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TELESOLUTIONS

TECHNICAL PRACTICE

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Trunk Dial Unit

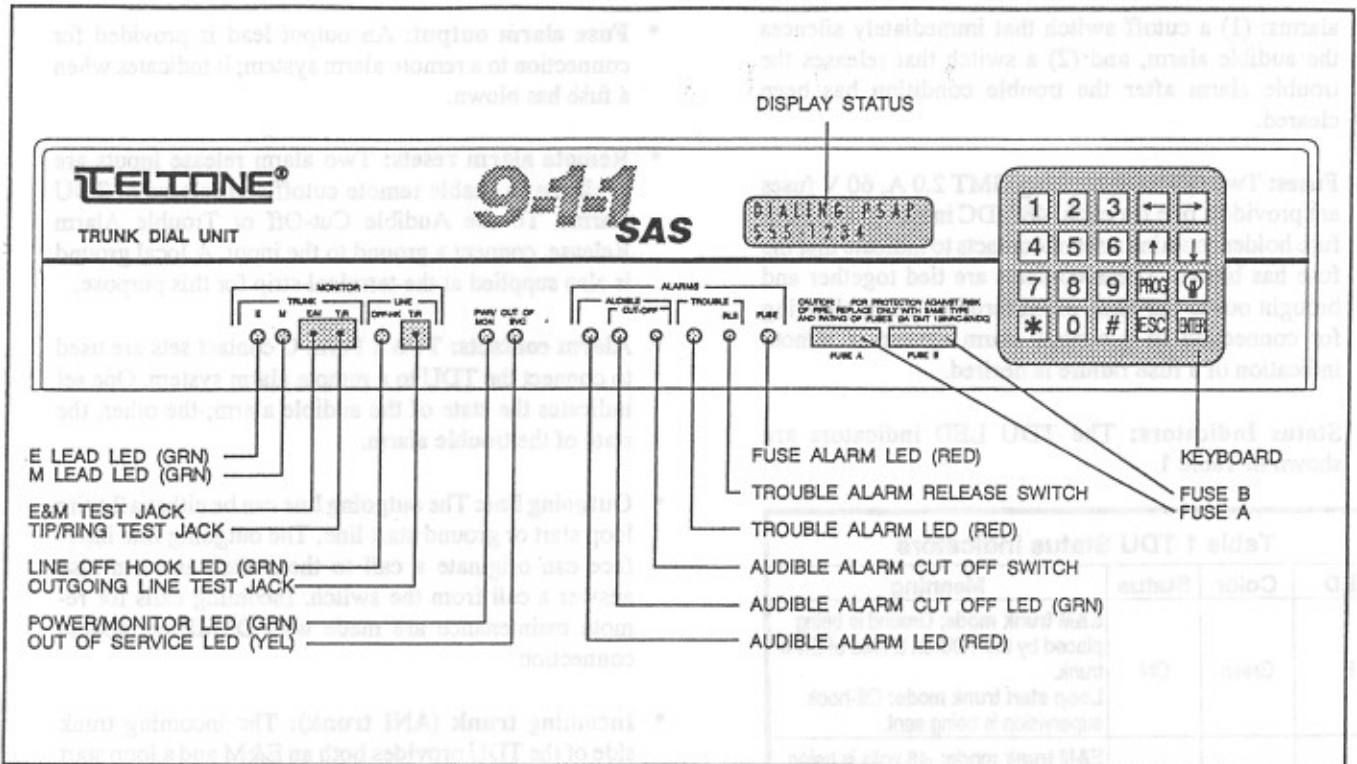


Figure 9 TDU Front Panel

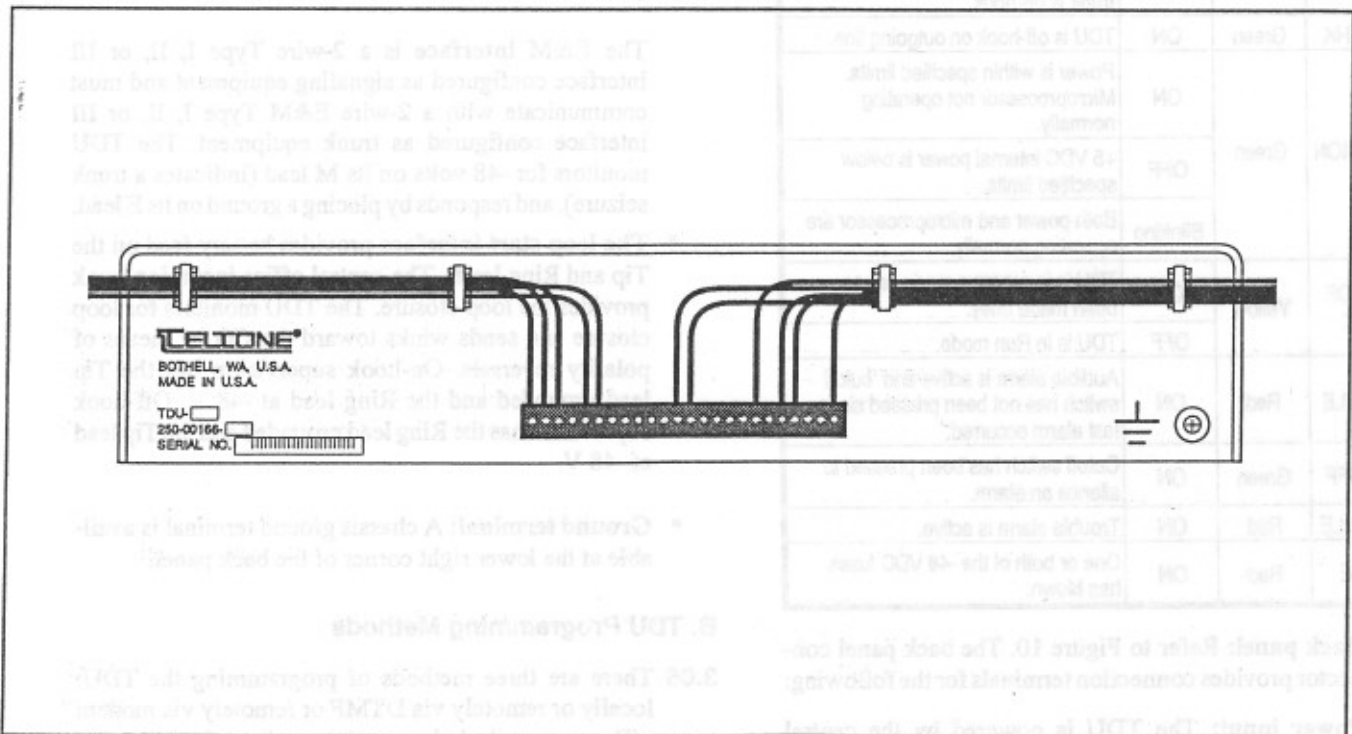


Figure 10 TDU Back Panel

alarms: (1) a cutoff switch that immediately silences the audible alarm, and (2) a switch that releases the trouble alarm after the trouble condition has been cleared.

- **Fuses:** Two failure-indicating GMT 2.0 A, 60 V fuses are provided, one for each -48 VDC input circuit. Each fuse holder contains a set of contacts to indicate that the fuse has blown. These contacts are tied together and brought out to the back panel terminal strip, allowing for connection to a central alarm system if remote indication of a fuse failure is desired.
- **Status Indicators:** The TDU LED indicators are shown in Table 1.

Table 1 TDU Status Indicators

LED	Color	Status	Meaning
E	Green	ON	E&M trunk mode: Ground is being placed by the TDU on E lead of E&M trunk. Loop start trunk mode: Off-hook supervision is being sent.
M	Green	ON	E&M trunk mode: -48 volts is being sensed by the TDU on M lead of E&M trunk. Loop start trunk mode: Incoming trunk is off-hook.
OFF-HK	Green	ON	TDU is off-hook on outgoing line.
PWR/MON	Green	ON	Power is within specified limits. Microprocessor not operating normally.
		OFF	+5 VDC internal power is below specified limits.
		Blinking	Both power and microprocessor are operating normally.
OUT OF SVC	Yellow	ON	TDU is in program mode or has been made busy.
		OFF	TDU is in Run mode.
AUDIBLE	Red	ON	Audible alarm is active and cutoff switch has not been pressed since last alarm occurred.
CUTOFF	Green	ON	Cutoff switch has been pressed to silence an alarm.
TROUBLE	Red	ON	Trouble alarm is active.
FUSE	Red	ON	One or both of the -48 VDC fuses has blown.

3.04 Back panel: Refer to Figure 10. The back panel connector provides connection terminals for the following:

- **Power input:** The TDU is powered by the central office -48 VDC supply system. For redundancy, two independent inputs are provided. These inputs are fused separately at the front panel.

- **Fuse alarm output:** An output lead is provided for connection to a remote alarm system; it indicates when a fuse has blown.
- **Remote alarm resets:** Two alarm release inputs are available to enable remote cutoff and release of TDU alarms. To use Audible Cut-Off or Trouble Alarm Release, connect a ground to the input. A local ground is also supplied at the terminal strip for this purpose.
- **Alarm contacts:** Two 1 Form C contact sets are used to connect the TDU to a remote alarm system. One set indicates the state of the audible alarm; the other, the state of the trouble alarm.
- **Outgoing line:** The outgoing line can be either a 2-wire loop start or ground start line. The outgoing line interface can originate a call to the switch and can also answer a call from the switch. Incoming calls for remote maintenance are made with DTMF or modem connection
- **Incoming trunk (ANI trunk):** The incoming trunk side of the TDU provides both an E&M and a loop start interface. Wiring of the trunk to the TDU back panel differs for the two trunk types, as described in paragraph 3.16.

The **E&M interface** is a 2-wire Type I, II, or III interface configured as signaling equipment and must communicate with a 2-wire E&M Type I, II, or III interface configured as trunk equipment. The TDU monitors for -48 volts on its M lead (indicates a trunk seizure), and responds by placing a ground on its E lead.

- **The loop start interface** provides battery feed on the Tip and Ring leads. The central office incoming trunk provides the loop closure. The TDU monitors for loop closure and sends winks toward the CO by means of polarity reversals. On-hook supervision has the Tip lead grounded and the Ring lead at -48 V. Off-hook supervision has the Ring lead grounded and the Tip lead at -48 V.
- **Ground terminal:** A chassis ground terminal is available at the lower right corner of the back panel.

B. TDU Programming Methods

3.06 There are three methods of programming the TDU: locally or remotely via DTMF or remotely via modem access. The paragraphs below explain each method.

3.10 Modem Remote Access: The TDU can be accessed remotely for configuration and can examine call events records and alarm status. Remote modem access is performed with a 300 bps, 1200 bps, or 2400 bps modem. When enabled, the modem is accessed through the TDU outgoing line connection. While the TDU is accessed through the modem, it busies out the incoming ANI trunk interface. The interface remains busied and the Out-of-Service LED on the TDU front panel remains on until the modem disconnect and the outgoing line is freed.

All keypad programming options and maintenance tests, except those requiring physical access to the TDU, such as keypad and display tests, are accessible through the modem menus.

PROGRAMMING THE TDU

3.11 TDU programming has three sections: numbers, signaling, and configuring. The Program menu is summarized in Table 6, page 38.

3.12 Numbers: The TDU stores ten telephone numbers for dialing out, with location-specific information for each of the first six numbers, and three time-of-day values.

