

Technical Practice Section 106-121UL  
General Description and Installation Procedures  
Issue 1, April 15, 1991

# M-106

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## ***Remote Service Access Unit***

## M-106 Remote Service Access Unit

### General Description and Installation Procedures

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## 1. GENERAL INFORMATION

**1.01** This manual describes the single-card versions of the Teltone M-106 Remote Service Access Unit. Rack-mountable versions of the M-106, designed for high-density installations such as telephone central offices, are described in Teltone technical practice 106-161.

**1.02** Whenever this manual is reissued, the reasons for reissue will be stated in this paragraph.

**1.03** A condensed version of Part 3 of this manual is issued separately as the Remote Service Access User's Guide. The information in Part 4 is also published separately as Section 106-211UL, M-106 Installer's Aid. A package of 25 User's Guides and one Installer's Aid are shipped with each M-106 unit.

**1.04 Regulatory Approvals:** The M-106 meets the requirements of U.S. Federal Communications Commission (FCC) Part 68 and Part 15 Class A, Underwriters Laboratories (UL) 1459, and the Canadian Standards Association. See paragraphs 1.05 through 1.09 for FCC information.

**1.05 FCC Registration:** The M-106 has been tested and found to comply with FCC rules, Part 68 and Part 15, subpart J, for Class A computing devices. The M-106 is FCC approved for direct connection to telephone company lines per Part 68 FCC Rules and Regulations. The registration number is AHH9WA-67638-OT-E; the Ringer Equivalence Number (REN), 0.6B. The REN is useful in determining the quantity of devices you may connect to your telephone line and still have those devices ring when your number is called.

**1.06** Part 68 stipulates that all direct connections to telephone company lines must be made through standard (USOC) jacks. Preexisting jacks may be used if they conform to code and are appropriate for the installation. No connections may be made to party lines or coin lines, and continuous tones in excess of -9 dBm may not be transmitted.

**1.07** You must arrange for installation of USOC jacks, or for verification of existing jacks, in advance of M-106 installation. Use Table 1 to determine which USOC jacks you require or to ensure that the preexisting jacks are correct. You must also notify the telephone company when you take the M-106 permanently out of service.

**1.08** If the M-106 causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

**1.09** Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

**1.10** If you experience trouble with the M-106, contact Teltone Corporation at:

**1-800-426-3926**

or

**206-487-1515**

and ask for M-106 Technical Product Support. To obtain a Material Return Authorization (MRA) number or information on repair or warranty, ask for M-106 Order Entry. The telephone company may ask you to disconnect the M-106 from the network until the problem has been corrected or until you are sure the M-106 is not malfunctioning.

**Note:** To avoid unauthorized return charges, please call to obtain an MRA number before shipping equipment to Teltone.

**1.11 Do not attempt to operate or repair malfunctioning Part 68 registered equipment.** Doing so risks voiding both the FCC registration and the product warranty.

Network	Line		Required USOC Jacks
	Direction	Status	
PBX	Incoming	Dedicated	RJ11C
		Undedicated	RJ31X
	Outgoing	Dedicated	RJ12C
		Undedicated	RJ32X
KTS	Incoming	Dedicated	RJ12C
		Undedicated	RJ33X
	Outgoing	Dedicated	RJ12C
		Undedicated	RJ34X

## 2. DESCRIPTION

### A. Concept

**2.01** The M-106 Remote Service Access Unit (Figure 1) provides access to PBX, key telephone, or CO Centrex services from telephones outside the system, without attendant assistance. Off-premises callers can place local or toll calls through the system, access WATS, FX, and tie lines, or use specialized services such as dictation or paging systems and computer services. Users can access these services from home, hotel, mobile, or pay phones by dialing a number dedicated to the M-106.

**2.02** Access to the unit can be via a standard polarity-guarded DTMF pushbutton phone or via a rotary dial phone with a portable DTMF generator. The M-106 requires DTMF (Dual-Tone Multifrequency) tones for its access code and subsequent dialing and features. Where necessary, the M-106 unit can be programmed through option switches to convert these DTMF signals into the corresponding number of dial pulses. A voice frequency amplifier is included as an

ordering option to improve audibility to both parties where low volumes exist.

**2.03** Figure 2 shows the basic M-106 installation scheme, in which the incoming line and outgoing port are both dedicated to the M-106. After ringing the M-106 (and entering an optional security code, if used) the off-premises caller will have access to the services available to the station port dedicated to the M-106, for example, WATS, FX, or TIE lines. More specialized installation schemes with undedicated incoming and/or outgoing lines are also possible. (See Figure 9.)

