6271 Tie Trunk Answer Supervision Module

contents

1. general description

1.01 The Tellabs 6271 Tie Trunk Answer Supervision Module (figure 1) provides false delayed answer-supervision indications for PBX trunk circuits that cannot return answer supervision. This module monitors the local trunk's E lead and operates its own M1-lead relay in response to valid state changes on the trunk's E lead. The 6271 can be used at one or both ends of a PBX tie-trunk circuit.

1.02 In the event that this Practice section is reissued, the reason for reissue will be stated in this paragraph.

1.03 The false answer-supervision indications provided by the 6271 can be returned immediately upon the conclusion of dialing or after an adjustable 0 to 31-second delay. The length of the timing delay is selected, in 1-second increments, by means of an option switch located on the 6271's printed circuit board.

1.04 The 6271 can be switch optioned to recognize normal or inverted E&M-lead signaling states. An additional switch option allows the 6271 to accommodate Type I or Type II E&M signaling interfaces.

1.05 The 6271 recognizes valid dial pulses at rates of 8 to 12 pulses per second (pps) and with break ratios of 30 and 85%. The dial-pulse detection circuitry of the 6271 is designed to accept initial digits 1 through 0.

1.06 The 6271 can also be bridged across the receive tip and ring leads of a 4wire transmission facility to detect dual-tone multifrequency (DTMF) signaling. The 6271 recognizes all 16 DTMF signals at levels from −18 to +12dBm.

1.07 A front-panel *busy* LED lights to indicate a circuit-busy condition, i.e., M lead at battery potential. Front-panel test points access battery, ground, E lead, and M lead.

1.08 The 6271 operates on filtered, ground-referenced −22 to −56Vdc input. Current requirements (at −48Vdc) range from 50mA at idle to 75mA when busy.

1.09 A Type 10 module, the 6271 mounts in one position of a Tellabs Type 10 Mounting Shelf, versions of which are available for relay-rack or

figure 1. 6271 Tie Trunk Answer Supervision Module

apparatus-case installation. In relay-rack applications, up to 12 modules can be mounted across a 19-inch rack, while up to 14 modules can be accommodated in a 23-inch rack. In either case, 6 inches of vertical rack space is used.

2. application

2.01 The 6271 Tie Trunk Answer Supervision Module is used at one or both ends of a PBX tie-trunk circuit to provide false delayed answer supervision indications for PBX trunks that cannot return answer supervision. Switch options condition the module for normal or inverted E&M-lead signaling and for Type I or Type II E&M signaling interfaces.

2.02 As stated above, the 6271 module can be used at one or both ends of a PBX tie-trunk circuit. In either case, the originating trunk circuit controls operation of the 6271 module(s) from the time the originating circuit is seized until the time it disconnects. In the event of glare (simultaneous M-lead seizure by both trunks), the consequences depend upon the protection and reaction characteristics of the PBX trunks in use. The 6271 does, however, prevent lockup normally associated with glare by locking out its M1-lead relay if the local trunk's M-lead relay operates before its E lead changes state.

2.03 In applications where single-frequency (SF) signaling is used, an E-lead seizure is detected at both ends of the tie-trunk circuit if an SF failure occurs. This seizure is interpreted as an incoming call by each 6271 module in the tie-trunk circuit and each 6271 enables logic circuitry designed to

detect DTMF or dial-pulse (DP) signaling. Because valid DTMF or DP signaling is not transmitted or received during SF failure, the 6271(s) does not provide an answer-supervision indication. Each 6271 returns to the normal idle state when SF tone is restored.