- **Telephone numbers:** The TDU is able to dial a primary number (normal operation), a secondary number (if the first location is not accessible), a local emergency number (if no locations are accessible), or any of the four maintenance numbers. (For the TDU to step to the local number, both primary and secondary locations must be equipped with a CAU or a CTU.) The TDU can also be programmed to ring alternate numbers at the primary and secondary locations and the local emergency site starting and ending at specified times of day. The telephone numbers are organized as follows:

- (1) Primary number
- (2) Time-of-day change primary number
- (3) Secondary number
- (4) Time-of-day change secondary number
- (5) Local emergency number
- (6) Time-of-day change local emergency number
- (7) Maintenance number 1
- (8) Maintenance number 2
- (9) Maintenance number 3
- (10) Maintenance number 4

- **Called location information:** The TDU needs information about the type of equipment at the called location so that it can properly format the MF information it sends. For each of the first six numbers, the user enters

a single digit (0-6) to identify the called location as one of the following:

- 0 — Called location with no CAU or CTU
- 1 — Location that expects ANI on wink.
- 2 — Location that expects ANI on answer.
- 3 — Tandem central office.
- 4 — Location that expects ANI on wink and supports Virtual Trunk
- 5 — Location that expects ANI on answer and supports Virtual Trunk.
- 6 — Tandem central office with Virtual Trunk support

- **Time values:** Three time values can be programmed into the TDU:

- Time-of-day change for the primary number
- Time-of-day change for the secondary number
- Time-of-day change for the local emergency number

3.13 Signaling Parameters: In some installations, the format of the address signaling (called and calling numbers) expected at the destination is different from the format received by the TDU from the switch. The TDU needs the following information to determine the format of received and transmitted information:

- **TDU location:** The TDU needs to know if it is in an end office or a tandem office. If an end office, the TDU expects two MF strings, the first being the called number, and the second the calling number in network format. If the TDU is in a tandem office, it expects only one MF string, the calling number in PSAP format.
- **Address signaling start:** The method for requesting address signaling from the ANI trunk can be either the occurrence of seizure of the TDU incoming trunk interface (immediate dial operation) by the switch, or a wink start by the TDU toward the ANI trunk.
- **Default ANI:** This number is used by central offices that are unable to send ANI for particular classes of callers or if the TDU does not receive ANI from the trunk. If the TDU does not receive an ANI spill from the switch when it is requested, one of the following will occur:

If a number is programmed here, it is used as the content of the ANI spill. This number may be one of the three-digit prefixes (NNX) used in the CO; however, up to 14 digits can be used. (All 16 digits cannot be used since the KP and ST digits are inserted automatically by the TDU.) This number should be in a format that is acceptable to the PSAP equipment.

If no number is programmed here and no ANI is spilled by the switch, the TDU will send a KP-2-ST MF signal

to the CAU or CTU. The PSAP or tandem display should correctly interpret this occurrence.

- **Numbering plan digit:** The numbering plan digit (NPD) is a single digit. If a numbering plan digit has been programmed, the ANI string sent will consist of the NPD followed by the last 7 digits of the received ANI string. This digit is used in the conversion from network format ANI to PSAP ANI.
- **Called number:** If the TDU and CTU are both in tandem offices (tandem to tandem operation), the TDU needs to synthesize a called number string. This number can be up to 14 digits, but typically is one of the following strings:

911
11
1

The TDU will automatically include KP and ST digits. This number will also be used as the default called number in an end-office-to-tandem call if no called number was received from the end office.

- **NPD translations:** In some locations with tandem to tandem operation, it may be necessary to translate the NPD received from the first tandem office into an area code for the second tandem office. The NPD to NPA translation table allows three digits for each NPD translation (NPDs 0-7).

3.14 Configuration: The user can select from a number of configuration options, as listed below.

- **Outgoing line type:** Loop Start or Ground Start can be selected as appropriate.
- **Dial outpulsing type:** DTMF (tones) or PULSE (rotary dial pulses) for dialing out of the loop interface.
- **Non-SAS disconnect type:** Where no CAU or CTU is installed at the called location, the user can configure the TDU to disconnect when it detects: (1) 800 ms open or calling party disconnect, or (2) dial tone or dialing attempts
- **Statistical alarm thresholds:** The user is able to specify the number of successive failures required to generate an alarm, for the following categories:
 - (1) Failure to detect dial tone before calling party disconnects
 - (2) RAM Read/Write test failures
 - (3) Program memory checksum test failures
 - (4) Data base checksum test failures

Options are 0 through 15. If 0 is selected for a category, no alarm is ever generated for that failure type.

- **System clock:** A screen is provided for setting the current time, date, and day of week, and to enable automatic adjustment of the system clock for daylight saving time changes.
- **Remote access:** DTMF remote access to the TDU is protected by a security code of up to 16 digits. Operations that can be accomplished through remote access to the TDU are listed in paragraph 3.09. These operations can be selectively enabled or disabled, or the "global" option can be disabled to deny all remote access to the TDU.
- **Timeouts:** Timeout values can be set for the following:

(1) **Ring/No Answer (primary and secondary):** The user can specify that the TDU dial the secondary number when the primary location fails to answer within a chosen time period. Options are 0 through 255 (seconds). If 0 is selected, no attempt is made to call the other numbers and the primary number continues to ring for 120 seconds before the call is disconnected. If 1 through 255 is chosen, the TDU will ring the primary, then the secondary number for the chosen number of seconds, then ring the local number for 120 seconds before disconnecting the call and generating an alarm.

(2) **Called number timeout:** A wink start trunk may deliver both the called number and calling number, or only the calling number (ANI). If only the calling number is delivered, the TDU will time out after waiting for the called number, and then request the calling number (see Figure 15). This timeout can be set between 0 and 255 seconds. If 0 is chosen, a minimum 2 second timeout will occur.

(3) **Network setup timeout:** The network can be given a limited amount of time to set up the call to the intended location. The timer is active from the time the TDU finishes dialing until it receives the "CAU/CTU Answer" code. Options are 0 through 255 (seconds). If 0 is selected, there is no timeout, so the TDU will not terminate the call until the calling party disconnects. If 1 through 255 is chosen, the TDU will terminate the call and dial the secondary number after the timeout period passes. If the secondary CAU/CTU also does not answer within the timeout period, the TDU will then dial the local number for the specified number of seconds.

(4) **Dial tone delay timeout:** When the TDU goes off-hook on the outgoing line, it looks first for loop current, then for dial tone. The user can specify a length

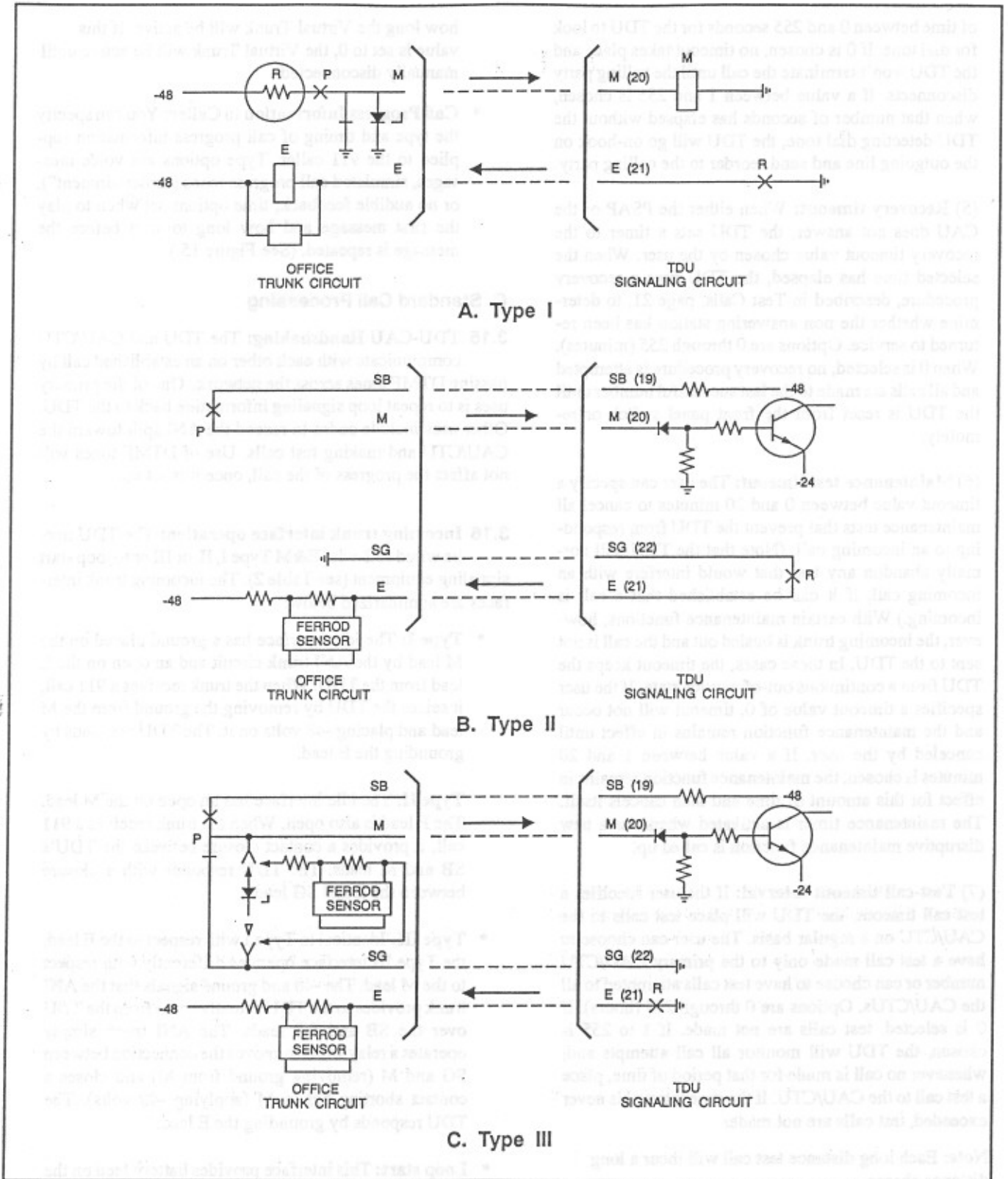


Figure 14 E&M Interface Circuits

of time between 0 and 255 seconds for the TDU to look for dial tone. If 0 is chosen, no timeout takes place and the TDU won't terminate the call until the calling party disconnects. If a value between 1 and 255 is chosen, when that number of seconds has elapsed without the TDU detecting dial tone, the TDU will go on-hook on the outgoing line and send reorder to the calling party.

(5) **Recovery timeout:** When either the PSAP or the CAU does not answer, the TDU sets a timer to the recovery timeout value chosen by the user. When the selected time has elapsed, the TDU runs a recovery procedure, described in Test Calls, page 21, to determine whether the non answering station has been returned to service. Options are 0 through 255 (minutes). When 0 is selected, no recovery procedure is attempted and all calls are made to the last successful number until the TDU is reset from the front panel switch or remotely.

(6) **Maintenance test timeout:** The user can specify a timeout value between 0 and 20 minutes to cancel all maintenance tests that prevent the TDU from responding to an incoming call. (Note that the TDU will normally abandon any test that would interfere with an incoming call, if it can be established that a call is incoming.) With certain maintenance functions, however, the incoming trunk is busied out and the call is not sent to the TDU. In these cases, the timeout keeps the TDU from a continuous out-of-service state. If the user specifies a timeout value of 0, timeout will not occur and the maintenance function remains in effect until canceled by the user. If a value between 1 and 20 minutes is chosen, the maintenance function remains in effect for this amount of time and then cancels itself. The maintenance timer is activated whenever a new disruptive maintenance function is called up.

(7) **Test call timeout interval:** If the user specifies a test call timeout, the TDU will place test calls to the CAU/CTU on a regular basis. The user can choose to have a test call made only to the primary CAU/CTU number or can choose to have test calls attempted to all the CAU/CTUs. Options are 0 through 255 (hours). If 0 is selected, test calls are not made. If 1 to 255 is chosen, the TDU will monitor all call attempts and, whenever no call is made for that period of time, place a test call to the CAU/CTU. If the time interval is never exceeded, test calls are not made.