**Note:** Satisfactory operation of the M-106 requires a line with transmission losses to the central office of less than 5.5 dB. The sum of ringer equivalence numbers for all devices connected to the line should be less than 5.0.

**2.04** Ground start signaling is recommended for use on the M-106 incoming line. With loop start on the incoming line, if the user fails to key # before hanging up the M-106 may be held in a busy state (depending on the type of central

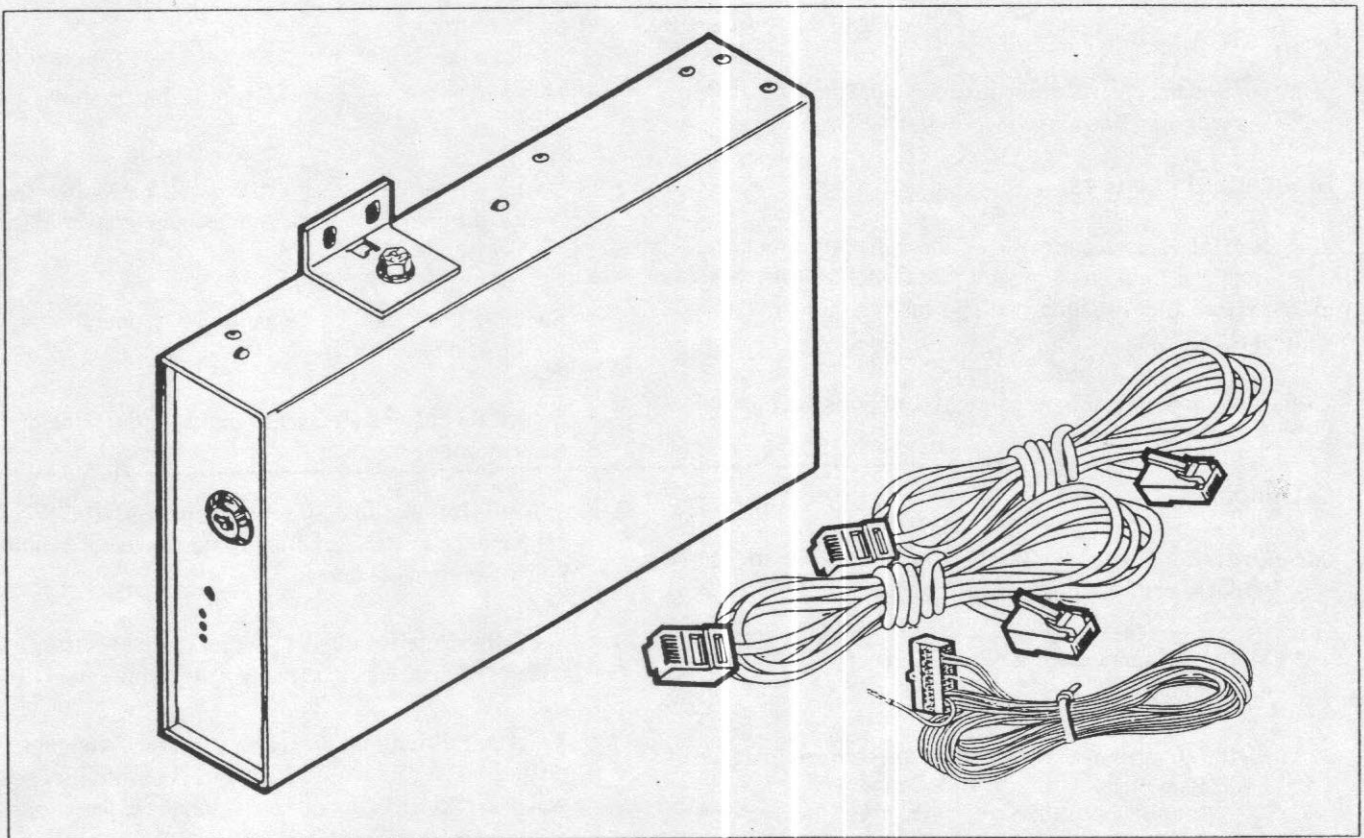


Figure 1 M-106 Remote Service Access Unit



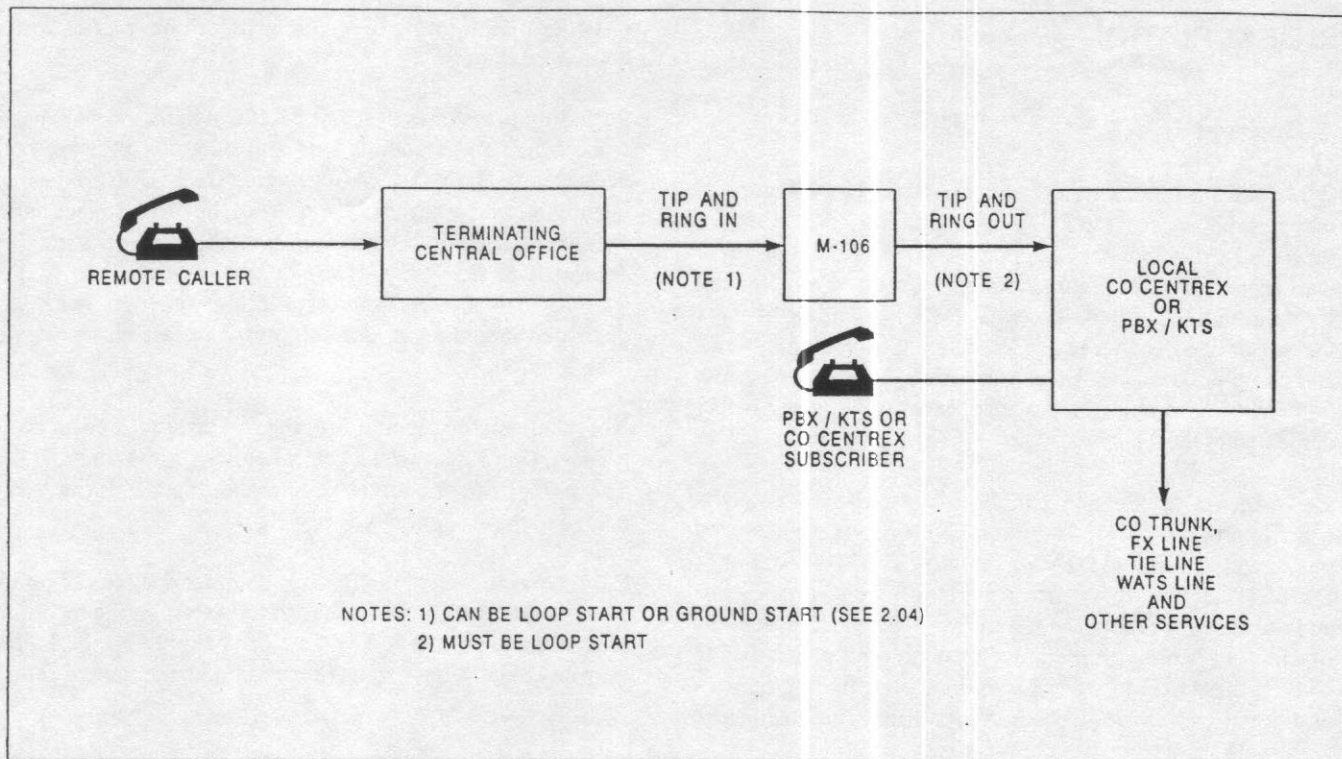


Figure 2 Typical Installation Scheme

office) unless the central office is capable of forcing disconnect. The outgoing line must be loop start.

## B. Standard Features

**2.05 Retrial:** This feature allows the caller to disconnect from the outgoing line and place another call, or to make a retrial after a dialing error, no answer, or busy signal, without reaccessing the M-106.

**2.06** Both incoming and outgoing M-106 ports are polarity guarded.

## C. Options

**2.07 Ordering Options:** The M-106 is available in four standard configurations:

- M-106-01 operates with -48 VDC power and includes a voice amplifier
- M-106-02 operates with -24 VDC power and includes a voice amplifier
- M-106-05 is identical to M-106-01 but excludes the amplifier

- M-106-06 is identical to M-106-02 but excludes the amplifier

**2.08 Switch Options:** Switch settings on the M-106 card control the operation of the tone-to-pulse converter and set the security code.

- Switch S1 and Switch S4 control the operation and timing of the converter
- Switch S2 enables the user to program the three-digit security code

**2.09 Wiring Options:** Jumper settings on the M-106 circuit card and the Power/Auxiliary cable connector control the following optional features:

- **Security Code Enable:** A jumper on the M-106 card enables or disables the security code requirement
- **Voice amplifier gain direction control:** Two jumpers on the M-106 card are used to control the amplifier gain where difficulty in breaking dial tone is experienced
- **Call Timer:** A jumper lead at the back of the power/auxiliary cable allows selection, from 5 options,

of the maximum time per seizure (5 to 20 minutes or no time limit) that a caller can use the M-106 circuitry.

