note 1)

mmmmmm = POB queue peg count

nnnnnn = Dial tone delays, either dial pulse or TOUCH-TONE, greater than 11 seconds (Note 2)

Note 1: Not available in non-SP offices prior to CC-CTX-4.

Note 2: Available with CTX-4 and later generics.

Fig. 3—TC15 Output Message Format (Sheet 1 of 5) (11.04)

CC- CTX-7 and Later Programs:

TC15 OUTPUT MESSAGE FORMAT:

TC15	aaaaaa	b	cccc	dd:dd:dd	ee/ee
INC	TA	I0	DT	TT	0R
ffffff	hhhhhh	jjjjjj	llllll	nnnnnn	pppppp
gggggg	iiiiii	kkkkkk	mmmmmm	oooooo	
EE/LS	P0EX	RM	RD	RR	CB/TGC
qqqqqq	ssssss	uuuuuu	wwwwww	yyyyyy	222222
rrrrrr	tttttt	vvvvvv	xxxxxx	zzzzzz	333333
0/0 0:00					

EXPLANATION OF VARIABLE FIELDS

aaaaaa	=		Office identification
bbbb	= M		Requested by maintenance teletypewriter
	= T		Requested by traffic teletypewriter
	= L		Requested by line load control program
	= 0		Requested by overload program
	=		Can be any combination of above sources (MT, 0L, LOTM, etc)
cccc	= CDPR		Customer dial pulse receiver queue overflow
	= CTTR		Customer TOUCH-TONE® receiver queue overflow
	= MF		Multifrequency receiver queue overflow
	= RV		Revertive pulse receiver queue overflow
	= DP		Dial pulse receiver queue overflow
	= MISC		Other than receiver queue overflow
dd:dd:dd	=		Time of collect
ee/ee	=		Date of collect
ffffff	=		Total incoming calls
gggggg	=		Incoming call first failure to match
hhhhhh	=		Total tandem calls

iiiiii	=	Tandem calls first failure to match
jjjjjj	=	Total intra-office calls
kkkkkk	=	Intra-office calls - overflow
llllll	=	Dial tone speed test initiations from dial pulse lines
mmmmmm	=	Dial pulse line dial tone delays greater than 3 seconds
nnnnnn	=	Dial tone speed test initiations from TOUCH-TONE® lines
oooooo	=	TOUCH-TONE® line dial tone delays greater than 3 seconds
pppppp	=	Total originating calls
qqqqqq	=	Total main program cycles (E-to-E)
rrrrrr	=	Line scan completions
ssssss	=	POB queue
tttttt	=	Dial tone delays, either dial pulse or TOUCH-TONE®, greater than 11 seconds
uuuuuu	=	Multifrequency receiver attachment tests
vvvvvv	=	Multifrequency receiver attachment delays over 3 seconds
wwwwww	=	Dial pulse receiver attachment tests

Fig. 3—TC15 Output Message Format (Sheet 2 of 5) (11.04)

zzzzzz	=	Revertive pulse receiver attachment delays over 3 seconds	999999	=	Total number of times the signal processor failed to find an idle by-link hit timing junior register.
222222	=	Calls encountering network management code block controls	AAAAAA	=	Total number of times the signal processor failed to find an idle by-link dialing junior register
333333	=	Calls encountering network management trunk group controls	BBBBBB	=	Total number of line service request hopper overflows
444444	=	Total number of signal processor trunk scan completions	CCCCCC	=	Total number of all hopper overflows which caused K-level interrupts
555555	=	Total number of times the signal processor failed to complete all nonsupervisory work within a 5 msec interval	DDDDDD	=	Total number of signal processor failures to find an idle by-link J-POB
666666	=	Total number of times the signal processor failed to complete POB execution within the allotted time	EEEEEE	=	Total number of trunk seizure and answer hopper overflows
777777	=	Total incoming by-link seizures	FFFFFFFF	=	Octal flag word indicating which hoppers overflowed adding to count CCCCCC
888888	=	Total number of times the signal processor failed to find an idle timed scan junior register			