Note: Each long distance test call will incur a long distance charge.

(8) **Virtual Trunk timeout:** The user can specify a timeout value between 0 and 9,999 minutes. This sets

how long the Virtual Trunk will be active. If this value is set to 0, the Virtual Trunk will be active until manually disconnected.

- **Call Progress Information to Caller:** You can specify the type and timing of call progress information supplied to the 911 caller. Type options are voice messages, simulated call progress tones ("entertainment"), or no audible feedback; time options set when to play the first message and how long to wait before the message is repeated. (See Figure 15.)

C. Standard Call Processing

3.15 TDU-CAU Handshaking: The TDU and CAU/CTU communicate with each other on an established call by passing DTMF tones across the network. One of the primary uses is to repeat loop signaling information back to the TDU. Other uses include codes to resend the ANI spill toward the CAU/CTU and making test calls. Use of DTMF tones will not affect the progress of the call, once it is set up.

3.16 Incoming trunk interface operation: The TDU may be wired to 2-wire E&M Type I, II, or III or to loop start signaling equipment (see Table 2). The incoming trunk interfaces are summarized below:

- **Type I:** The idle interface has a ground placed on the M lead by the ANI trunk circuit and an open on the E lead from the TDU. When the trunk receives a 911 call, it seizes the TDU by removing the ground from the M lead and placing -48 volts on it. The TDU responds by grounding the E lead.
- **Type II:** The idle interface has an open on the M lead. The E lead is also open. When the trunk receives a 911 call, it provides a contact closure between the TDU's SB and M leads. The TDU responds with a closure between the E and SG leads.
- **Type III:** Identical to Type I with respect to the E lead, the Type III interface operates differently with respect to the M lead. The -48 and ground signals that the ANI trunk provides to the TDU actually come from the TDU over the SB and SG leads. The ANI trunk simply operates a relay which removes the connection between SG and M (removing ground from M) and closes a contact shorting SB to M (applying -48 volts). The TDU responds by grounding the E lead.
- **Loop start:** This interface provides battery feed on the Tip and Ring leads. The central office provides the loop closure. The TDU monitors for loop current and sends winks toward the central office by means of polarity

reversals. On-hook supervision has the Tip lead grounded and the Ring lead at -48 V. Off-hook supervision has the Ring lead grounded and the Tip lead at -48V.

Note: Details of E&M interface operation are given in LSSGR TR-TSY-000064, Iss. 2, July 1987, Section 6.3.3, and Notes on the BOC Intra-LATA Network, AT&T, 1986, Section 6, subsection 8.

3.17 Local address signaling: The ANI trunk spills address information to the TDU either in response to the ground on the E lead from the TDU or an off-hook on the trunk (immediate dial) or by the TDU giving an E lead wink or off-hook supervision to the ANI trunk (wink start). The E lead wink is an off-hook wink toward the trunk, returning to the on-hook state. The TDU must detect loop current on the outgoing line before it will return any ground (permanent or wink) on the E lead or off-hook supervision.

- **End office:** An end office will send the called number to the TDU in response to the wink (wink start), or immediately after it seizes the trunk (immediate dial). The TDU will then place the trunk into an off-hook state, which signals the trunk to send the calling number (ANI). This MF information is then received and stored within the TDU for later transmission to the CAU/CTU.
- **Tandem office:** A tandem office will send the calling number (ANI) to the TDU in response to the wink (wink start) or immediately after it seizes the trunk (immediate dial). The TDU will then place the trunk into an off-hook state. This MF information is then received and stored within the TDU for later transmission to the CAU/CTU.

3.18 Call initiator: The TDU places a call over the outgoing line, using the programmed primary number. While the TDU is placing the call, voice messages or simulated call progress tones (if programmed) are sent towards the calling party to indicate that the call is being processed. If the TDU is unable to draw loop current from the line interface, an alarm is set.

3.19 CAU/CTU answer: When ringing appears on the incoming loop interface of the CAU/CTU, the CAU/CTU IN USE LED will flash at a 20 Hz rate and the CAU/CTU will answer the call and send the "CAU/CTU Answer" digit code to the TDU. The IN USE LED will turn ON steady when the CAU/CTU answers. The TDU responds with the Alert PSAP code. The CAU/CTU then closes the loop toward the outgoing interface to indicate an incoming call and blinks its IN USE LED.

3.20 PSAP answer: When the unit on the outgoing loop answers, the CAU/CTU sends the "PSAP Answer" code to the TDU. If the PSAP ANI request type is programmed for spill on ANSWER, the TDU will send the ANI at this time. The TDU will then send the stored ANI string (using MF digits) upon receipt of one of the following messages: "Send ANI", "PSAP Wink", or "PSAP Flash". At this point, the CAU/CTU will be cut through and the ANI string will proceed directly to the PSAP station.

- If the call is a test call, after the CAU/CTU sends the "CAU/CTU Answer" code, the TDU responds with the "Test Call" code instead of the "Alert PSAP" code, and the CAU/CTU responds with either an "ASW" or a "Trouble" code, depending on the current alarm state. After sending this status, the CAU/CTU will go on-hook toward the CO. The TDU records the results of test calls in the statistics call records.
- Where no CAU/CTU is present at the called number, Message 3 is played (if voice messaging is enabled) and the TDU cuts the call through immediately after dialing and does not perform any other functions. Also, no ANI is transmitted.

3.21 Sending Called Number and ANI: The called number and ANI formats sent by the TDU, and the timing of their sending, can differ depending on the type of location at which the CAU/CTU is installed. The following paragraphs describe the different methods used:

- **NON-SAS (No CAU/CTU):** If the destination has no CAU or CTU, the called or calling numbers are not sent.
- **PSAP-ANI on WINK:** If the destination is a PSAP that expects ANI to be sent in response to a wink, the TDU sends PSAP format ANI in response to either a "PSAP wink" or "PSAP flash" message from the CAU at that location. If the TDU is located in an end office, it will use the numbering plan digit (NPD), if one is programmed, to convert the network format ANI to PSAP format ANI.
- **PSAP-ANI on ANSWER:** If the destination is a PSAP that expects ANI to be sent upon answer, the TDU sends PSAP format ANI in response to a "PSAP answer" message from the CAU at that location. If the TDU is located in an end office, it will use the numbering plan digit (NPD), if one is programmed, to convert the network format ANI to PSAP format ANI.
- **Tandem office:** If the destination is a tandem office, the TDU will send the called number in response to a

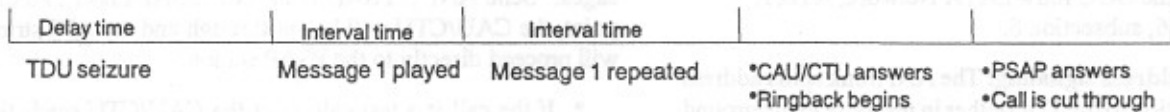
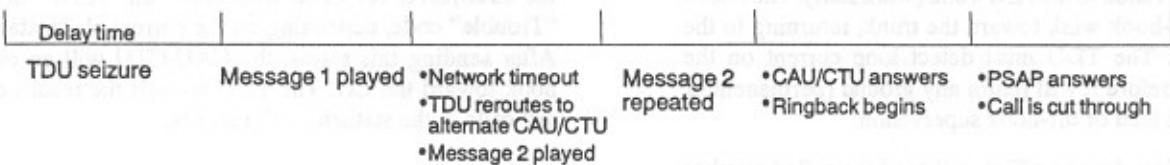
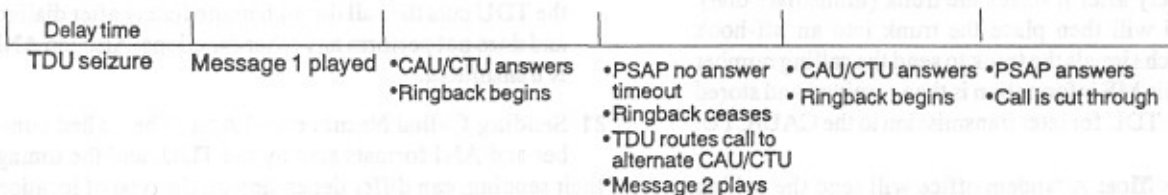
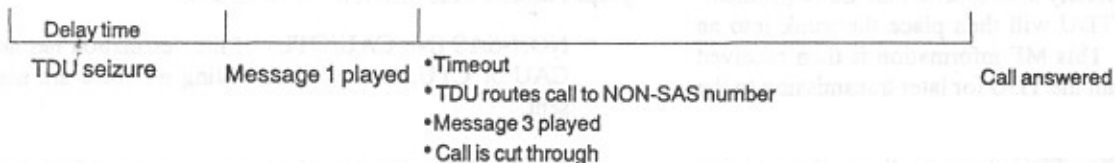
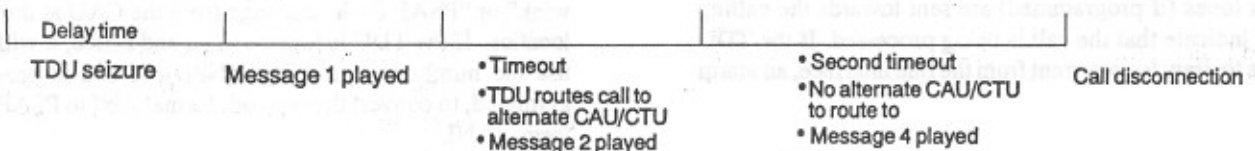
(1) First attempt of TDU to reach a CTU/CAU (call completes):**(2) Routing to an alternate CAU/CTU due to network timeout (call completes):****(3) Routing to an alternate CAU/CTU due to no answer at PSAP (call completes):****(4) Call is routed to alternate NON-SAS number:****(5) No response from primary and secondary CAU/CTUs and no NON-SAS number programmed:**

Figure 15 Voice Message Timeline

“PSAP wink” or “PSAP flash” message from the CTU, and the calling number (PSAP ANI) in response to a “PSAP answer” message. If the TDU is located in an end office, these strings are sent exactly as they were received from the office. If the TDU is in a tandem office, the called number is the one programmed by the user, and the calling number is converted from PSAP format to network format by inserting an information digit (always 0), translating the received NPD to an NPA (if programmed), and including the 7 digits of the received phone number.

3.22 Call Processing Messages: Figure 15 is a timeline showing when messages are played during call processing. If voice messaging is selected, the caller will hear one of four messages. (The messages differ depending on where the TDU is routing the call.) Default messages are recorded and stored in the TDU, but the user can rerecord these messages (see “Remote Access” and Message 4, below). The ability to call in and change messages can be enabled or disabled through the configuration menu. In the default configuration, the feature is disabled. Maximum message length is 4 seconds.

Message 1 is played back to the caller as the TDU routes the call to a CTU/CAU (not necessarily the primary number).

Message 2 is played if the TDU is required to reroute the call to an alternate location because the call was not answered at the first location. The message will be played again if the TDU has to reroute the call to a third location.

Message 3 is played if the TDU is routing the call to a NON-SAS number (a number without a CAU/CTU). The message is only played once before the TDU cuts the caller through to the outgoing line.

Message 4 is played when either the TDU cannot dial out on its outgoing line or there is no NON-SAS number programmed and the TDU cannot make contact with the Primary, Secondary, or Local number. The default message instructs the caller to dial a local emergency number; however, it is recommended that this message be changed during installation to specify a number to dial. For example, Message 4 could be changed to:

“All emergency circuits are busy. Dial 555-9898.”

When recording messages, make short and clear statements short, spoken in a calm, unhurried voice conveying just enough information to assure the caller that his call is in progress, is being rerouted, or giving simple instructions to dial a number not included in the normal 9-1-1 network (for example, the seven- or ten-digit administrative line of the local police department).