2.04 The remainder of this section describes the operation of the 6271 during incoming and outgoing call set-up and release. (For purposes of explanation, normal E&M-lead operation and Type I E&M interfacing are assumed.) Figure 2 shows a typical application in which 6271 modules are used at both ends of a PBX tie-trunk circuit.

incoming call set-up
2.05 On incoming calls, the 6271 monitors the local trunk circuit's E lead. When the distant trunk seizes the circuit, ground is applied to the local trunk's E lead. The 6271 detects this E-lead ground and, after all valid DP or DTMF signaling is received, a user-adjustable 0 to 31-second timer expires and the module applies battery to the local trunk's M lead, as evidenced by the lighting of the 6271's *busy* LED. Because actual answer may be accomplished independently of any indication provided by the 6271, the false answer-supervision indication provided by the module is intended primarily for trunk completion at the calling end and the timing delay introduced by the 6271 prevents actual answer before machine answer.

incoming call release
2.06 Release of incoming calls is controlled by the distant trunk. When the distant caller goes on-hook and ground is applied to the distant trunk's M lead, the local trunk's E lead releases. This resets the 6271's circuitry, extinguishes the module's *busy* LED after a 250ms delay, and releases the 6271's M1-lead relay. The release of the 6271's M-lead relay presents an open to the distant trunk's E lead, thus releasing the circuit.
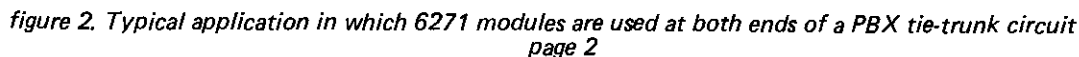
outgoing call origination
2.07 Seizure of the local trunk places battery on the distant trunk's M lead. After a 35ms delay, the 6271's logic circuitry is enabled. This logic circuitry

recognizes that the local trunk's M lead has operated and that the E lead is open (i.e., the 6271 recognizes that an outgoing call is originating) and blocks operation of its own M1-lead relay (to prevent an uncalled for answer-supervision indication) while maintaining control of the local trunk's M lead. Signaling on the local trunk's M lead passes directly through the normally closed contacts of the 6271's M1-lead relay to the associated SF or DX equipment.

2.08 When the distant end answers (or, if 6271 modules are used at both ends, when the distant end returns a false answer-supervision indication), the local E lead goes to ground and the 6271's logic circuitry is set for the release sequence. On aborted or incomplete calls, the 6271's logic circuitry recognizes that an answer (or answer-supervision indication) has not been received and resets the module's logic circuitry accordingly.

outgoing call release
2.09 When 6271 modules are used at both ends of the circuit, release of each 6271 is dependent upon the local trunk. After the distant trunk releases, the local trunk and the local 6271 module remain seized because the distant 6271 module holds the E-lead at ground until the local M-lead relay releases. Approximately 250ms after the local M-lead releases, the distant 6271 releases the circuit, the E-lead returns to the idle state, and the local 6271 returns to the idle state.

2.10 If the 6271 module is used at only one end of the circuit, the 6271 does not release until both trunks are released. Release logic in the 6271 recognizes that both the E lead and M lead are in the idle state and resets all 6271 circuitry accordingly.

3. installation
inspection
3.01 The 6271 Tie Trunk Answer Supervision Module should be visually inspected upon arrival to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the module should be visually inspected again prior to installation.

figure 2. Typical application in which 6271 modules are used at both ends of a PBX tie-trunk circuit

mounting

3.02 The 6271 module mounts in one position of the Tellabs Type 10 Mounting Shelf. The module plugs physically and electrically into a 56-pin connector at the rear of the Shelf.

installer connections

3.03 Before making any connections to the mounting shelf, make sure that power is **off** and modules are **removed**. Modules should be put into place only **after** they are properly optioned and **after** wiring is completed.

3.04 Table 1 lists external connections to the 6271 module. All connections are made via wire wrapping at the 56-pin connector at the rear of each module's mounting shelf position. Pin numbers are found on the body of the connector.

connect:	to pin:
4W RCV T (4wire receive tip)	25
4W RCV R (4wire receive ring)	23
E (E lead from local trunk)	5
M (M lead from local trunk)	31
M1 (M lead to local signaling equipment)	21
SB (signal battery input lead for Type II E&M)	49
−BATT (−22 to −56Vdc filtered input)	35
GND (ground)	17

table 1. External connections to 6271

option selection

3.05 Four switch options must be set before the 6271 can be placed into service. After these switches are set as described in the following paragraphs, no further alignment of the 6271 is required. The location of each option switch on the module's printed circuit board is shown