- **Seize Feature:** Another jumper at the back of the power/auxiliary cable can be wired in one of two ways:

To start and stop a piece of equipment to which the M-106 is dedicated

To permit a caller to complete a call even when the M-106 is accidentally switched OFF while the call is in progress

**2.10 Remote Switch:** Leads are provided for connection to a customer-provided remote M-106 ON/OFF switch such as a night transfer switch at the PBX console. If implemented, this remote switch can be wired either in series or in parallel with the switch on the M-106 unit.

**2.11** Figure 3 is a diagram of the M-106 and its connections.



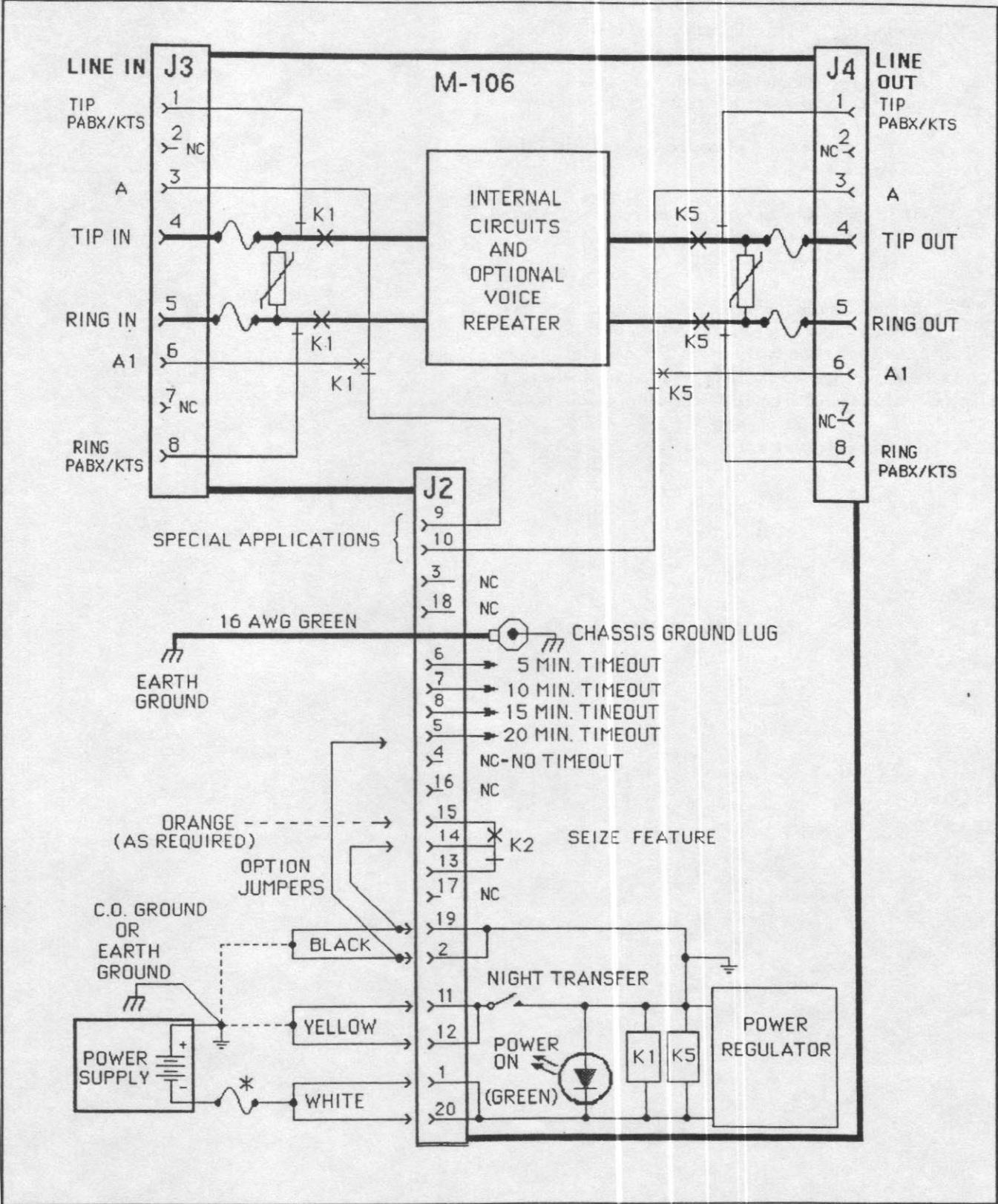


Figure 3 M-106 Connections

### 3. OPERATION

#### A. Summary

**3.01** The M-106 is activated when a caller dials the access number associated with its incoming line (connected to J3). When the M-106 detects the ringing, it goes off-hook answering the call.

**3.02** The security code option is checked at this point. If it is active, the M-106 sends a tone to the caller for confirmation and to indicate time to enter the 3-digit password. If the password is not entered within approximately 15 seconds or is entered incorrectly, the M-106 disconnects from the incoming line and waits for a new call.