3.23 Disconnect: Calling party disconnect: When the TDU detects calling party disconnect, it sends the “Calling Party Disconnect” code to the CAU/CTU. Depending on the timing of the calling party disconnect, the TDU handles the disconnect in one of three ways:

1) **If the calling party disconnects before the TDU receives ANI**, the TDU releases the incoming trunk and the call becomes a test call to the CAU/CTU.

2) **If the calling party disconnects after the TDU receives ANI but before the PSAP has answered**, the TDU releases incoming trunk, then busies out the trunk until the PSAP answers. The TDU sends the ANI, then releases both its incoming trunk and outgoing line.

3) **If the calling party disconnects after establishing a connection to the PSAP operator and ANI has been sent**, the TDU releases both its incoming trunk and outgoing line. The PSAP operator hears reorder tone.

- **PSAP (called party) disconnect:** When the called party goes on-hook, the CAU/CTU senses the lack of loop current or reversal supervision, sends the “PSAP Disconnect” code to the TDU, goes on-hook on both loop interfaces, and turns off its IN USE LED. Upon receipt of the “PSAP Disconnect” code, the TDU drops the ground on the E lead toward the ANI trunk and goes on-hook on the outgoing loop interface. The trunk recognizes this as a disconnect and removes -48 volts from the M lead and applies ground. The trunk is now ready to accept another call.

- **Non-SAS disconnect:** The menu interface offers two options for disconnect where there is no CAU or CTU at the called location.

If **NORMAL** is selected, the TDU will disconnect if the calling party disconnects or if an 800 ms open interval is detected.

If **ENHANCED** is selected, the TDU will disconnect if the above conditions are met and if dial tone or dialing attempts are detected.

D. Virtual Trunk

3.24 Operation: The Virtual Trunk minimizes call setup time by establishing and maintaining a connection between the TDU and a CAU or CTU. (To establish the Virtual Trunk, both devices must have Virtual Trunk capability. If the receiving device, the CAU or CTU, does not support Virtual Trunk operation, an alarm will be set. The TDU will not busy the incoming trunk if an alarm is set, but will attempt to complete the call on another route.)

If you choose this mode of operation, the TDU remains connected to CAU/CTU between calls. The Virtual Trunk is established automatically when the TDU receives an incoming call or a Virtual Trunk is made by local or remote programming. When the call to a CAU/CTU ends, the TDU drops the incoming trunk, and the CAU/CTU drops its outgoing port. The connection between the TDU and CAU/CTU is maintained.

When the TDU receives a new call, it routes the call over the established Virtual Trunk. If it does not receive the VIRTUAL response when expected, the TDU will complete the call on a standard (i.e., non virtual) trunk, log the event, and set an in-service trouble alarm.

Once the Virtual Trunk is established, the TDU will display normal status messages during calls. Between calls it will test the trunk periodically and will display the following message:

```
VIRTUAL TRUNK
STANDBY
```

At five-second intervals, the TDU will test the Virtual Trunk. The results of the test will display on the TDU screen, alternating with the above message. If the trunk is established and operating correctly, the following will display:

```
VIRTUAL TRUNK
REMOTE OK
```

If there is a problem with the Virtual Trunk the following message will display and the trunk will be disconnected.

```
VIRTUAL TRUNK
REMOTE FAIL
```

- **Timeout:** The Virtual Trunk timer sets the amount of time that the connection remains between the TDU and CAU/CTU. The timer can be set from 0 - 9999 minutes. (For example, if the timer is set to 20, the Virtual Trunk is active for 20 minutes.) If a call is received, the timer is reset after the call ends. The Virtual Trunk will not disconnect while a call is in progress.

- **Disconnection:** If there is no active call, the connection can be dropped manually by local TDU programming, by pressing ESC on the front panel keypad. (It also can be dropped automatically after the timeout period expires.) Pressing ESC will disconnect the trunk, causing the TDU to display the following message:

```
VIRTUAL TRUNK
DISCONNECT
```

- As the message below indicates, press ESC to maintain the Virtual Trunk. To disconnect it, press ENTR while pressing the ACO switch.

```
ESC TO ABORT
ACO+ENTR TO DISC
```

- **Called Location:** You can establish a Virtual Trunk on a per location basis. That is, you can choose to have it established when the TDU routes a call to the primary location, secondary location, either location, or not at all.

If the TDU tries to establish a Virtual Trunk to a device that does not support Virtual Trunk operation, the TDU sends an alarm, but does not busy out the trunk. The TDU will then try to process the call normally. The following message will display if the destination does not support Virtual Trunks:

```
NON-VIRTUAL
DESTINATION
```

- **Link Testing:** While the Virtual Trunk is active, the TDU sends test messages to the CAU/CTU every 5 seconds between calls. If the CAU/CTU does not get any messages from the TDU for 10 seconds, the CAU/CTU will hang up. If the link test fails, the TDU will try to reestablish the failed link. If the TDU cannot reestablish the connection, it will use the next alternative route, and begin recovery testing on the faulty trunk. If the next alternative is also a Virtual Trunk, the TDU will establish the Virtual Trunk to the alternate site. Recovery on the faulty circuit occurs when the active Virtual Trunk on the alternative route becomes inactive. Once inactive, the TDU will attempt recovery on any faulty circuits.

Failure, recovery successful. If an active Virtual Trunk fails, and recovery testing is successful before the timer expires, the connection will be reestablished for the duration of the timer or until forced termination.

- **New Time of Day Number:** If the time of day configuration changes while the Virtual Trunk is active, the

TDU disconnects the Virtual Trunk. If the new Time of Day number is designated as a Virtual Trunk, the TDU will establish the connection with the new number.

- **Remote Access:** To activate the Virtual Trunk remotely, press '9' and the TDU sends a confirmation tone. Press 0 to cancel the Virtual Trunk and 1 through 6 to select the destination. When remote programming is disconnected, the TDU dials the selected destination (1-6) and attempts to establish the Virtual Trunk.

E. Manual Activation of Virtual Trunk

3.25 Manual activation of the Virtual Trunk is very similar.

To activate the Virtual Trunk manually (i.e., from the front panel or via remote access), the TDU will respond to the CAU ANSWER message with a VIRTUAL message, send a TEST CALL message, and wait for a VIRTUAL message followed by a CAU WELL or CAU TROUBLE message.

3.26 Test calls: Once the Virtual Trunk is established, the TDU will send test calls at five-second intervals.

F. Virtual Trunk Operation with TMU

- If the TDU is connected to a TMU, it will signal the TMU each time a Virtual Trunk is established or disconnected. The TMU is able to command the TDU to disconnect the trunk and it will be able to query the TDU to find out if a Virtual Trunk is active.

G. Integrity Tests

3.27 Test Calls: Any normally scheduled maintenance test calls are suspended whenever recovery or no answer procedures are in process to ensure that the scheduled test calls do not interfere with the recovery or no answer procedures. The scheduled test calls are resumed when the system returns to normal.

3.28 Network Test: Test calls can be selected to test either all CAU and CTU destinations sequentially or only the number currently in service. The TDU will also periodically check outgoing loop integrity by going off-hook (via loop or ground start) and checking for dialtone. This test can be enabled or disabled and the frequency of loop tests are programmable at one-minute intervals from 1 to 255 minutes.

3.29 Trunk Test: If the TDU is located in a tandem office and the tandem sends a KP-8-ST string in response to the wink from the TDU, the TDU will respond with 60 IPM towards the caller and initiate background test calls to the selected locations.

Under normal conditions, when a test call to the Primary PSAP fails, the Secondary PSAP number will be tried, if it has a CAU/CTU. If this also fails, then the local emergency number will be tried, again, only if it has a CAU/CTU. Automatic test calls will not be made to non-SAS numbers.

H. Call Anomalies

3.30 Under certain circumstances, the TDU may not be able to establish a connection or complete a call. In the following situations, the system operates as described:

- **Failure to detect dial tone.** Persistent failures to receive dial tone on the outgoing loop interface may indicate a problem at the CO. The user can set a dial tone detect threshold specifying that "x" number of successive failures to detect dial tone will generate an alarm.
- **All trunks busy.** If all trunks leaving the calling party CO are busy, the TDU will receive reorder tone and will immediately place the call to the local emergency number, if a local number has been programmed. If no local number has been programmed, the TDU will place the call to the secondary number. On all subsequent calls, the TDU will first try to dial out on the trunks to the PSAP before trying the local number.
- **CAU/CTU busy.** If all of the CAU/CTUs at a particular location are in use, the receiving CO will return busy tone to the TDU. The TDU then places the call to the secondary location. If it is also busy, the TDU calls the local emergency number. All subsequent calls are made to the primary location, before trying the secondary and local numbers.
- **All numbers busy.** If the primary, secondary, and local numbers (or whichever of these have numbers programmed) all return busy or reorder, and none of the numbers are to NON-SAS numbers, the TDU will clear all busy flags and retry the call, starting with the primary number.
- **CAU/CTU no answer.** If the CAU/CTU does not answer within a user-defined time, the TDU assume by that the CAU/CTU has failed. The TDU will abort the call attempt to this number and place a call to the secondary number. If that number does not answer, the local emergency number is called. All subsequent calls will be made to the last number that answered (see "Recovery procedures, CAU/CTU").
- **PSAP (called party) no answer.** If the PSAP fails to answer, then the "Ring/No Answer Timeout" feature

comes into play. If the user has chosen "0" as the timeout value, then the primary number continues to ring until 120 seconds have elapsed. The TDU then sends a "Calling Party Disconnect" code and the CAU/CTU disconnects on both incoming and outgoing loops. If the user has specified a nonzero timeout number, and the called party does not answer within that time, the CAU/CTU is instructed to terminate the call. The TDU now tries the secondary location number for the same amount of time. If the secondary location also fails to answer, the call is terminated and the local number is tried. The local number will be rung for 120 seconds before the TDU terminates all attempts, disconnects the caller, and sets the alarm. All subsequent calls will be made to the last number that answered (see "Recovery procedures, PSAP," paragraph 3.30).

- **PSAP unavailable.** For ACD applications, it is possible to detect when the PSAP equipment is not available. When alerting the PSAP, the CAU closes the loop into the ACD and expects to detect loop current. If it does not, then the ACD has either busied out this line (because of heavy traffic) or the ACD is malfunctioning. In either case, the CAU/CTU sends a "PSAP Unavailable" code back to the TDU and then goes on-hook on the incoming interface. The TDU will then place the call to the secondary location. If the secondary location is also busy, the local number will be called. All subsequent calls will be made to the last number that answered properly.
- **TDU not responding.** If the CAU/CTU answers an incoming call and does not get a handshake from the TDU, then either the TDU has malfunctioned or the call was not from a TDU. In this case, the CAU/CTU will abandon the call and go on-hook toward the CO.

3.30 Recovery procedures from no answer or PSAP unavailable. Whenever the CAU/CTU or the PSAP (terminating equipment) does not answer, the TDU terminates the call and tries the secondary location, then the local emergency number. Subsequent calls are made directly to the number that answered the previous call. Recovery procedures are provided to enable the TDU to determine when the primary (or the secondary) location are back in service and resume directing calls to that device. Two recovery procedures are used:

- **For CAU/CTU no answer,** the TDU sets the recovery timer to the value chosen by the user. Whenever the timer times out, the TDU makes a test call to the failed number and resets the timer. Meanwhile, all live calls received before the timeout occurs are made to the last successful number. This operation will continue until either (1) the test call succeeds, or (2) the user changes

the value of the recovery timer to 0. When the test call succeeds, all further calls will be made to that number.

- **For PSAP no answer or unavailable,** the TDU also sets the recovery timer to the value chosen by the user and until the timer times out all live calls are made directly to the last successful number. When the timer expires, a test call will be made to the failed location. Since test calls test to the CAU/CTU, the assumption is made that, if the unit is not in alarm, the problem with the PSAP will have been corrected. If the PSAP does not answer the next live call placed to it, the PSAP No Answer procedure is used and the timer is reinitialized to the chosen value. The cycle repeats until the PSAP answers or the timeout is set to 0.