figure 3. Option switch locations

in figure 3; table 3 summarizes 6271 switch options.
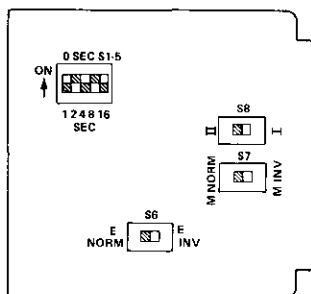
3.06 Switches *S1* through *S5* (packaged as a single five-position DIP switch) select the 6271's 0 to 31-second answer-supervision delay. The amount of delay (in seconds) introduced by each switch is indicated on the module's printed circuit board just below the switch. Switch settings are cumulative; thus, the total delay introduced is equal to the sum of those switches set to the *OFF* position, i.e., set toward the indicated values. Delays ranging from 0 second (*S1* through *S5 ON*) to 31 seconds (*S1* through *S5 OFF*) can be selected in 1-second increments. These switch settings are summarized in table 2.

3.07 Switch *S6* selects normal or inverted E-lead operation. Set *S6* to the *E NORM* position for normal E-lead operation or to the *E INV* position for inverted operation. In like manner, switch *S7* selects normal or inverted M-lead operation. Set *S7* to the *M NORM* position for normal M-lead operation or to the *M INV* position for inverted operation.

switch	when set to *OFF* introduces indicated delay (in seconds)
S1	1
S2	2
S3	4
S4	8
S5	16

Note: *These switch settings are cumulative. Total delay introduced is equal to the sum of those switches set to OFF.*

table 2. Answer-supervision delay selection

switch	function	options	settings
S1 through *S5*	answer-supervision delay	0 to 31 seconds	see table 2
S6	E-lead operation	normal	*E NORM*
		inverted	*E INV*
S7	M-lead operation	normal	*M NORM*
		inverted	*M INV*
S8	E&M signaling interface	Type I	*I*
		Type II	*II*

table 3. 6271 switch options

3.08 Switch *S8* conditions the 6271 for Type I or Type II E&M signaling. Set *S8* to either *I* (Type I) or *II* (Type II), as required.

4. circuit description

4.01 To provide the clearest possible understanding of the operation of the 6271 Tie Trunk Answer Supervision Module, function sequence flowcharts (figures 4 and 5) that illustrate sequential operation of the module on incoming and outgoing calls are presented in lieu of a more conventional circuit description. Horizontal paths identify events occurring simultaneously, and vertical paths denote sequential events. Dotted lines indicate elapsed time. These charts can be used to determine whether a module is performing normally by observing the module's response and comparing it to that shown in the chart. Reference to the 6271 functional block diagram (section 5 of this Practice) may aid in understanding the sequence charts.

6. specifications

common

answer-supervision delay
0 to 31 seconds ±2%, switch-selectable in 1-second increments

M-lead relay contact rating
**contact resistance: 50 milliohms maximum
current: 1A maximum
voltage: 200Vdc maximum**