**3.03** If the password is accepted, the caller is connected to the outgoing line (connected to J4), and the M-106 goes off-hook and draws dial tone on that line. The caller can now dial calls in the same way as other users on that switch with normal user privileges or those programmed in the switch for that station.

**3.04** The switchhook flash option (S1-6) allows the user to flash the outgoing line by keying \* for less than 1 second. This allows the use of call transfer, conference calling, or any other flash features available to the station user.

**3.05** The retrieval feature allows the user to on-hook, then off-hook on the outgoing line by keying # for less than 1 second. The user will again hear dial tone and can redial or dial a new number.

**3.06** The timeout option can be used to limit the user to 5, 10, 15, or 20 minutes total calling time. If timeout is implemented, the M-106 will disconnect both incoming and outgoing lines at the selected time after the unit was accessed.

**3.07** When the user has concluded all calls, a # must be keyed for more than 1 second to disconnect both lines unless the switch provides a "forced disconnect" (a momentary removal of ground and battery) on the incoming line. Otherwise, the M-106 is dependent on the timeout option to disconnect the unit for the next user.

#### B. Detailed Operation

**3.08** The following description provides complete step-by-step instructions for placing a call through the M-106. Each instruction is accompanied by an explanation of the operations performed by the M-106 in response to that particular step. See also Figure 3.

#### STEP 1: RING THE M-106

**3.09 Summary:** The M-106 unit's response to the application of a ringing voltage depends on the operational status of the unit. The unit is enabled when the Night Transfer and/or remote transfer switches are set to ON (up). See also Table 5, Installation Tests.

**3.10 Disabled Condition:** If the M-106 is disabled (switched OFF), all connections are broken between the internal circuitry of the unit and the incoming and outgoing lines. Where the incoming line is dedicated to the M-106, the ringing voltage goes undetected and the customer will receive ringback tone indefinitely.

**3.11 Idle Condition:** If the M-106 is enabled (switched ON) and idle (not in use), its ring detector monitors the incoming line for 16-66 Hz ringing. Whenever this signal is detected, the M-106 ring trips, with the following results:

(1) The M-106 seizes the incoming line (Relay K2 operates), and connects it to a holding bridge. This bridge assures that the line remains seized even if loop current is lost for up to 420 ms.

(2) Relay K2 also enables the optional seize feature, if implemented. If the seize feature is connected to a particular device dedicated to the M-106, that device can be automatically started.

(3) The optional call timer, if implemented, begins counting down from its programmed limit. This timer will reset only when the M-106 is disconnected and reaccessed.

**Note:** Items 4 and 5 apply to M-106 units in which the security code option is enabled. If the security code option is not enabled, the caller will receive dial tone and may place the desired call (Proceed to STEP 3).

(4) The M-106 tone generator, after a pause of 2.4 seconds, forwards to the caller a 440 Hz answer tone lasting 1.6 seconds. This tone indicates that the caller has approximately 15 seconds in which to signal the M-106 security code.

(5) The security timer also begins counting down. Like the call timer, this timer will reset only when the M-106 is disconnected and reaccessed.

**3.12 Busy Condition:** If the M-106 is enabled but busy (in use), the central office switching system will forward a busy signal to the caller.

**Note:** All subsequent operations involving the M-106 must be performed with standard DTMF signals supplied by a



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polarity-guarded pushbutton telephone set or by a DTMF tone generator.

### STEP 2: SIGNAL THE SECURITY CODE (OPTIONAL)

**3.13 Summary:** The M-106 monitors for the programmed 3-digit code to be entered in the correct sequence before the security timer runs out.

**3.14 Successful Call:** If the correct code is entered within the allotted time, the following events occur:

(1) The M-106 seizes the outgoing line and connects it to a holding bridge. Seizure of the line is indicated to the caller by dial tone.

(2) **Tone-to-Pulse Option (S1-1 OFF):** The conditional time-out circuit becomes active if the tone-to-pulse converter is enabled, and if option switch S1-5 is set to OFF. If no digit is received within 8 seconds or 16 seconds (depending on the position of S1-3), this timer will cause the converter to shut down until a retrieval or switchhook flash is signaled, or the M-106 is reaccessed. If S1-5 is set to ON, the conditional time-out circuit does not begin clocking until the first digit intended for conversion is received. In either case, each digit received before time-out causes the timer to reset.

**3.15 Unsuccessful Call:** If a complete code is not entered before time-out, the M-106 releases the incoming line (and Relay K2) 19.2 seconds after ring trip. If an incorrect code is entered, it releases the line immediately after button up of the third digit.