Fig. 3—TC15 Output Message Format (Sheet 3 of 5) (11.04)

SP-CTX-6 Issue 8, SP CTX-7 Issue 8 and Later Programs:

TC15 OUTPUT MESSAGE FORMAT:

TC15	aaaaaa	b	cccc	dd:dd	ee/ee/ee
INC	TA	IO	DT	TT	OR
ffffff	hhhhhh	jjjjjj	llllll	nnnnnn	pppppp
gggggg	iiiiii	kkkkkk	mmmmmm	oooooo	
EE/LS	PO/EX	RM	RD	RR	CB/TGC
qqqqqq	ssssss	uuuuu	wwwwww	yyyyyy	222222
rrrrrr	tttttt	vvvvvv	xxxxxx	zzzzzz	333333
TS/FS	PI/BLS	TR/HR	BJ/BP	LH/TH	KH/HOP
444444	666666	888888	AAAAAA	BBBBBB	CCCCCC
555555	777777	999999	DDDDDD	EEEEEE	FFFFFF

EXPLANATION OF VARIABLE FIELDS

aaaaaa	=		Office identification	111111	=	Dial tone speed test initiations from dial pulse lines
bbbb	=	M	Requested by maintenance teletypewriter	mmmmmm	=	Dial pulse line dial tone delays greater than 3 seconds
	=	T	Requested by traffic teletypewriter			
	=	L	Requested by line load control program	nnnnnn	=	Dial tone speed test initiations from TOUCH-TONE lines
	=	Ø	Requested by overload program			
	=		Can be any combination of above sources (MT, ØL, LOTM, etc)	oooooo	=	TOUCH-TONE line dial tone delays greater than 3 seconds
cccc	=	CDPR	Customer dial pulse receiver queue overflow	pppppp	=	Total originating calls
	=	CTTR	Customer TOUCH-TONE receiver queue overflow	qqqqqq	=	Total main program cycles (E-to-E)
	=	MF	Multifrequency receiver queue overflow	rrrrrr	=	Line scan completions
	=	RV	Revertive pulse receiver queue overflow	ssssss	=	POB queue
	=	DP	Dial pulse receiver queue overflow	tttttt	=	Dial tone delays, either dial pulse or TOUCH-TONE, greater than 11 seconds
	=	MISC	Other than receiver queue overflow			
dd:dd	=		Time of collect	uuuuuu	=	Multifrequency receiver attachment tests
ee/ee	=		Date of collect			
ffffff	=		Total incoming calls	vvvvvv	=	Multifrequency receiver attachment delays over 3 seconds
gggggg	=		Incoming call first failure to match			
hhhhhh	=		Total tandem calls	wwwwww	=	Dial pulse receiver attachment tests
iiiiii	=		Tandem calls first failure to match	xxxxxx	=	Dial pulse receiver attachment delays over 3 seconds
jjjjjj	=		Total intraoffice calls			
kkkkkk	=		Intraoffice calls overflow	yyyyyy	=	Revertive pulse receiver attachment tests

Fig. 3—TC15 Output Message Format (Sheet 4 of 5) (11.04)

CC- CTX-7 and Later Programs (Cont)

xxxxxx = Dial pulse receiver attachment delays over 3 seconds.

yyyyyy = Revertive pulse receiver attachment tests

zzzzzz = Revertive pulse receiver attachment delays over 3 seconds

222222 = Calls encountering network management code block controls

333333 = Calls encountering network management trunk group controls

0/0 0:00 = Month/Date hour: quarter hour

Fig. 3—TC15 Output Message Format (Sheet 5 of 5) (11.04)

TØC01 OUTPUT MESSAGE FORMAT

09TØC01
aa
. . .
. . .

EXPLANATION OF VARIABLE FIELD

aaa = LLD   Line load control is denying originating service to one or more group of nonessential lines.

= TNP   Toll network protection is active.

= LAU   Line load control is in the automatic mode (Notes 1, 2).

= LOF   Line load control is off (Notes 1, 2).

= LON   Line load control is enabled (Note 1).

= RVN   Restore-verify tests are running (Note 2).