M-lead delay
**seizure: 35 ±7ms
release: 250 ±50ms**

E LEAD OPEN,
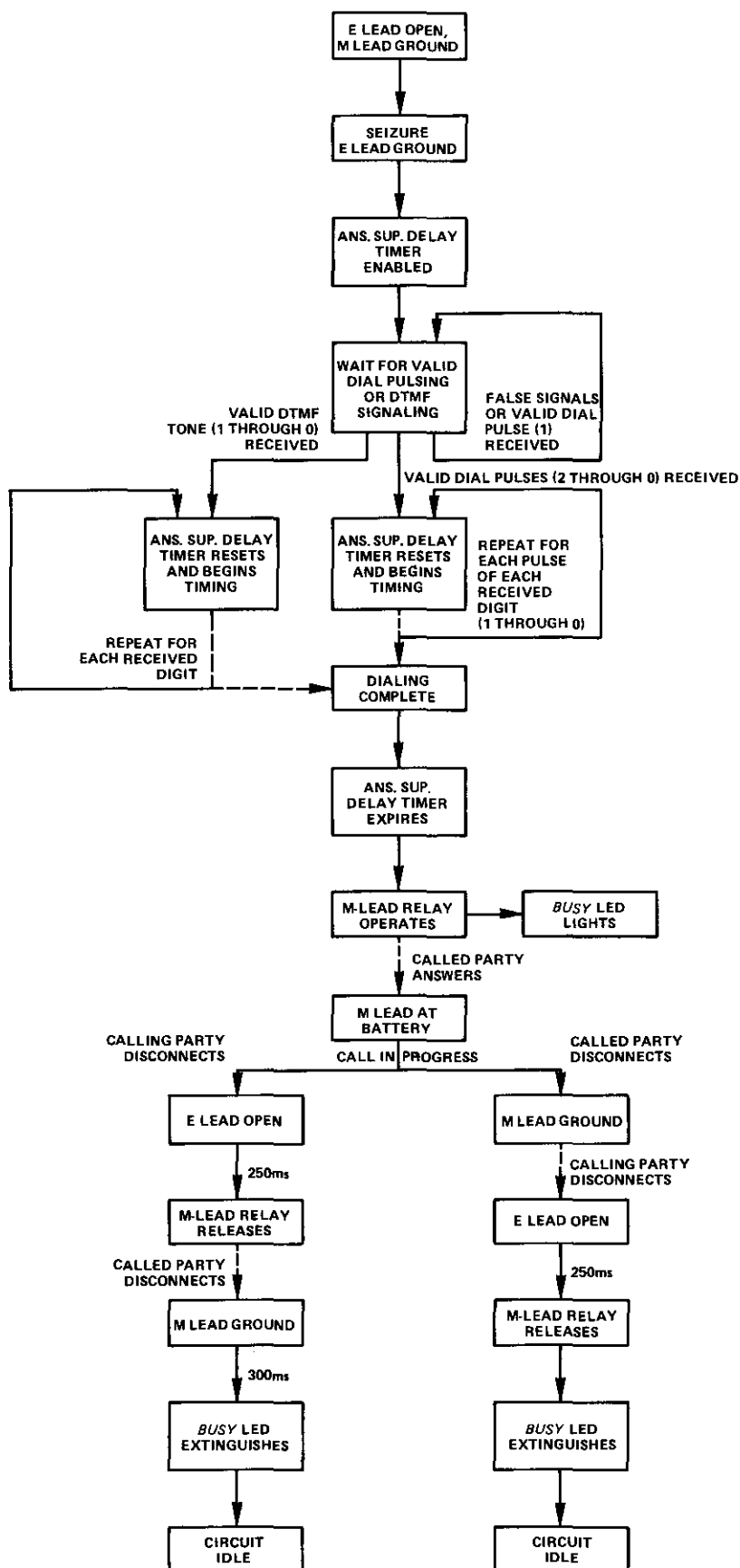M LEAD GROUND

↓

SEIZURE
E LEAD GROUND

↓

ANS. SUP. DELAY
TIMER
ENABLED

↓

WAIT FOR VALID
DIAL PULSING
OR DTMF
SIGNALING

VALID DTMF
TONE (1 THROUGH 0)
RECEIVED

FALSE SIGNALS
OR VALID DIAL
PULSE (1)
RECEIVED

VALID DIAL PULSES (2 THROUGH 0) RECEIVED

ANS. SUP. DELAY
TIMER RESETS
AND BEGINS
TIMING

ANS. SUP. DELAY
TIMER RESETS
AND BEGINS
TIMING

REPEAT FOR
EACH PULSE
OF EACH
RECEIVED
DIGIT
(1 THROUGH 0)