### STEP 3: PLACE THE DESIRED CALL

**3.16 Summary:** The forwarding of dial tone signifies that the caller can place a call using the services available through the M-106 outgoing line port. Dial tone should be broken and the call should be completed.

**3.17 If Dial Tone Is Not Broken:** Assuming a properly loaded line with transmission losses less than 5.5 dB, certain M-106 installations may experience difficulty breaking dial tone. The customer can control this in one of two ways:

(1) When the M-106 is used with WECO Horizon or other equipment that receives DTMF signaling only, signal levels and voice frequency amplifier operation may lead to difficulty breaking dial tone. The amplifier normally switches gain to the direction that amplifies the stronger signal while attenuating the weaker one. If the DTMF signal is attenuated below the threshold of the DTMF receiver, a caller cannot

break dial tone. For these installations, an amplifier direction control option is provided that forces amplification of the DTMF signal (after the M-106 has seized an outside line). After dial tone has been broken, this direction control must be turned off, restoring amplifier operation to normal. This can be done in one of two ways, as determined by a jumper setting on the M-106 circuit card (see Figure 5):

- **Manual Method:** Normal amplifier operation is restored after the user enters # for less than 1 second. (The user must be careful to distinguish this signal from a # signal of more than 1 second, which terminates the call.)
- **Automatic Method:** Normal amplifier operation is restored after each digit. Since this method does not require a manual turnoff signal, it is preferable when only one dial tone must be broken. However, problems breaking subsequent dial tones may persist with this method, unless the user is careful to press down long enough on the keypad button while dialing a digit.

(2) To prevent problems breaking dial tone that are not due to amplifier operation, the user must press down long enough on the keypad buttons while dialing or use the HIGH setting of the tone generator.

**CAUTION:** Be sure the switch (PBX/CO/Centrex) is not equipped for Touch-Tone service before enabling tone-to-pulse conversion. If the switch will accept Touch-Tone but tone-to-pulse conversion is required, then the "Early Split" feature must be used to ensure that the tone digits are not detected by both the M-106 and the switch.

**3.18 Tone-to-Pulse Conversion:** If option switch S1-1 is set to OFF, the M-106 tone-to-pulse converter is enabled and the caller can access rotary dial services. Until the converter shuts down, all valid DTMF digits reaching the M-106 are converted into the corresponding number of 10 pps dial pulses. Before being converted, each DTMF digit causes relay K3 to split the incoming line from the outgoing line (the lines remain seized by means of the holding bridges). Dial pulse signals are transmitted along the outgoing line. The outpulsing circuits have a circulating, first-in-first-out memory with a capacity of 20 digits. All digits remaining in the memory are outpulsed before the converter shuts down. After shutdown, the connection between the incoming and outgoing lines is restored. DTMF signals then pass through the M-106 unit without being processed by it.

**3.19 Converter Shutdown After First Digit:** By keying any first digit for which a corresponding section of S4 is set to ON, the caller can cause the converter to outpulse that digit and then shut down.

**3.20 Keyed Converter Shutdown:** If switch S1-4 is set to ON, the caller can shut down the converter by keying # for less than one second (# or \*, if the switchhook flash feature is not implemented).

**3.21 Retrial:** By keying \* for more than one second and then waiting for dial tone, the caller can make more than one call per incoming access, or make a retrial in the event of a dialing error, no answer, or busy signal. Detection of this tone causes the M-106 to release the outgoing line for 4 to 6 seconds and then re seize it. The tone-to-pulse timer is reset, but the call timer is not.

**3.22 Switchhook Flash:** If option switch S1-6 is set to OFF, the caller can simulate a switchhook flash by keying \* for less than one second. Detection of this tone causes the M-106 to release the outgoing line for 200 to 910 ms and then re seize it. The tone-to-pulse timer is reset, but the call timer is not. If S1-6 is set to ON (switchhook flash disabled), keying \* for less than one second causes the instant shutdown described in paragraph 3.13.

#### STEP 4: TERMINATE THE CALL

**3.23 Caller Disconnection:** The caller can disconnect the M-106 at any time by keying # for more than one second. Detection of this tone causes the M-106 and Relay K2 to immediately release the incoming and outgoing Lines. The caller will hear a click followed by silence (or dial tone), indicating that the M-106 has disconnected.

**3.24 Timer Disconnection:** If the optional call timer is implemented, about 20 seconds before automatic disconnect the caller will hear a 440 Hz tone lasting 1.6 seconds. When the call timer times out, the M-106 disconnects.