= RVI   Restore-verify tests are inhibited (Note 3).

= DTI   Dial tone speed tests are inhibited.

= DT3   The dial tone speed tests have encountered a dial tone delay greater than 3 seconds.

= D11   The dial tone speed tests have encountered a dial tone delay greater than 11 seconds.

= TLN   The matching loss for incoming calls has exceeded 10 percent in the trunk link network.

= FGI   False cross and ground tests are inhibited.

= BRI   Blocked retrials of trunk hunts inhibited occurs whenever there is a major CC overload.

= INO   There is an incoming trunk overload (CTX-6 and later generics).

= SPT   The system PSPD timing has been shortened because of receiver queuing.

= MJO   There is a major real-time overload of the central processor.

= MNO   There is a minor real-time overload of the central processor.

= TTT   There is an overload of the trunk combination TOUCH-TONE and dial pulse receiver queue.

= TT   There is an overload of the customer TOUCH-TONE receiver queue.

= DP   There is an overload of the customer dial pulse receiver queue.

= MF   There is an overload of the multifrequency receiver queue.

= RP   There is an overload of the revertive receiver queue.

= TDP   There is an overload of the trunk dial pulse receiver queue.

= PBQ   POB queuing is occurring.

= HVL   There is a heavy real-time load on the central processor. This is determined by the 5 minute traffic check.

Note 1: If line load control is in the automatic mode LAU and either LOF or LON will be in the variable field, depending on whether or not the dial tone speed test delays were severe enough (three successive dial tone speed test delays greater than 11 seconds) to warrant the automatic enabling of the line load control.

Note 2: RVN, LOF are normal conditions.

Note 3: In large offices, the restore-verify tests are normally inhibited by the system during the busy hours. Due to heavy call volume resulting in heavy real-time load on the central processor.

Fig. 4—TØC01 Output Message Format (11.05)

TØC02 OUTPUT MESSAGE FORMAT

10TØC02
aaa

. . .

. . .

EXPLANATION OF VARIABLE FIELD

aaa = LLD   Line load control is denying service to one or more groups of non-essential lines.

    = TNP   Toll network protection is active.

    = LAU   Line load control is in the automatic mode (Notes 1, 2).

    = LOF   Line load control is off (Notes 1, 2).

    = LON   Line load control is on (Note 1).

    = RVN   Restore-verify tests are running (Note 1).

    = RVI   Restore-verify tests are inhibited (Note 2).

    = DTI   Dial tone speed tests are inhibited.

    = DT3   The dial tone speed tests have encountered a dial tone delay greater than 3 seconds.

    = INO   There is an incoming trunk overload (CTX-6 and later generic).

    = D11   The dial tone speed tests have encountered a dial tone delay greater than 11 seconds.

    = TLN   The matching loss for incoming calls has exceeded 10 percent in the trunk link network.

    = FGI   False cross and ground tests are inhibited.

    = BRI   Blocked retrials of trunk hunts inhibited. Occurs whenever there is a major CC overload.

    = SPT   The system PSPD timing has been shortened because of receiver queuing.

    = MNO   There is a minor real-time overload of the central processor.

    = MJO   There is a major real-time overload of the central processor.

    = TTT   There is an overload of the trunk combination TOUCH-TONE and dial pulse receiver queue.

    = TT   There is an overload of the customer TOUCH-TONE receiver queue.

    = DP   There is an overload of the customer dial dial pulse receiver queue.

    = MF   There is an overload of the multifrequency receiver queue.

    = RP   There is an overload of the revertive receiver queue.

    = TDP   There is an overload of the trunk dial pulse receiver queue.

    = PBQ   POB queuing is occurring.

    = HVL   There is a heavy real-time load on the central processor. This is determined by the 5-minute traffic check.

Note 1: If line load control is in the automatic mode, LAU and either LOF or LON will be in the variable field, depending on whether or not the dial tone delays were severe enough (three successive dial tone speed test delays greather than 11 seconds) to warrant the automatic activation of the line load control program.

Note 2: RVN, LOF, and LAU are normal conditions.