4. INSTALLATION

A. Connections

4.01 The TDU-B-02 Trunk Dial Unit is installed in the central office behind a ANI trunk. After both TDU and CAU or CTU units are installed, call processing through the system should be tested as described in "Standard Call Processing".

4.02 Unpack the TDU and examine it for evidence of shipping damage. Return any unit that appears damaged to Teltone. Check the items received against the shipping list to be sure they are correct.

4.03 Choose Unit Location: Choose a location that is convenient for routing incoming and outgoing lines, power, and remote alarm connections. Refer to Table 2 and Figure 14. Paragraph 3.04 describes the TDU interfaces.

4.04 Install Unit in Rack: The TDU may be center or front mounted in a 19- or 23-inch rack by positioning the supplied brackets appropriately (see Figure 13). The unit requires two vertical rack spaces. Position the unit so you can easily read the keypad and display panel. Install the unit using the hardware provided.

4.05 Wire the Unit: All incoming and outgoing TDU connections are made to a screw terminal on the back panel. Stripped wire leads are inserted into the openings and secured by turning the screws clockwise. Wire routing may exit right or left. Tie blocks are provided on the unit (see Figure 10).

(1) The wiring can be accomplished with the connector either inserted or removed from the socket. If you remove the connector, note whether the pins are numbered or labeled on the connector itself. If not, pin 1 is on the left when the connector is oriented as shown in Figure 12.

Terminal	Signal	
1	-48 VDC A Input	Power
2	-48 VDC B Input	
3	Fuse Alarm Output	
4	Ground	
5	Audible Alarm Reset	Alarm Reset
6	Trouble Alarm Reset	
7	Ground	
8	Normally Closed	Audible Alarm Output
9	Common	
10	Normally Open	
11	Normally Closed	Trouble Alarm Output
12	Common	
13	Normally Open	
14	Ground	Outgoing Line
15	Tip	
16	Ring	
17	Tip	Incoming Trunk
18	Ring	
19	SB Lead	E&M Trunk Signaling
20	M Lead	
21	E Lead	
22	SG Lead	
23	Tip	
24	Ring	Incoming Loop Start Trunk

(2) **Incoming Trunk Connections:** The incoming trunk to the TDU may be either E&M or loop start.

- If the incoming trunk is E&M, refer to Table 2 and the E&M interface diagram in Figure 14. Minimum 24 gauge wire is recommended. Make the following connections:

(a) The E lead ground comes from the SG terminal (22).

Where **Type I or III signaling is used**, connect a jumper wire between the local ground (terminal 4, 7, or 14) and SG (terminal 22).

Where **Type II signaling is used**, connect SG to the other end of the E&M circuit.

(b) Connect Tip to terminal 17 and Ring to terminal 18. Terminals 23 and 24 should be left disconnected.

(c) Connect M to terminal 20 and E to terminal 21.

(d) SB is required only for Types II and III E&M trunks.

If the trunk is loop start, refer to Table 2 and make the following connections (minimum 24 gauge wire is recommended):

(a) Connect Tip to terminal 23 and Ring to terminal 24.

(b) Connect a jumper between terminal 17 and terminal 23 (Tip).

(c) Connect a jumper between terminal 18 and terminal 24 (Ring).

(d) Connect a jumper between terminal 14 and 22. This provides a local ground for the SG lead. The ground is required for proper operation of the wink relay and the front panel E LED.

(3) **Outgoing Line Connections:** Connect the outgoing line to terminals 15 and 16. A minimum 24 gauge wire is recommended.

(4) (Optional) **Alarm Connections:** Two 1 Form C contact sets for audible alarm and trouble alarm are provided at Terminals 8-13 for connection to a central alarm system, if desired. Terminals 5 and 6 are available for remote alarm release. (Placing a ground on each input initiates the alarm cutoff or release.) See Figure 11.

(5) **Power Connections:** Connect -48 VDC power to Terminals 1 and/or 2 of the TDU, and connect ground to Terminal 4. (Recommended wire gauge would provide resistance from the distribution panel to the TDU of less than 1 ohm.)

(6) **Identify line and trunk equipment:** Attach the supplied 2" x 3-1/2" adhesive card holder to the unit, if desired, and write in the identity of the connecting line and trunk equipment on the 107-00300-01 information card.

4.06 Grounding information: A frame (earth) ground point is located on the back panel, on the lower right side.

- The TDU must be attached to a frame ground if it is not rack mounted.
- If the TDU is rack mounted, connection to a frame ground is optional.

A customer-supplied ground strap (24 gauge wire or as determined by local practice) with No. 6 ring lug will be required to attach the frame ground. (Terminals 4, 7, and 14 of the terminal strip provide a common or power supply ground.)

B. TDU Turnup

4.07 Call processing through each TDU should be tested in conjunction with CAU/CTU installation personnel, after one or more CAU/CTUs have been installed, as described in Part 3C. If no CAUs are yet installed, the following minimal tests of TDU functions can be performed.

4.08 Power Check: Using a Digital Volt Meter (DVM):

- Place the meter's positive lead on terminal 1 (-48 VDC).
- Place the meter's negative lead on terminal 4 (ground) and verify CO battery (-50 +/- 8 VDC).

VERIFY THE TRUNK TO THE TDU

4.09 Static Incoming Trunk Tests: Using a DVM, verify the following voltages are present on the TDU terminal strip for the incoming trunk type being used.

Note: Test ground by referencing the DVM negative lead to central office battery and the positive lead to the desired terminal. For example, to verify ground on the SG terminal, place the negative lead on terminal strip position 1 and the positive lead on the SG terminal. The DVM will display positive central office battery.

(1) Two-Wire Loop Start Trunk:

Lead	Terminal	Voltage
<input type="checkbox"/> Tip	17 & 23	Ground
<input type="checkbox"/> Ring	18 & 24	CO Battery

(2) E&M Type I

Lead	Terminal	Voltage
<input type="checkbox"/> Tip	17	Dry
<input type="checkbox"/> Ring	18	Dry
<input type="checkbox"/> M	20	Open or Ground from Office
<input type="checkbox"/> E	21	- Battery from TDU

(3) E&M Type II

Lead	Terminal	Voltage
<input type="checkbox"/> Tip	17	Dry
<input type="checkbox"/> Ring	18	Dry
<input type="checkbox"/> SB	19	- Battery from TDU
<input type="checkbox"/> M	20	Open or Ground from Office
<input type="checkbox"/> E	21	- Battery from TDU

SG 22 Ground from Office

(4) E&M Type III

Lead	Terminal	Voltage
<input type="checkbox"/> Tip	17	Dry
<input type="checkbox"/> Ring	18	Dry
<input type="checkbox"/> SB	19	- Battery from TDU
<input type="checkbox"/> M	20	Open or Ground from Office
<input type="checkbox"/> E	21	- Battery from TDU
<input type="checkbox"/> SG	22	Ground from TDU

4.10 Static Outgoing Line Tests: Using a DVM, verify the following voltages are present on the TDU terminal strip for the outgoing line type being used.

(1) Loop Start Line:

Lead	Terminal	Voltage
<input type="checkbox"/> Tip	15	Ground
<input type="checkbox"/> Ring	16	CO Battery

- Using a butt set, go OFF-HOOK between terminals 15 and 16 on the TDU and verify dial tone is returned by the Office.

(2) Ground Start Line:

Lead	Terminal	Voltage
<input type="checkbox"/> Tip	15	Open
<input type="checkbox"/> Ring	16	CO Battery

- Using a butt set, go OFF-HOOK between terminals 15 and 16 and momentarily ground terminal 16 utilizing the capabilities of the butt set or a short length of wire. Verify dial tone is returned by the central office.

4.11 Alarms: Verify the following central office alarm connections.

Note: The TDU's audible and trouble alarms are 1FC relays. Each alarm has a set of normally open and normally closed contacts. Depending on the central office alarm system, either the normally open or the normally closed contact will be used to trigger the central office alarm in the event of a failure.

(1) Alarms

Lead	Terminal	Connection
<input type="checkbox"/> Fuse Alarm	3	To battery bay fuse alarm
<input type="checkbox"/> Audible Alarm	8	Normally closed to CO alarm system
<input type="checkbox"/> Audible Alarm	9	Common from CO alarm system

- | | | | |
|---|------------------------------------|--|---|
| <input type="checkbox"/> Audible Alarm 10 | Normally open to CO alarm system | <input type="checkbox"/> Add Signal Start | Select wink (default) or immediate start |
| <input type="checkbox"/> Trouble Alarm 11 | Normally closed to CO alarm system | <input type="checkbox"/> Default ANI | Enter a default ANI number if appropriate |
| <input type="checkbox"/> Trouble Alarm 12 | Common from CO alarm system | <input type="checkbox"/> Number Plan Digit | Enter a Number Plan Digit if appropriate |
| <input type="checkbox"/> Trouble Alarm 13 | Normally open to CO alarm system | <input type="checkbox"/> Called # String | Enter if appropriate, typically 1, 11, or 911 |

4.12 Apply Power: Apply power to the TDU by installing the appropriate GMT type fuse in the TDU's front panel.

- Verify that the E-Lead, Out of SVC, Audible Alarm, and the Trouble Alarm LEDs are on steady and that the Power LED is blinking.
- The following LEDs should be off: M, OFF-HK, CUT-OFF, and FUSE.

Note: The Audible and Trouble Alarm LED are on because no PSAP numbers are programmed in the TDU from the factory. Once a PSAP number is programmed, the Alarm LEDs will turn off.

4.13 TDU Programming

- Press the "PROG" key on the TDU's front panel keypad.

Using the detailed explanations of the program menu beginning on page 33 as a guide, program the following:

(1) Telephone Numbers and Locations

- | | |
|---|------------------------------------|
| <input type="checkbox"/> Primary PSAP | Telephone number of Primary PSAP |
| <input type="checkbox"/> Primary Location | Enter 0, 1, 2, or 3 |
| <input type="checkbox"/> Secondary PSAP | Telephone number of Secondary PSAP |
| <input type="checkbox"/> Secondary Location | Enter 0, 1, 2, or 3 |
| <input type="checkbox"/> Local | Local PSAP Telephone Number |
| <input type="checkbox"/> Local Location | Enter 0, 1, 2 or 3 |

Note: After you have programmed the Primary PSAP number, the Audible Alarm, and Trouble Alarm will release and the corresponding LEDs on the front panel will turn off.

(2) Signaling

- | | |
|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> TDU Location | Select end office (default) or tandem |
|---------------------------------------|---------------------------------------|

(3) Time and Date: Check that the settings for:

- Time
- Date
- Daylight Savings Time
- Day of the Week are correct.