REPEAT FOR
EACH RECEIVED
DIGIT

DIALING
COMPLETE

↓

ANS. SUP.
DELAY TIMER
EXPIRES

↓

M-LEAD RELAY
OPERATES → *BUSY* LED
LIGHTS

CALLED PARTY
ANSWERS

M LEAD AT
BATTERY

CALLING PARTY
DISCONNECTS

CALL IN PROGRESS

CALLED PARTY
DISCONNECTS

E LEAD OPEN

M LEAD GROUND

250ms

CALLING PARTY
DISCONNECTS

M-LEAD RELAY
RELEASES

E LEAD OPEN

CALLED PARTY
DISCONNECTS

250ms

M LEAD GROUND

M-LEAD RELAY
RELEASES

300ms

BUSY LED
EXTINGUISHES

BUSY LED
EXTINGUISHES

CIRCUIT
IDLE

CIRCUIT
IDLE

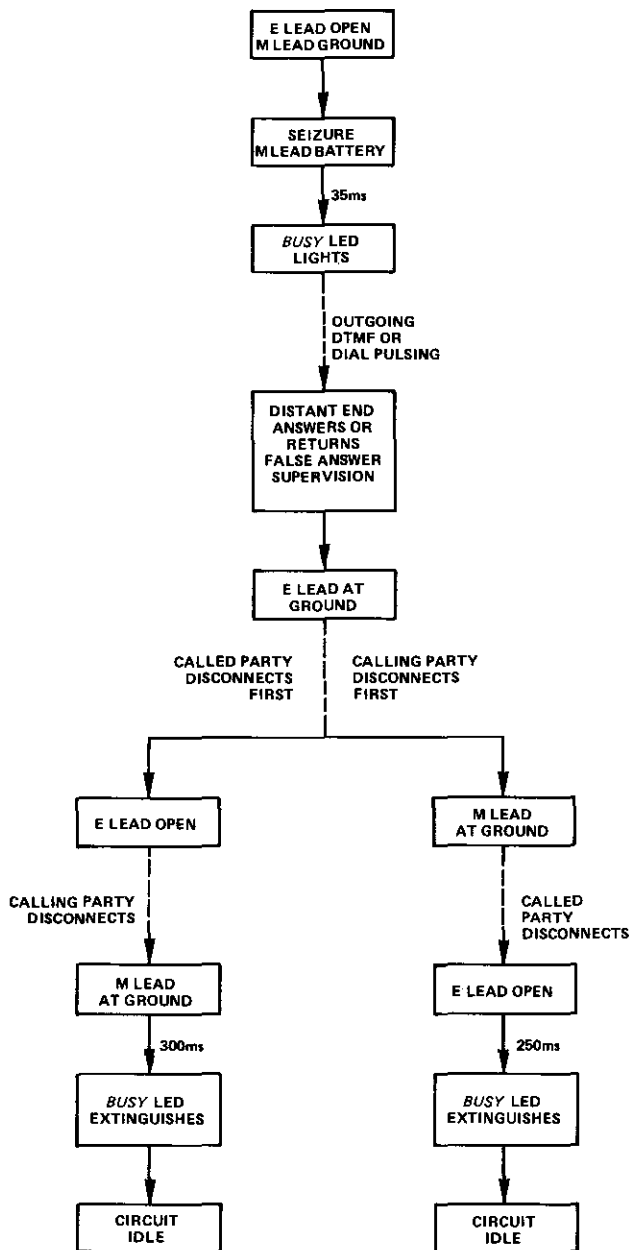*figure 4. Operation of 6271 module during incoming call (normal Type I E&M).*

figure 5. Operation of 6271 during outgoing call (normal Type I E&M)

M-lead signaling states, normal
idle: ground
busy: open or negative battery

M-lead signaling states, inverted
idle: open or negative battery
busy: ground

E-lead delay
seizure: 70 ±10ms
release: 250 ±5ms

E-lead signaling states, normal
idle: open or negative battery
busy: ground

E-lead signaling states, inverted
idle: ground
busy: open or negative battery

E-lead dial-pulse recognition

pulse rate	break ratio
8pps	30 to 85%
10pps	35 to 85%
12pps	40 to 80%

4wire receive section

4wire receive impedance
600 ohms nominal, 300 to 4000Hz

DTMF level
−18 to +12dBm (at 600 ohms)

dial tone rejection
+6dB, referenced to lower amplitude tone

detection frequencies

$F_o =$

697	1209
770	1336
852	1477
941	1633

frequency-detection bandwidth
±3% of F_o

detection delay
30 ±10ms

60Hz rejection
2Vrms maximum

acceptable twist
−8dB minimum to +4dB maximum

physical

input power requirements
−22 to −56Vdc, filtered, ground referenced
50mA idle, 75mA busy

operating environment
20° to 130°F (−7° to +54°C), humidity to 95%
(no condensation)