Fig. 5—TØC02 Output Message Format (11.07)

NO. 1 ESS — ABNORMAL TRAFFIC LOAD — POWER FAILURE

A large metropolitan area encountered a major power failure. Customer reaction caused an abnormal traffic load on the No. 1 ESS serving this area. The No. 1 ESS was equipped with an SP CTX-4, Issue 5 Generic Program.

1. Switching Overload Identification

The first indications of the traffic overload were received at 2:30 pm. This data was gathered from the TC15 traffic reports throughout the overload.

| TIME	ORIG CALLS	INC CALLS	O + I CALLS	DTD OVER 3 SEC	IML	E TO E PROGRAM CYCLES	LINE SCAN RATES	DTD OVER 11 SEC
2:15	4013	2790	6803	0%	0%	34378	14495	0%
2:30	9035	3911	12946	60.9%	.03%	12467	11300	56%
2:45	10931	5408	16339	93.8%	.04%	4149	9713	84%
3:00	11049	6914	17963	86.2%	.04%	3731	11558	11%
3:15	11140	7248	18388	76.4%	.01%	4196	11862	0%
3:30	11279	7520	18799	41.8%	.09%	4895	11916	1%
3:45	11214	7105	18319	10.7%	.12%	6849	11871	0%
4:00	11170	6865	18035	.9%	.14%	6741	11434	2%
4:15	10898	6430	17328	0%	.11%	8008	11868	0%
4:30	11034	5239	16273	4.4%	.06%	10306	11669	0%
4:45	10260	4698	14958	28.4%	.04%	12309	12383	8%
5:00	6690	3857	10547	0%	0%	26072	13445	0%
5:15	5521	2895	8416	0%	0%	29956	14198	0%

2. Traffic Control Decision

The TC15 traffic data was used in the determination of administration control action. It was decided that line load control should remain in the OFF mode throughout the entire overload.
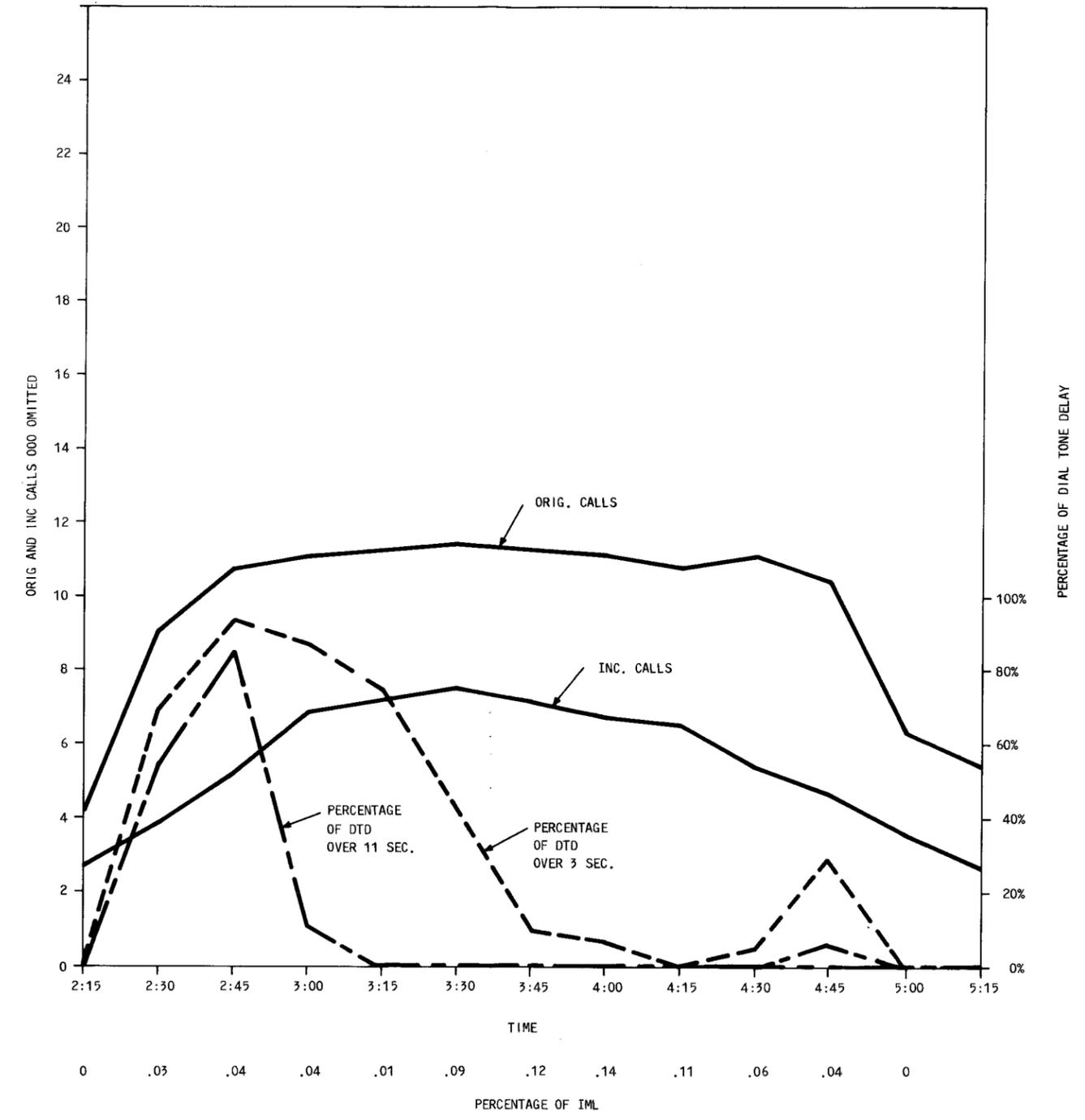
3. Overload Analysis Graphs