(4) Remote Access

- | | |
|--|---------------------|
| <input type="checkbox"/> Modem Access | Disabled (default) |
| <input type="checkbox"/> Modem Password | 8358663 (default) |
| <input type="checkbox"/> DTMF Access | Enabled (default) |
| <input type="checkbox"/> DTMF Password | 8358663 (default) |
| <input type="checkbox"/> Access Attempts | 3 (default) |
| <input type="checkbox"/> Restrict Time | 5 minutes (default) |

(5) Outgoing Line

- | | |
|-------------------------------|---|
| <input type="checkbox"/> Type | Loop Start (default) or Ground Start |
| <input type="checkbox"/> Dial | DTMF (default) or rotary signaling |
| <input type="checkbox"/> Disc | Normal (default) or enhanced disconnect |

(6) Verify Call Timings: Verify the following call timings are correct per your 911 network survey:

- | | |
|---------------------------------|----------------------|
| <input type="checkbox"/> No Ans | 60 seconds (default) |
| <input type="checkbox"/> Called | 5 seconds (default) |
| <input type="checkbox"/> Ntwk | 30 seconds (default) |
| <input type="checkbox"/> Dt | 60 seconds (default) |

(7) Verify System Timings: Verify the following system timings are per your 911 network survey:

- | | |
|------------------------------------|----------------------|
| <input type="checkbox"/> Rcvry | 30 minutes (default) |
| <input type="checkbox"/> Mntc | 20 minutes (default) |
| <input type="checkbox"/> Test Time | 4 hours (default) |

- Test Type All locations
- Loop 10 minutes (default)

(8) Call Progress

- Type Voice (default)
- Delay 5 seconds (default)
- Interval 5 seconds (default)

(9) TDU Name

- TDU name No default name has been programmed

B. Installation Testing (9-1-1SAS System)

4.14 The following installation test series is recommended for each installed TDU and CAU/CTU to thoroughly check end-to-end call processing through the 9-1-1SAS with minimal disruption to the PSAPs. (It is assumed that at least one TDU and one CAU/CTU have been installed as described in the CAU-100 and this manual.) Some coordination between TDU and CAU/CTU installation personnel and/or with PSAP administration will be required.

4.15 Alarm Test: The TDU can be exercised from the front panel keypad to verify the Alarm Monitoring System can detect when the TDU has alarmed. Complete the four steps below.

- Set an alarm on the TDU through the maintenance and diagnostic menu.
- Verify the alarm LEDs on the TDU front panel turn on and the Alarm monitoring system detected the alarm.
- Press the Audible Alarm Cut-off pushbutton on the TDU front panel and verify the audible alarm is released.
- Press the Trouble RLS pushbutton on the TDU front panel and verify the trouble alarm is released.

TEST REMOTE ACCESS TO THE TDU

4.16 From a test phone, place a call to the TDU loop line. (The display will show INCOMING CALL, the INCOMING ANSWER.) After you hear 3 short beeps, enter 8358663 (the default security code), followed by #. You should again hear three beeps. If you hear a steady tone, enter the code again.) The display will show REMOTE ACCESS.

4.17 Voice Message Verification: If voice messages are enabled:

- Verify proper message content by using the DTMF remote access voice message playback option. See section H for a detailed explanation on the DTMF remote access options.

PLACE A TEST CALL TO THE CAU

4.18 Place a test call through the TDU to the CAU (the call will not be passed to the PSAP operator) as follows:

- Press any arrow key on the TDU keypad. You will see the following menu:

STATISTICS/SW
MAINTENANCE.

- Use → to highlight MAINTENANCE, then press ↓.
- Highlight EXT. FUNCTIONS and press ↓.
- At the CALL 1 - 10 display, verify that 1 is highlighted. Then press ENTER to place the call.
- The E and LINE OFF-HK LEDs should turn on and the display should show several messages, including REMOTE ANSWER, TEST CALL REMOTE OK, and ON HOOK, ending with IDLE.

4.19 Test Call: Place a test call from the TDU to Secondary 9-1-1SAS devices to verify operation.

- Repeat 4.18, placing a call to the secondary location, 3, instead of the first. To do this follow the instructions, but verify that 3 is highlighted on the CALL 1-10 display.

VERIFY END-TO-END CALL PROCESSING

4.20 End-To-End System Test: Complete the following tests to ensure that all parts of the system are functioning correctly.

- Unbusy the central office trunks to allow 911 calls to reach the TDU.
- Force a 911 call to the TDU and verify that the following events occur in order:
 - TDU is seized (M-Lead LED is on).
 - The E-Lead flashes then comes on permanently after receiving the ANI from the switch.

- The TDU goes OFF-HOOK on the outgoing line and places a call to the 9-1-1SAS device at Primary location.
- The 9-1-1SAS device at the Primary location answers and requests the ANI.
- The correct ANI is received and the PSAP agent has a talk path to the 911 caller.
- The 911 caller disconnects and the TDU idles after the trunk drops.

4.21 Clear Call and Event Records: Clear all records to ensure that records from test calls and events do not interfere with actual records.

- Clear the call and event records in the TDU before placing the unit in service.
- The call record stored in the TDU for this call is accurate.

5. MAINTENANCE and TROUBLESHOOTING

CAUTION: Be sure to busy out the trunk whenever the TDU is to be taken out of service.

TECHNICAL SUPPORT

5.01 For technical assistance with this product, contact Tel-tone Product Support at: **1-800-426-3926** or **206-487-1515**.

RUNNING DIAGNOSTICS

5.02 A number of diagnostic tests are available through the TDU menu interface. Call completion statistics, as well as alarm and other event information, are also available through the menus. See Operation.

9-1-1SAS SYSTEM TROUBLESHOOTING

5.03 If 911 calls are not being completed, the following steps can help in locating the problem.

(1) TDU has alarmed: If the PWR/MON light is off, the unit is not receiving the internal +5 volts it needs to operate. Check that the fuses have not blown and that there is -48 V going to terminal pins 1 or 2 on the TDU back panel connector.

If the PWR/MON light is on but is not blinking, return the TDU to Tel-tone for analysis. (Refer to page 61 for return procedures.)

If the PWR/MON light is on and blinking, enter the diagnostic menu and check the event records to determine the cause of the alarm condition. Refer to paragraph 3.30 for the list of possible error codes.

(2) The TDU is not detecting 911 calls from an E&M trunk. Verify that the 911 call is being properly routed within the central office to the TDU. To route a call to the TDU, the central office E&M trunk should place -48 V on the TDU's M lead. If the TDU M lead is not being seized, check the E&M trunk operation and wiring. When the TDU detects the -48 V on its M lead, it will return a ground on the E lead, which should make that trunk busy.

(3) The TDU is not detecting 911 calls from a loop signaling trunk. Verify that the 911 call is being properly routed within the CO to the TDU. To route a call to the TDU, the CO should place a loop closure across the trunk. The TDU responds with a voltage reversal on the trunk when off-hook supervision is sent. If the TDU's trunk is not being seized, check the trunk's Tip/Ring wiring. A butt set can be placed across the trunk. An off-hook on the set should cause the M lead LED to come on and an outgoing call to be initiated.

(4) The TDU is not receiving ANI from the central office trunk. Verify that the proper method of address signaling for requesting the ANI from the trunk has been programmed into the TDU (enter the Programming: Signaling Parameters menu). The two methods are immediate dial and wink start.

(a) E&M Trunks: If the TDU is programmed for immediate dial operation, when the TDU senses -48 V on the M lead, the E lead will go to ground as soon as the called number is received or the called number timeout period expires. When the E lead goes to ground, the trunk should send the calling number to the TDU.

If the TDU is programmed for wink start, when the TDU senses the -48 V on the M lead, the E lead will go to ground for 250 ms, then return to its on-hook state, where it remains until the called number is received or the called number timeout period expires. At this time, the E lead will go permanently off-hook and the trunk should send the calling number to the TDU.

(b) Loop Start Trunks: If the TDU is programmed for immediate dial operation, as soon as the called number is received or the called number timeout period expires, the TDU sends a reversal.

If the TDU is programmed for wink start, when the TDU senses closure, it sends a reversal, then restores polarity and waits for the called number, then reverses polarity again for the permanent off-hook.

(5) **The Primary PSAP is not receiving the 911 calls:** Verify that the number programmed into the TDU for the Primary PSAP is correct and includes 1 + area code if necessary.

Enter the diagnostic menu and place a test call to the Primary PSAP.

If the test call fails, the TDU was not able to communicate with the CAU/CTU. The remote device may be out of service, busy, or defective.

If the CTU/CAU answers, the test call will report "REMOTE OK". Check the circuits on the outgoing side of the CAU/CTU.

TDU ALARM HANDLING

5.04 TDU alarms are activated based on certain critical parameters within and around the TDU. These alarms can be caused by loss of power, memory or microprocessor failure, or inability to make calls. The alarms can be released manually and automatically.

5.05 **Mechanical Operation of Alarms:** An alarm consists of a "trouble" component and an "audible" component. When an alarm occurs, the contacts for the trouble alarm and the audible alarm are activated together, lighting the trouble alarm, audible alarm, and OUT OF SVC LEDs. The TDU will also place a ground on the E lead to busy out the trunk during alarm conditions. If the office returns an M lead seizure in response to the E lead ground by the TDU, the TDU will ignore the M lead until it has been released. If an alarm condition is detected while a call is in process, the alarm will be delayed until after the call has finished. (This is done so that the E lead seizure will be dropped for 1.75 seconds to release the calling party before the E lead is resealed to busy out the trunk.)

Note: An alarm set due to either a Virtual Trunk failure or a because a destination is unable to support Virtual Trunk operation will not light the OUT OF SVC LED and does not busy the E lead. The TDU remains in service and continues to process calls.

- The trouble alarm contacts will remain activated until the cause of the alarm is remedied and the trouble alarm release mechanism is actuated, either from the front

panel switch or the back panel input (by grounding the trouble alarm release reset contact), or by the software program. When the trouble alarm is released the trouble alarm contacts deactivate and the Trouble LED goes out. Note that the trouble alarm will remain in effect for as long as any alarm-causing condition is present. That is, the trouble alarm is "level" sensitive.

- The audible alarm will remain active until the audible cutoff is actuated from the front panel switch or the back panel input (by grounding the audible alarm reset contact), or by the software program. When the cutoff mechanism is actuated, the audible alarm contacts deactivate, the cutoff LED lights, and the audible alarm LED goes out. Note that the audible alarm will not reactivate unless a new alarm occurs. That is, the audible alarm is "edge" or "event" sensitive. When a new alarm occurs, and the cutoff switch has been previously pressed, the cutoff LED will go out and the audible alarm will be reactivated, lighting the audible LED and closing the contacts again.

- Table 3 lists the TDU alarms and causes.

Name	Cause
ALRM SET POWER	No power
ALRM SET RAM	RAM test failed
ALRM SET PROG	PROG test failed
ALRM SET DBSE	DBASE test failed
ALRM SET DT	No dial tone on outgoing line
ALRM SET NLOOP	No loop current on outgoing line
ALRM SET NPSAP	No answer from any PSAP
ALARM SET WD	Internal problem with watchdog TDU
ALRM SET USER	Intentionally set by user
ALRM SET NON VT	CAU or CTU does not support Virtual Trunk
ALRM SET VTFAIL	Established Virtual Trunk failed
ALRM SET GSFAIL	Failure in the ground start line
Note: See page 29 for information on responding to alarms.	

5.06 **Criteria for Setting Alarms:** Ten different criteria can set an alarm on the TDU. These are detailed below.

5.07 **Automatic Alarm Recover:** Most alarms are automatically recoverable from software. That is, they are released when the problem that caused the alarm is fixed and the software program determines that all is well. Various recovery methods are used to determine the health of the unit:

- **For the Power Down alarm**, the alarm clears when the unit is powered back up and internal diagnostics are run. This takes about 1 second.
- **For the memory-based alarms (RAM, PROG, and DBASE)**, the memory tests are continually run in the background. Each time a failure occurs, a counter is incremented. When the count reaches the user-programmed threshold, an alarm is set. If the memory test continues to fail, the count continues incrementing until it reaches 255 (FF hex), at which point it stops incrementing. When the problem that caused the alarm is corrected, and tests start passing again, the count is decremented back toward 0. As long as more tests pass than fail, the count will eventually reach 0 and the alarm will clear automatically.
- **For outgoing interface-type alarms (DT and NLOOP)**, the TDU will go into a modified "test call" mode, in which it makes a test call once each minute to determine whether the problem has been corrected. Note that this class of alarm is generally based on a local external failure. If the problem has been corrected, the alarm is released; otherwise, the test calls continue. If the test call timeout has been set to 0, these test calls only proceed to the point of drawing loop current or dial tone, then terminate. If the test call timeout has been set to anything but 0, these test calls will complete.
- **For a "No PSAP Available" (NPSAP) alarm**, the TDU will also make test calls to each of the failed CAU or PSAP numbers. Note that this recovery procedure can be shut off by setting the recovery interval time to 0 so that no calls are ever made. If the recovery procedure is disabled, this alarm will have to be released manually (either locally or through remote access).
- **For a Watchdog (WD) alarm**, the TDU will run all internal diagnostics (memory tests, etc.) until it concludes that it is running properly, and then it will release the alarms. The TDU also does this on power-up.
- **User-generated (USER) alarms** must be released by the user. Automatic release would defeat the purpose of a user-generated alarm, since the TDU would test itself, find no problem, and immediately release the alarm.