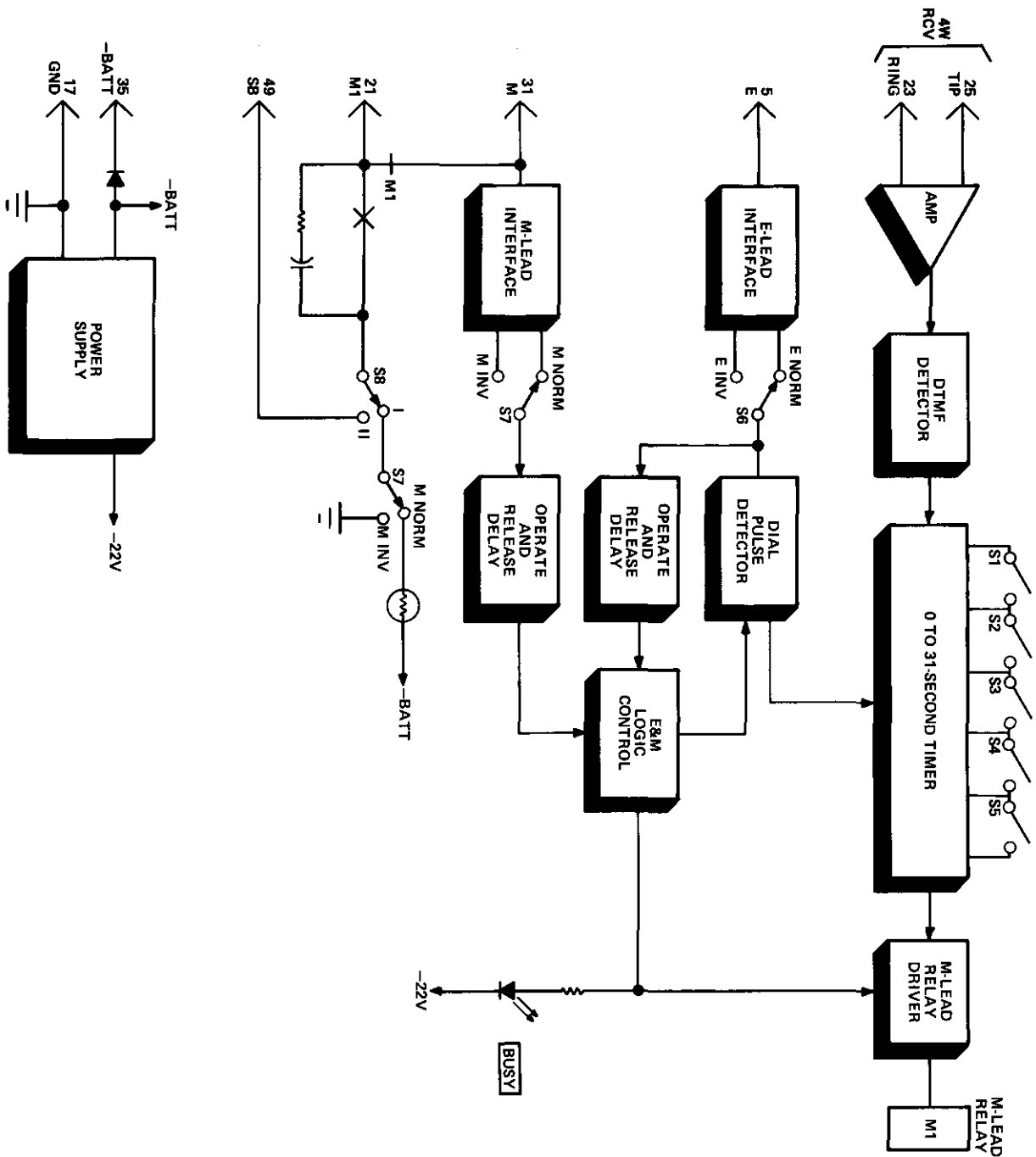*weight*
6 ounces (170 grams)

dimensions
5.58 inches (14.17cm) high
1.42 inches (3.61cm) wide
5.96 inches (15.14cm) deep

mounting
relay rack or apparatus case via one position of Tellabs
Type 10 Mounting Shelf

7.   testing and troubleshooting

7.01   The Testing Guide Checklist in this section may be used to assist in the installation, testing, or troubleshooting of the 6271 Tie Trunk Answer Supervision Module. The Checklist is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new one should be substituted and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement. We strongly recommend that no internal (component-level) testing or repairs be attempted on the 6271 module. Unauthorized testing or repairs may void the module's warranty.