Two graphs were prepared to show the effects of heavy calling during the power failure. Attachment A, Sheet 2 shows its effect on call processing Attachment A, Sheet 3 shows its effect on calls versus service.

**Attachment A—Abnormal Traffic Load—Power Failure
(Sheet 1 of 3)**
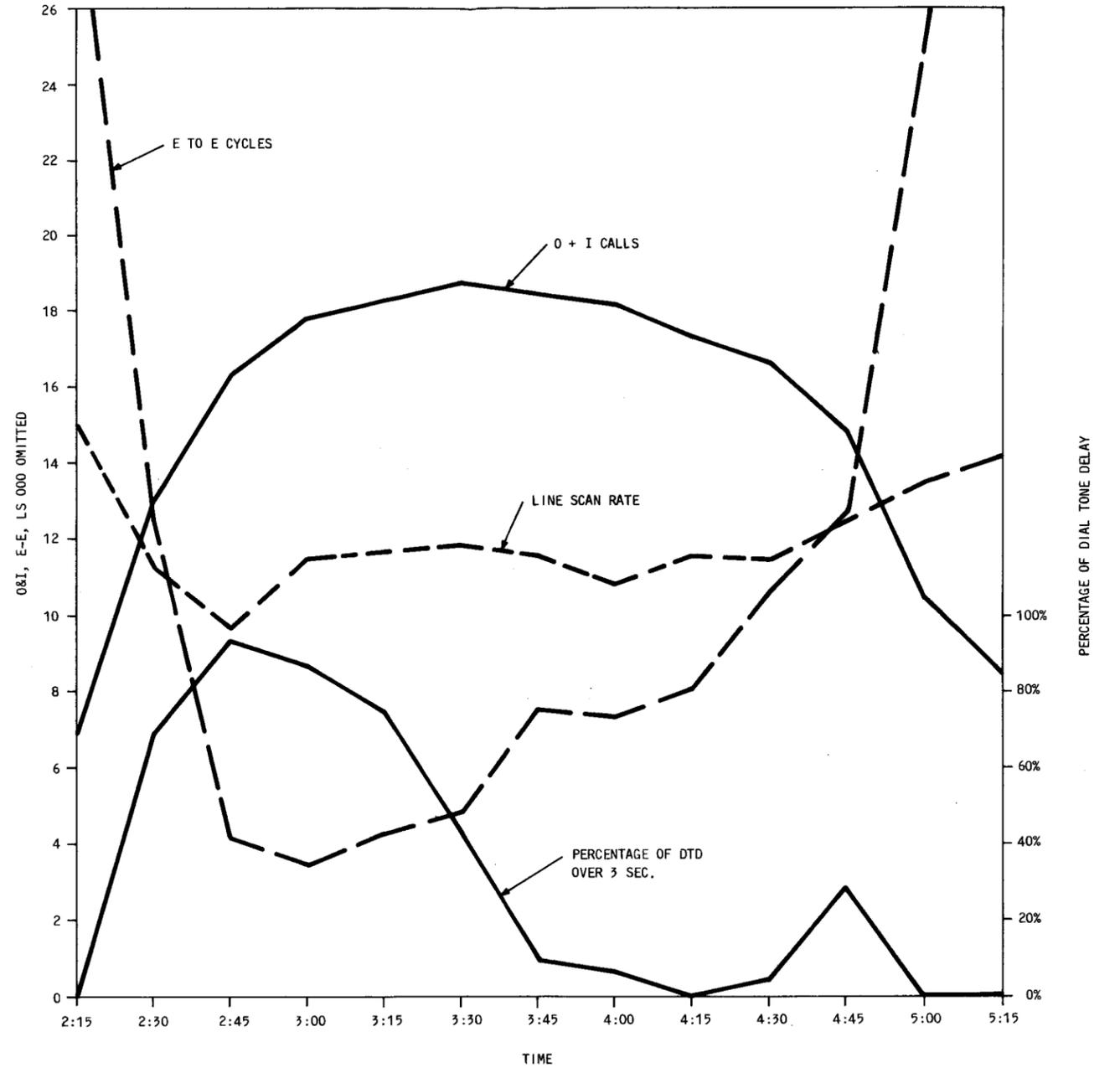
Attachment A—Abnormal Traffic Load—Power Failure
(Sheet 2 of 3)