In all the above cases (except power down if the unit is still powered down), pressing the alarm release pushbuttons or remotely clearing alarms will immediately release the alarms and clear all fail counts to zero.

5.08 Responding to Alarms: If the TDU is in alarm, examine the Event Records to find the cause. Match the alarm record to the following text to find the explanation, possible reasons for the alarm, and a suggested response. For instructions on accessing Event Records, see Local and/or Remote Programming.

ALRM SET POWER: This alarm is set when power is restored to the TDU after a power failure. The problem was most likely caused by a blown fuse, but the TDU may have been powered down for maintenance.

ALRM SET NLOOP: This alarm is set when the TDU does not detect loop current on the outgoing line. Causes include improper line type programmed into the TDU, faulty line connection to the TDU, or an electrical problem with the line. Isolate the problem by verifying the line type configuration programmed in the TDU matches the line. Then, test the outgoing line for proper operation as outlined in the TDU TURNUP section.

ALRM SET DT: This alarm is set because the TDU did not detect dial tone on its outgoing line for the number of successive times set as the DIAL TONE ALARM THRESHOLD. This alarm is normally set because high switch usage created long dial tone delays.

ALRM SET RAM: This alarm is set because during internal diagnostic testing, the number of times the RAM test failed exceeded the value programmed as the RAM TEST THRESHOLD. Since this is an internal failure, the TDU should be replaced and sent in for repair as explained in REPLACING THE TDU, on page 30.

ALRM SET PROG: This alarm is set because during internal diagnostic testing the number of times the PROG test failed exceeded the value programmed as the PROG TEST THRESHOLD. Since this is an internal failure, the TDU should be replaced and sent in for repair as explained in REPLACING THE TDU, on the next page.

ALRM SET DBASE: This alarm is set during internal diagnostic testing when the number of times the DBASE test failed exceeded the value programmed as the DBASE TEST THRESHOLD. This is an internal failure, so the TDU should be replaced and sent in for repair as explained in REPLACING THE TDU, on the next page.

ALRM SET WD: This alarm is set because of a problem internal to the TDU. The TDU should be replaced and sent in for repair as explained in REPLACING THE TDU, on the next page.

ALRM SET USER: This alarm is set intentionally and does not indicate a problem with the TDU. The alarm can be cleared by pressing the TROUBLE RLS pushbutton on the TDU front panel or through the maintenance menu.

ALRM SET NPSAP: This alarm is set when the TDU fails to receive a SAS ANSWER and a PSAP ANSWER message from the Primary, Secondary, or Local locations. The call may not have completed to the remote locations or it did complete and the SAS device answered, but the PSAP did not answer when it was alerted.

To determine how far the call progressed, examine the call records. If the call records show that the call to a location logged a NETWORK TIMEOUT record, then the remote SAS device did not receive or did not answer the call. IF this is the case, it is recommended that TEST CALLS be placed to the suspect locations. For instructions on placing test calls from the TDU, see page 26.

If the call records show that the call to a location logged a RING/NO ANSWER record, then the call was answered by the remote SAS device, but the PSAP did not answer when alerted.

ALRM SET GSFAIL: This alarm is set when the ground start line fails.

ALRM SET NON VT: This alarm is set when the TDU attempts to establish a Virtual Trunk with a CAU or CTU that does not have Virtual Trunk capability.

ALRM SET VTFAIL: This alarm is set if an established Virtual Trunk fails. The TDU remains in service and will attempt to complete the call via an alternate route when this alarm is set. The failure may have occurred at the remote end so you should attempt a manual test call to the remote device.

REPLACING THE TDU

5.09 To replace a TDU, complete the following steps:

- (1) Busy out the trunk to which the TDU is connected.
- (2) Remove power from the circuit that supplies the TDU: either by pulling the TDU front panel fuse or the office panel fuse.
- (3) Pull out the back panel connector.
- (4) Remove any tie wraps which secure the unit wiring.
- (5) Remove the existing unit from the rack and install the new unit.

(6) Insert the connector and reinstall tie wraps.

(7) Replace power to the circuit (see step 2 above). The PWR/MON LED should begin blinking. Other LED states should be as described in Table 1.

(8) Test the unit as described in Part 3C.

(9) Program the unit as required for the application.

(10) Unbusy the trunk to place the unit in service.

6. ADMINISTRATION

A. TDU Status Displays

6.01

Table 4 defines the displays that appear on the TDU display panel during the processing of calls in Run mode.

Display	Description
IDLE 10:36:45 MON JAN 15, 1990	Unit is idle. No call activity. Local time, day, and date are displayed (time is in 24-hour format).
SEIZED	The 911 trunk has applied -48 Volts to the M lead; the TDU has applied ground to the E lead.
OFF-HOOK	The TDU is off-hook toward the CAU.
DIALING PSAP <number>	The primary PSAP <number> is being dialed.
REMOTE RINGING	At least one ringback burst detected from CAU.
REMOTE ANSWER	An answer has been detected from the CAU.
ALERTING PSAP	The CAU has alerted PSAP.
PSAP RINGING	Ringling is being applied to PSAP key system.
PSAP ANSWERED	An answer has been detected from PSAP.
SENDING ANI <number>	ANI<number> is being sent to CAU.
PSAP CONNECTED	A call is in progress.
CALL IN PROGRESS NON-SAS	Call in progress. There is no CAU at answering station.
PSAP FLASH	A flash has been detected from far end (PSAP).
PSAP WINK	A wink has been detected from far end (PSAP).
NO LOOP CURRENT	No loop current is detected upon seizure of the loop interface (alarm condition).
PSAP DISCONNECT	PSAP has disconnected.
CALLING PARTY DISCONNECT	The calling party has disconnected.
CALL TIMEOUT	The call has been abandoned (PSAP/CAU no answer, network timeout).
COMMUNICATION FAILURE	Communications between TDU and CAU have failed.
ON-HOOK	The TDU has gone on-hook toward the CAU.

DIALING 2ND PSAP <number>	The secondary PSAP number is being dialed.
DIALING LOCAL <number>	The local emergency number is being dialed.
TEST CALL REMOTE OK	A test call was made; CAU reports OK.
TEST CALL REMOTE ALARM	A test call was made; CAU reports it is in alarm condition.
INCOMING CALL	Ringing is appearing on the loop interface.
INCOMING ANSWER	The incoming call on the loop interface has been answered; awaiting security code.
REMOTE ACCESS	Remote access has been granted.

B. Statistics and Diagnostics

6.02 Call and event logs can be examined, and diagnostic tests performed, through the diagnostics menu (summarized in Table 6 on page 38). (The logs and diagnostics can also be accessed via modem as explained on page 51.) This menu can be accessed whenever the TDU is idle by pressing any cursor key. If no cursor or enter key is pressed for one minute, or if a call comes in, the screen reverts to its normal display status mode.

Note: While certain diagnostic tests are in progress, the incoming line will be busied out to prevent a live call from trying to complete through this circuit.

6.03 Statistics: The TDU maintains two types of records: a log of the 100 most recent call attempts, and a log of the 100 most recent occurrences of the events listed under "Event statistics" below. This information is accessible through the user menu interface or remotely via modem.

- **Call Record statistics:** For each call attempt through the system (other than test calls), the call log shows:
 - (1) Time and date stamp
 - (2) An integer representation of the number dialed (1-6, where 1 = Primary PSAP, 3 = Secondary PSAP, etc.)
 - (3) Completion indication
 - (4) Elapsed time in seconds from TDU off-hook to CAU/CTU answer.
 - (5) Elapsed time in seconds from call origination (incoming trunk seizure) to PSAP answer
 - (6) Called and calling numbers received and sent.
- For each test call attempt through the system, the call log shows:
 - (1) Time and date stamp
 - (2) An integer representation of the number dialed (1-6, where 1 = Primary PSAP, 3 = Secondary PSAP, etc.)
 - (3) An indication that the call was a test call
 - (4) Elapsed time in seconds from TDU off-hook to CAU/CTU answer.

The abbreviations used in the call records are:
 ANI SNT = ANI received from switch and sent on to forward equipment by the TDU
 ANI RCV = TDU received number, but did not forward since equipment did not request
 ANI DEF = number not received by TDU, so TDU forwards the default number

EXAMPLES:

```
2. 1027 0413 3
COMPLETE
```

A call was placed at 10:27 a.m. on April 13 to the Secondary PSAP (identified as "3" by the TDU) and was answered by the PSAP.

```
NTWK TIME 19S
COMPL TIME 23S
```

The TDU required 19 seconds to dial and reach the CAU. The time from call origination to PSAP answer was 23 seconds.

```
ANI SNT 05551212
CLD RCV 11
```

The user can also see the called and calling (ANI) numbers received and sent by the TDU. In the example, the TDU received and sent the calling number, but was not asked to send the called number it had received.

```
2. 1028 0413 1
COMPLETE
```

```
NETWK TIME 12S
COMPL TIME 16S
```

```
ANI DEF 2
CLD
```

A call was placed at 10:28 a.m. on April 13 to the Primary PSAP (identified as "1" by the TDU); and the PSAP answered in 16 seconds. The PSAP requested ANI information and the TDU sent 2, as it normally does when ANI is not received from the switch and no default ANI is programmed into the TDU.

```
3. 1029 0413 1
TEST REMOTE OK
```

```
NETWK TIME 5S
COMPL TIME S
```

ANI
CLD

A test call was placed at 10:29 a.m. on April 13 to the Primary PSAP and it took 5 seconds from TDU off-hook for the CAU/CTU to answer. The CAU/CTU was not in an alarm state. ANI information was not requested by the PSAP. (This will be the case in all test calls.) Completion time for test calls will not be displayed.

4. 1030 0413 1
COMPLETE

NETWK TIME 19S
COMPL TIME 23S

ANI SNT 5551212
CLD RCV 11

A call was placed at 10:30 a.m. on April 13 to the Primary PSAP and the PSAP answered in 23 seconds. ANI was requested by the PSAP and the TDU sent default ANI 5551212.

5. 1031 0413 2
TEST NETWORK T/O

NETWK TIME 30S
COMP TIME S

ANI
CLD

A test call was placed at 10:30 a.m. on April 13 to the alternate (time of day) Primary PSAP number. The call did not complete (network timeout was exceeded). ANI information was not requested by the PSAP. (This will be the case in all test calls.)

6. 1032 0413 1
TEST REM AL

NETWK TIME 7S
COMP TIME S

ANI
CLD

A test call was placed at 10:32 a.m. on April 13 to the Primary PSAP. It took 7 seconds from TDU off-hook for the CAU/CTU to answer and the CAU/CTU was in an alarm

state. ANI information was not requested by the PSAP. (This will be the case in all test calls.)

In addition, the call log indicates the percentage of live calls completed vs. calls attempted, as well as a percentage of test calls completed vs. test calls attempted.