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5. block diagram
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Note: *Warranty service does not include removal of permanent customer markings on the front panels of Tellabs modules, although an attempt will be made to do so. If a module must be marked* **defective,** *we recommend that it be done on a piece of tape or on a removable stick-on label.*

7.02   If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at your Tellabs Regional Office or at our Lisle, Illinois, or Mississauga, Ontario, Headquarters. Telephone numbers are as follows:

US central region: (312) 969-8800
US northeast region: (412) 787-7860
US southeast region: (305) 645-5888
US western region: (702) 827-3400
Lisle Headquarters: (312) 969-8800
Mississauga Headquarters: (416) 624-0052

7.03   If a 6271 is diagnosed as defective, the situation may be remedied by either *replacement* or *repair and return.* Because it is more expedient, the *replacement* procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

replacement
7.04   To obtain a replacement 6271 module, notify Tellabs via letter (see addresses below), telephone (see numbers above), or twx (910-695-3530

in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X6271 part number that indicates the issue of the module in question. Upon notification, we shall ship a replacement module to you. If the module in question is in warranty, the replacement will be shipped at no charge. Pack the defective 6271 in the replacement module's carton, sign the packing slip included with the replacement, and enclose it with the defective module (this is your return authorization). Affix the preaddressed label provided with the replacement module to the carton being returned, and ship the module prepaid to Tellabs.

repair and return
7.05   Return the defective 6271 module, shipment prepaid, to Tellabs (attn: repair and return).
in the USA: Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532

in Canada: Tellabs Communications Canada, Ltd.
1200 Aerowood Drive, Unit 39
Mississauga, Ontario, Canada L4W 2S7

Enclose an explanation of the module's malfunction. Follow your company's standard procedure with regard to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in warranty, no invoice will be issued.

testing guide checklist

test	test procedure	normal results	if normal conditions are not met, verify:
M-lead recognition	With *S6* and *S7* set for normal operation, connect a pulsing test set arranged to transmit M-lead signals (idle = ground; busy = battery) to the front-panel *M-lead* test point.	Front-panel *busy* LED lights when battery is applied and goes out when ground is applied ☐.	Power ☐. Option switch settings ☐. Test set connections ☐. Replace module and retest ☐.
E-lead recognition	With *S6* and *S7* set for normal operation, set *S1* to *OFF* and *S5* to *ON*. Connect a pulsing test set arranged to transmit E-lead signals (idle = open or battery; busy = ground) at 10pps and 50% break to the front-panel *E-lead* test point. Apply ground to the front-panel *M-lead* test point. Go off-hook with test set and dial digit 2 or greater.	After approx. 1 second, *busy* LED lights and M1 relay operates ☐.	Same as above ☐.
answer-supervision delay	With test connections as above, set switches *S1* through *S5* for the desired delay time (see table 2). Go off-hook with test set and dial digit 2 or greater.	Time between last dial pulse and operation of M1-lead relay corresponds to optioned time delay ± 2% ☐.	Same as above ☐.
DTMF detection	With *S6* and *S7* set for normal operation, set *S1* to *OFF* and *S5* to *ON*. Ground *M-lead* and *E-lead* front-panel test points. With a DTMF tel set or tone source connected across pins 25 and 23, apply any valid DTMF digit at 0dBm level.	Front-panel *busy* LED lights and M1-lead relay operates after approx. 1 second ☐.	Power ☐. Option switches ☐. E and M leads at ground ☐. DTMF tone between −18 and +12dB ☐. Replace module and retest ☐.

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