**Attachment A—Abnormal Traffic Load—Power Failure
(Sheet 3 of 3)**

NO. 1 ESS — ABNORMAL TRAFFIC LOAD — TORNADO

A tornado swept through a medium-sized city damaging houses and telephone lines and knocking down power lines. Public excitement which was generated by the storm placed an abnormal traffic load on the No. 1 ESS serving this area. The No. 1 ESS was equipped with an SP CTX-5, Issue 5 Generic Program.

1. Switching Overload Identification

The first indications of the traffic overload were received at 3:45 pm. This data was gathered from the TC15 traffic reports throughout the overload.

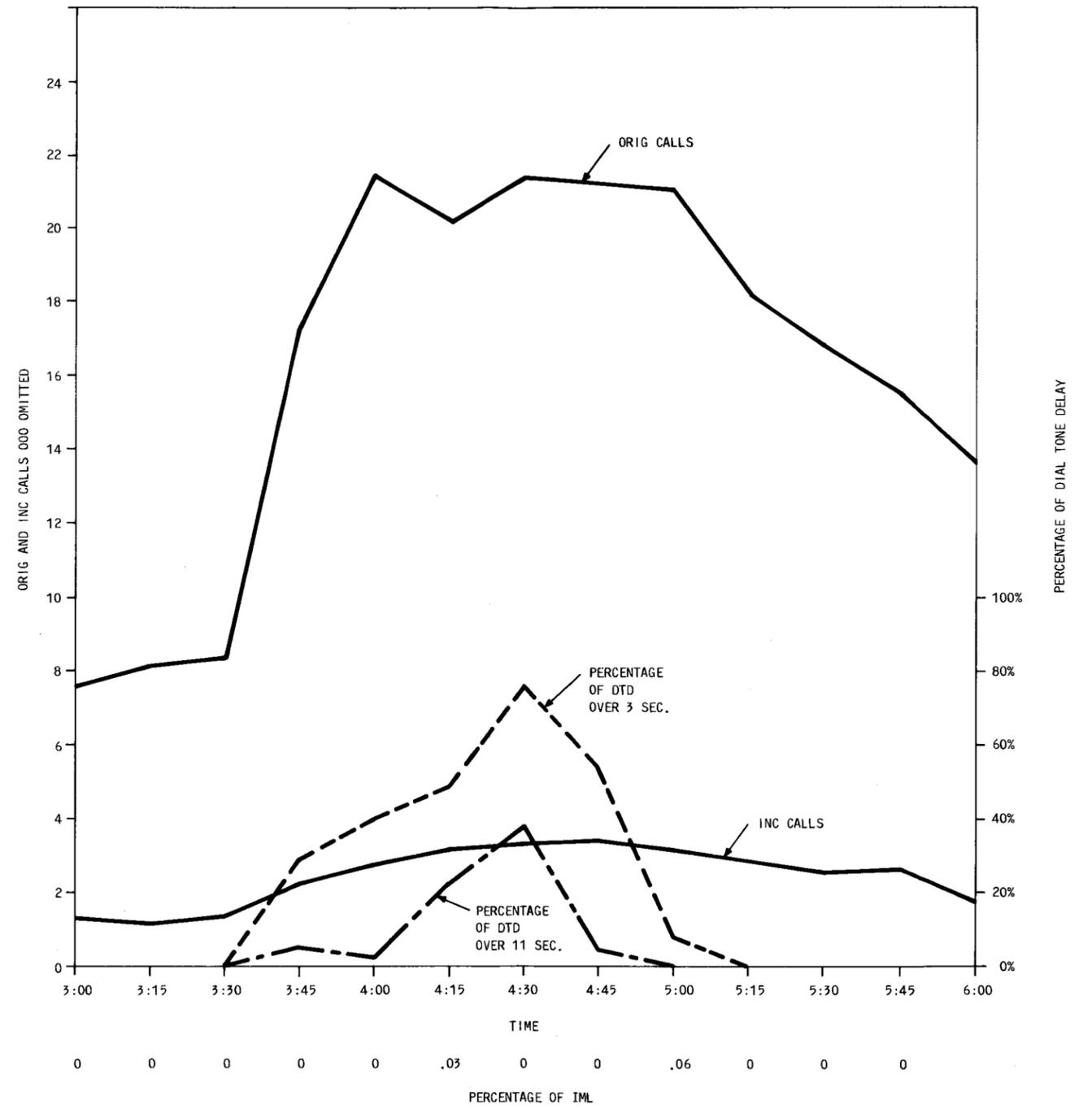| TIME	ORIG CALLS	INC. CALLS	O + I CALLS	DTD OVER 3 SEC	IML	E TO E PROGRAM CYCLES	LINE SCAN RATES	DTD OVER 11 SEC
3:00	7724	1339	9063	0%	0%	22779	10876	0%
3:15	8163	1235	9398	0%	0%	21724	10714	0%
3:30	8390	1406	9796	0%	0%	26868	9903	0%
3:45	17383	2159	19542	20.9%	0%	9428	4772	4.9%
4:00	21470	2801	24271	40.0%	0%	2162	291	3.6%
4:15	20732	3079	23811	40.9%	.03%	2135	627	22.2%
4:30	21497	3165	24662	76.9%	0%	1938	86	39.1%
4:45	21472	3379	24851	54.2%	0%	1914	207	6.7%
5:00	21154	3095	24249	9.3%	.06%	2946	4754	0%
5:15	18093	2860	20953	0%	0%	7219	7139	0%
5:30	16951	2522	19473	0%	0%	6579	7701	0%
5:45	15741	2544	18285	0%	0%	7355	8160	0%
6:00	13675	1879	15554	0%	0%	11246	8940	0%

2. Traffic Control Decision

The TC15 traffic data was used in the determination of administration control action. It was decided that line load control should remain in the OFF mode throughout the entire overload.

3. Overload Analysis Graphs

Two graphs were prepared to show the effects of heavy calling following the tornado. Attachment B, Sheet 2 shows its effect on call processing and Attachment B, Sheet 3 shows its effect on calls versus service.