- **Event Records:** A time and date stamp is logged for the last 100 occurrences of any of the following events:
 - (1) Power on
 - (2) Power fail
 - (3) Time set
 - (4) Date set
 - (5) Out-of-service from make busy
 - (6) Out-of-service from program mode
 - (7) Online
 - (8) Alarm set
 - (9) Alarm audible cutoff
 - (10) Alarm trouble release
 - (11) No dial tone detected before calling party disconnect
 - (12) RAM read/write failure
 - (13) Database checksum failure
 - (14) Program checksum failure
 - (15) Time-of-day change, primary PSAP number
 - (16) Time-of-day change, secondary PSAP number
 - (17) Time-of-day change, local emergency number
 - (18) Time-of-day restore, primary PSAP number
 - (19) Time-of-day restore, secondary PSAP number
 - (20) Time-of-day restore, local emergency number
 - (21) Recovery timeout has occurred
 - (22) Recovery timer has been set
 - (23) Database clear
 - (24) System reset
 - (25) Remote access attempted
 - (26) Remote access disconnect
 - (27) Remote access, PSAP number changed
 - (28) Security code passed
 - (29) Security code failed
 - (30) Communication failure
 - (31) Daylight saving time was advanced 1 hour
 - (32) Daylight saving time was set back 1 hour
 - (33) Automatic alarm clear

EXAMPLE:

10 1425 1102
OOS-PRGRM

The system was placed out of service for programming at 2:25 p.m. November 2.

3.63 Diagnostics: Any of the following internal self tests and external tests of dial and transmission capability can be performed manually through the diagnostics menu. Tests 1, 2, and 3 are also run continuously in background at the TDU. Tests 1 and 3 run continuously in the background at the CAU and CTU.

• **Internal resources:** The self-test capabilities are:

- (1) Internal RAM read/write test
- (2) Database checksum test
- (3) Program memory checksum test
- (4) M sensor test
- (5) Ground start test
- (6) Keypad test
- (7) LCD display test
- (8) Reset the TDU
- (9) Clear database and stop clock

External functions: The external function maintenance capabilities are:

- (1) Place test call to any programmed number
- (2) Force disconnect (loop interface/ trunk interface)
- (3) Send wink towards the trunk
- (4) Cut through the talk path between trunk Tip/Ring and outgoing loop Tip/Ring
- (5) Busy out the trunk interface
- (6) Busy out the outgoing loop interface
- (7) Control alarms (set, cutoff, release)
- (8) Production tests (for factory use)

7. MENU STRUCTURE

A. Local Menus

7.01 The two-line display panel and keypad on the front of the TDU provide the primary means for user access to the system. Remote access, described on page 50, is available for some functions. The display operates in three modes:

- In **Run mode** (normal operation), it continuously displays information about the TDU status and the progress of calls through the system. TDU status displays are defined in Table 4. When the TDU is idle (and only when it is idle), either of the following two modes may be entered.
- **Program mode** (entered by pressing the Program key) is used to enter telephone numbers and configuration data. When the Program mode is entered, the TDU applies a ground to the E lead to busy out the ANI trunk. The TDU is thus out of service during programming, and the OUT OF SVC indicator will be lighted. If the office returns an M lead seizure in response to the E

lead ground by the TDU, the TDU will ignore the M lead until it has been released.

- **Diagnostics mode** (entered by pressing any cursor key) is used to examine the system logs and perform diagnostic tests.

USING THE KEYPAD

7.02 The eight keys at the right of the keypad provide the following functions:

↑ and ↓	Cursor up and down keys, used to move between levels in the menu hierarchy. The display <i>changes</i> each time you press an up or down arrow key.
← and →	Cursor left and right keys, used to move between fields within one display. The display does not change when you press a left or right arrow key.
PROG	Used to enter and exit the Program mode.
BL	Lights the backlight for the display. Pressing this key once will light the backlight for 5 minutes, if no other keys are pressed. Pressing this key again will cause the light to go out.
ESC	Used to move to a higher level screen.
ENTER	Used to enter the data, or perform the instruction, that appears on the display panel.

ITEM SELECTION

7.03 To select a menu item, use ← and → until the desired item is blinking (in this manual, highlighted items are shown in bold type). Then either press ↓ to proceed to a lower level screen, or ENTER to perform the instruction or enter the data displayed. For example, to set the clock:

- Press PROGRAM. The following menu is displayed:

NUMBERS	SIGNAL
CONFIG	NAME

- If NUMBERS is blinking, press →. When CONFIG is blinking, press ↓. The screen will now display:

LINE	STATS	CLK
REM/ACC	T/O	CP

- Press → or ← as necessary until CLK is blinking. Then press ↓. The screen will now display:

TIME	DATE	DST
DAY	OF	WEEK

- Press → or ← as necessary until TIME is blinking. Then press ↓. The screen will now display:

SET	TIME
HH:MM:SS	

If a time is shown in the last line of the display, press ← to obtain the display shown above.

- If the current time is 2:55 P.M., type 145500. The display changes from HH:MM:SS to 14:55:00. If you make a mistake, press ← to erase the number and type the entire number again. (Note that six digits must be entered. For example, if the time is now 2:55 a.m., type 025500.)
- Press ENTER to store the time in the TDU database.
- Press PROGRAM to return the TDU to Run mode.

UNDERLINE CURSOR

7.04 A line under the first letter of a menu item indicates the current setting for that item. For example, in the following display:

DAY OF WEEK
<u>S</u> M T W T F S

Sunday (underlined) is the day of the week currently stored in the TDU database, whereas Wednesday (blinking) is the currently highlighted item. Pressing ENTER would change the day of week setting from Sunday to Wednesday.

THE PROGRAM MENU

7.05 The Program menu is used to enter telephone numbers, a central office identification number, start/stop times for time-of-day changes, a security code, and configuration parameters.

7.06 To enter the Program mode, press the Program key:

- If the unit is not idle, a display will inform you that the unit is not available for programming and that your request has been queued. You can press the Program key again to remove the request from the queue. If you do nothing, the unit will enter Program mode when it

becomes idle. If no key is pressed within 5 minutes, the unit will revert to Run mode.

- If the unit is idle, you will be placed in Program mode immediately and the following menu will appear in the display panel:

NUMBERS	SIGNAL
CONFIG	NAME

7.07 Pages 39 through 49 provide detailed explanation of the Program menu functions and tell you how to use the screens.

THE DIAGNOSTICS MENU

7.08 To enter the Diagnostics mode, press any arrow key while the unit is idle. The following menu will appear in the display panel:

STATISTICS	SWV
MAINTENANCE	

7.09 Refer to the following pages for information on the use of the Diagnostics menus and screens.

MENU TREES

7.10 The tables beginning on page 35 provide a summary of Program menu functions. Table 6 on page 38 provides a summary of Diagnostics menu functions.

Table 5 Programming Menu Tree (Sheet 1 of 3)



Use this screen:

To do this:

1. PRI PSAP
<number>

Enter the Primary PSAP number.

PRI LOCATION
1 PSAP - WINK

Enter the type of destination, at the Primary PSAP

2. TOD PRIPSA
<number>

Enter alternate Primary PSAP number based on time-of-day change.

TODPRI LOCATION
0 NON - SAS

Enter the destination type for the alternate Primary PSAP number

3. SEC PSAP
<number>

Enter the Secondary PSAP number.

etc. That is, use ↓ repeatedly to access screens to enter:

Destination type for Secondary PSAP
Time-of-day change secondary PSAP number and destination type
Local emergency number and destination type
Time-of-day change local emergency number and destination type
Maintenance numbers (1-4)
Time-of-day change start and stop times for PSAP numbers

LINE STATS CLK
REM/ACC T/O...CP

Use ← and → to select from the above screen.

Select:
LINE

To do this:

Set type of outpulsing, DTMF or PULSE.

STATS

Set Non-SAS disconnect type.

Set number of successive failures required to generate an alarm, for:

- . Dial tone detect failures
- . RAM read/write failures
- . Program memory checksum failures
- . Database checksum failures

CLK

Set the TDU clock to the current time, date, and day of week, and enable/disable automatic spring and fall clock adjustments for daylight saving time.

REM/ACC

Control remote access to the TDU:

- . Change the security code
- . Allow/deny all remote access
- . Allow/deny access to change Primary PSAP number and location

Allow/deny access to busy out the TDU

- . Allow/deny access to release alarms
- . Allow/deny access to reset the TDU

T/O

Set timeouts for following functions:

- . PSAP no answer timeout (pri+ sec)
- . Called number timeout
- . Network (CAU) no answer timeout
- . Dial tone delay timeout
- . Timeout for recovery from ring/no answer
- . Maintenance timeout
- . Test call interval

CP

Select type and timings of call progress information sent to caller while the call is being processed:

- . Voice, entertainment tones, or none
- . Time from seizure until first message or tone is played
- . Time interval before the message or tone is repeated.

Table 5 Programming Menu Tree (Sheet 2 of 3)

NUMBERS **SIGNAL**
CONFIG NAME

A

Use this screen:

To do this:

TDU LOCATION
ENDOFF TANDEM

Specify whether TDU is in an end office or a tandem office.

TMU COM
ENABLE DISABLE

Select whether the TDU is connected to a TMU.

ADD SIG START
WINK IMMEDIATE

Select incoming trunk type (wink or immediate dial).

DEFAULT ANI
478

Enter number to be sent where CO does not provide ANI.

NUM PLAN DIGIT
4

Enter information digit in ANI spill.

CALLED # STRING
911

Enter called number string (where TDU and CAU both in tandem offices).

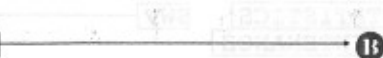
↓TP. NPD 0 to NPA
206

Translate number plan digit 0 to NPA number entry.

Translate number plan digits 1 through 7 to NPA.

TR. NPD 7 to NPA
555

Table 5 Programming Menu Tree (Sheet 3 of 3)

NUMBERS
CONFIGSIGNAL
NAME

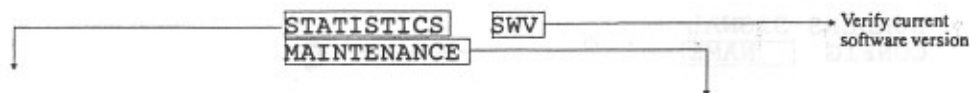
Select:

TDU NAME

To do this:

Enter a name for the TDU. Use the up/down arrow keys to scroll through the list of characters for each letter in the TDU name. Up to 16 characters can be in the TDU name.

Table 6 Diagnostics Menu Tree



CALLS EVENTS

Select:

To do this:

INT. RESOURCES

Perform any of the following internal controls and tests:

- . RAM read/write test
- . Program memory checksum test
- . Database checksum test
- . M-lead sensor test
- . Keypad test
- . LCD display test
- . Reset the TDU
- . Clear database and stop clock

Use ← and → to select from above screen.

Select:

To do this:

CALLS

- Examine call completion statistics:
- . Percentage of live calls completed vs. live calls attempted
 - . Percentage of test calls completed vs. test calls attempted
 - . Times and other statistics for most recent 100 calls (displayed one call at a time, starting with the most recent)
 - . Reason for failure on incomplete calls
 - . ANI information for each call attempt
 - . Clear calls log

EXT. FUNCTIONS

Perform any of the following external controls and tests:

- . Place a test call to any programmed number
- . Disconnect (unbusy) the trunk
- . Busy the trunk
- . Send a wink towards incoming trunk
- . Disconnect outgoing (loop) line (on-hook)
- . Establish Virtual Trunk to any programmed number.
- . Busy the outgoing line (off-hook)
- . Establish a talk path between trunk and outgoing loop
- . Disable the talk path
- . Set an alarm
- . Activate audible cutoff (silence alarm)
- . Activate trouble release (cancel alarm)
- . Production tests (factory and repair tests; not intended for customer use)

EVENTS

- Examine events log:
- . Display 100 most recent events, one at a time, starting with the most recent event
 - . Clear events log

INT. RESOURCES
EXT. FUNCTIONS

Use ← and → to select from above screen.