## 4. INSTALLATION GUIDE

**4.01** The following paragraphs are designed to assist in the installation, testing, and maintenance of M-106 units. The form contained in Table 2 can be used as an installation checklist. **Be sure the tone-to-pulse option is disabled (S1-1 ON) if the outgoing line is equipped for Touch-Tone dialing.**

**4.02 M-106 Physical Description:** The M-106 housing is 7-1/4 inches high by 2-1/4 inches wide by 12 inches deep (178 x 58 x 305 mm). The back panel has access ports

for the three jacks attached to the rear edge of the circuit card. See Figure 4. On the front panel are an ON/OFF (Night Transfer) switch and three LEDs. The front panel can be unlocked and removed to access the three thumbwheel switches (S2A, B and C) to change the security code. The unit can be either wall- or rack-mounted using the rotatable flanges attached to the top and bottom.

**Table 2 Installation Checklist (Sheet 1 of 2)**

I. Security Code Switches S2		
These switches provide combinations from 000 to 999. Use these switches only if the SC jumper (see below) has been implemented. Enter one digit, 0 — 9 in each box, or check "no security code":		
<input type="checkbox"/> S2-A	(1st digit, top thumbwheel)	
<input type="checkbox"/> S2-B	(2nd digit, middle thumbwheel)	
<input type="checkbox"/> S2-C	(3rd digit, bottom thumbwheel)	
<input type="checkbox"/>	No security code	
II. S1 Option Switches (on circuit card). Check one for each section:		
S1-1	<input type="checkbox"/> ON*	Disables the tone-to-pulse converter. If S1-1 is ON (tone-to-pulse disabled), then S1-2 through S1-5 and all 10 sections of S4 are not used. Go to S1-6. (STANDARD SETTING)
	<input type="checkbox"/> OFF	Enables the tone-to-pulse converter
S1-2	<input type="checkbox"/> ON	Enables early line split. This feature prevents digits intended to be outpulsed by the M-106 from activating DTMF-sensitive equipment connected to the M-106, but may increase the level of noise on the line.
	<input type="checkbox"/> OFF	Disables early line split operation
S1-3	<input type="checkbox"/> ON	Tone-to-pulse timer sets/resets for 8 seconds (see also S1-5)
	<input type="checkbox"/> OFF	Tone-to-pulse timer sets/resets for 16 seconds (see also S1-5)
S1-4	<input type="checkbox"/> ON	Converter shuts down when # is signaled for less than 1 second (# or * when S1-6 is ON)
	<input type="checkbox"/> OFF	Converter is not shut down by keyed signal
S1-5	<input type="checkbox"/> ON	Timer starts when first digit is detected
	<input type="checkbox"/> OFF	Timer starts when outgoing line is seized
S1-6	<input type="checkbox"/> ON	Disables the simulated switchhook flash feature (see S1-4)
	<input type="checkbox"/> OFF	Enables simulated switchhook flash. This feature requires that the M-106 be connected to equipment with call transfer capabilities. See also paragraph 3.22.
III. S4 Option Switches (on circuit card).		
S4-1 through S4-10	Converter shutdown after first digit. Each section set to ON causes the corresponding digit (section 10 = 0) to shut down the converter, whenever that digit is the first digit received after validation of the security code. This feature is most often used to gain access to an outgoing line or to restrict access to certain outgoing lines.	
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10      ON	
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10      OFF	
IV. Security Code Jumper SC/NSC (on circuit card)		
SC/NSC	<input type="checkbox"/> SC	Security code is required for access to the M-106
	<input type="checkbox"/> NSC	No security code is required

Table 2 Installation Checklist (Sheet 2 of 2)

V. Amplifier Gain Direction Control Jumper (on circuit card)		
J1	Pin E5	No amplifier gain direction control
	Pins E4 and E5	Amplifier gain direction control
J2 (see Note)	Pins E1 and E2	Ends gain direction control after # entered for less than 1 second
	Pins E2 and E3	Ends gain direction control after each digit
<b>Note:</b> J2 has no function if J1 is positioned on Pin E5 only (i.e., if amplifier gain direction control is not enabled).		
VI. Power/Auxiliary Cable Jumper Options		
A. Call Timer		
<input type="checkbox"/>		Not implemented
<input type="checkbox"/>		5 minutes
<input type="checkbox"/>		10 minutes
<input type="checkbox"/>		15 minutes
<input type="checkbox"/>		20 minutes
B. Seize or Equipment Start/Stop Jumper		
<input type="checkbox"/>		Not implemented
<input type="checkbox"/>		Seize implemented (call can continue when power switch is turned off)
<input type="checkbox"/>		Equipment start/stop application
C. Power Options (see paragraph 4.07)		
<input type="checkbox"/>		-24 VDC
<input type="checkbox"/>		-48 VDC
D. Remote Power On/Off Switch		
<input type="checkbox"/>		No remote switch
<input type="checkbox"/>		Connect remote switch in series with local switch
<input type="checkbox"/>		Connect remote switch in parallel with local switch