Attachment B—Abnormal Traffic Load—Tornado (Sheet 1 of 3)
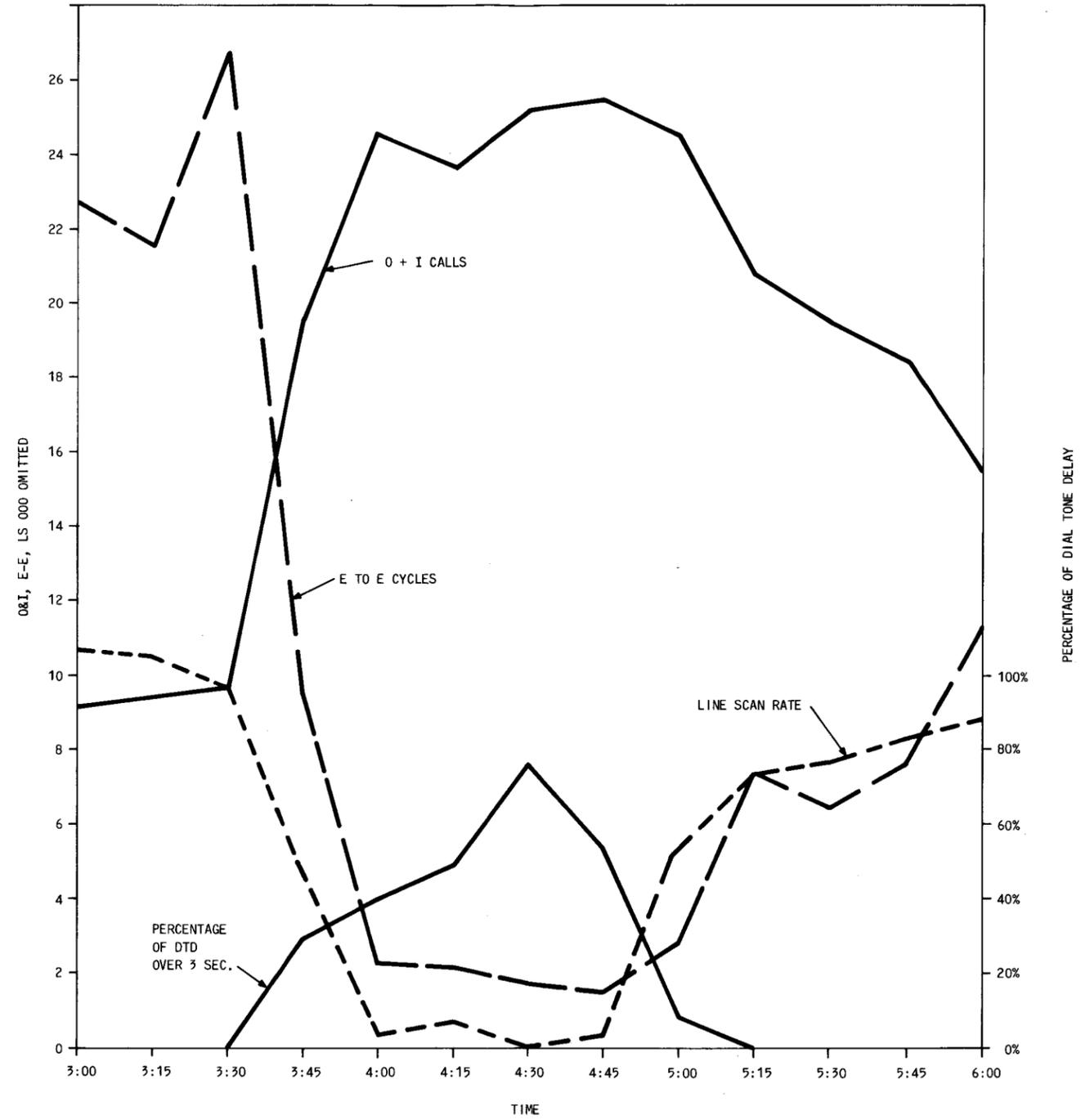
Attachment B—Abnormal Traffic Load—Tornado (Sheet 2 of 3)

Attachment B—Abnormal Traffic Load—Tornado (Sheet 3 of 3)