### A. Preliminary Planning

**4.03 Site Selection:** Consider the following when selecting a site for the M-106:

- The need for security and access to the front panel by authorized users to set the security code.
- Access to the back panel screws securing the circuit card is required for troubleshooting.
- A telephone should be available at the site, positioned so as to provide an unobstructed view of the M-106 LEDs during installation and troubleshooting.
- The M-106 must be placed within cable range of the USOC wall jacks and the PBX/KTX terminal strip.

**4.04** Ensure that the battery supply is -50  $\pm$  6 VDC (M-106-01 and M-106-05) or -24  $\pm$  4 VDC (M-106-02 and M-106-06).

**4.05** If the installation incorporates a remote ON/OFF switch, or if the seize feature is implemented to start and stop equipment connected to the M-106, run leads from these devices to the PBS/KTS terminal strip or another convenient location.

**CAUTION:** The M-106 contains static sensitive components. Handle the card only by the edges and avoid touching circuit traces or components.

### B. M-106 Circuit Card Adjustments

**4.06** Unscrew the two screws that secure the M-106 card to the back panel of the housing, unlock and detach the front panel, and then remove the card. See Figure 4.

**4.07** Inspect the card to ensure that it is undamaged. Note the circuit card dash number located on the back of the card. Then compare the card with Figure 5 to ensure that it is correct for the application:

- The M-106-01 and M-106-05 contain the -07 card, designed for use with -48 VDC battery supplies and



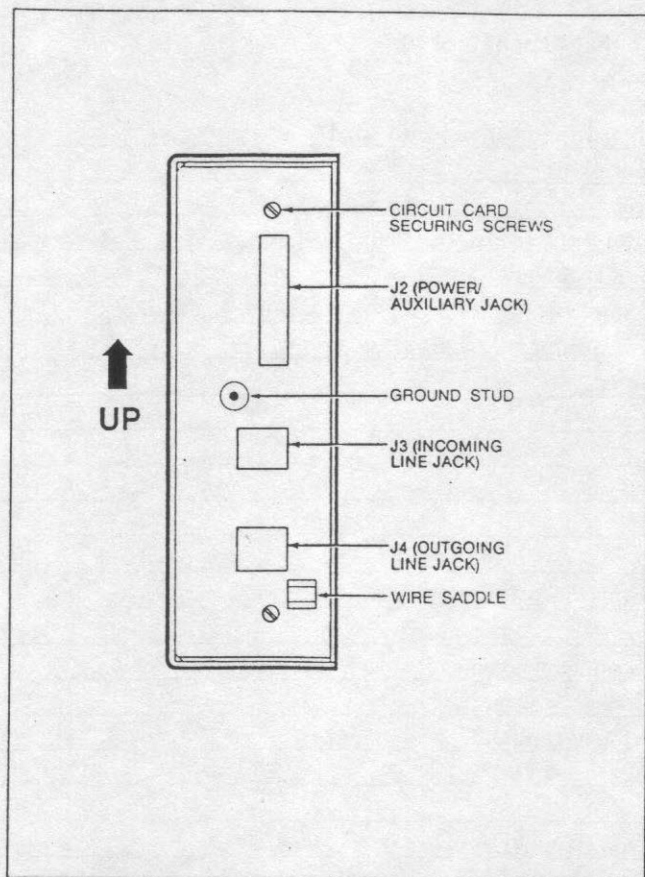


Figure 4 M-106 Back Panel

identified by the large 200-ohm resistor located near the heat sink.

- The M-106-02 and M-106-06 contain the **-08 card**, designed for use with -24 VDC battery supplies and identified by the small 0-ohm resistor or insulated jumper located near the heat sink.
- The M-106-01 and M-106-02 also contain a factory-installed voice frequency amplifier.

**Warning:** M-106 units may be damaged if used with battery supplies for which they were not designed.

**4.08 (a) All Cards:** Using Table 2 and Figure 5 as guides, set option switch packages S1 and S4 as required by the application. Set option jumpers SC/NSC as required.

**(b) M-106-01 and -02 Only:** Using Table 2 and Figure 5 as a guide, set option jumpers J1 and J2 as required by the application.

### C. Amplifier Adjustments (M-106-01 and -02 only)

**4.09** Detach the amplifier by removing the panhead screw located on the back of the M-106 card and then lifting the vertical card contacts from J1.

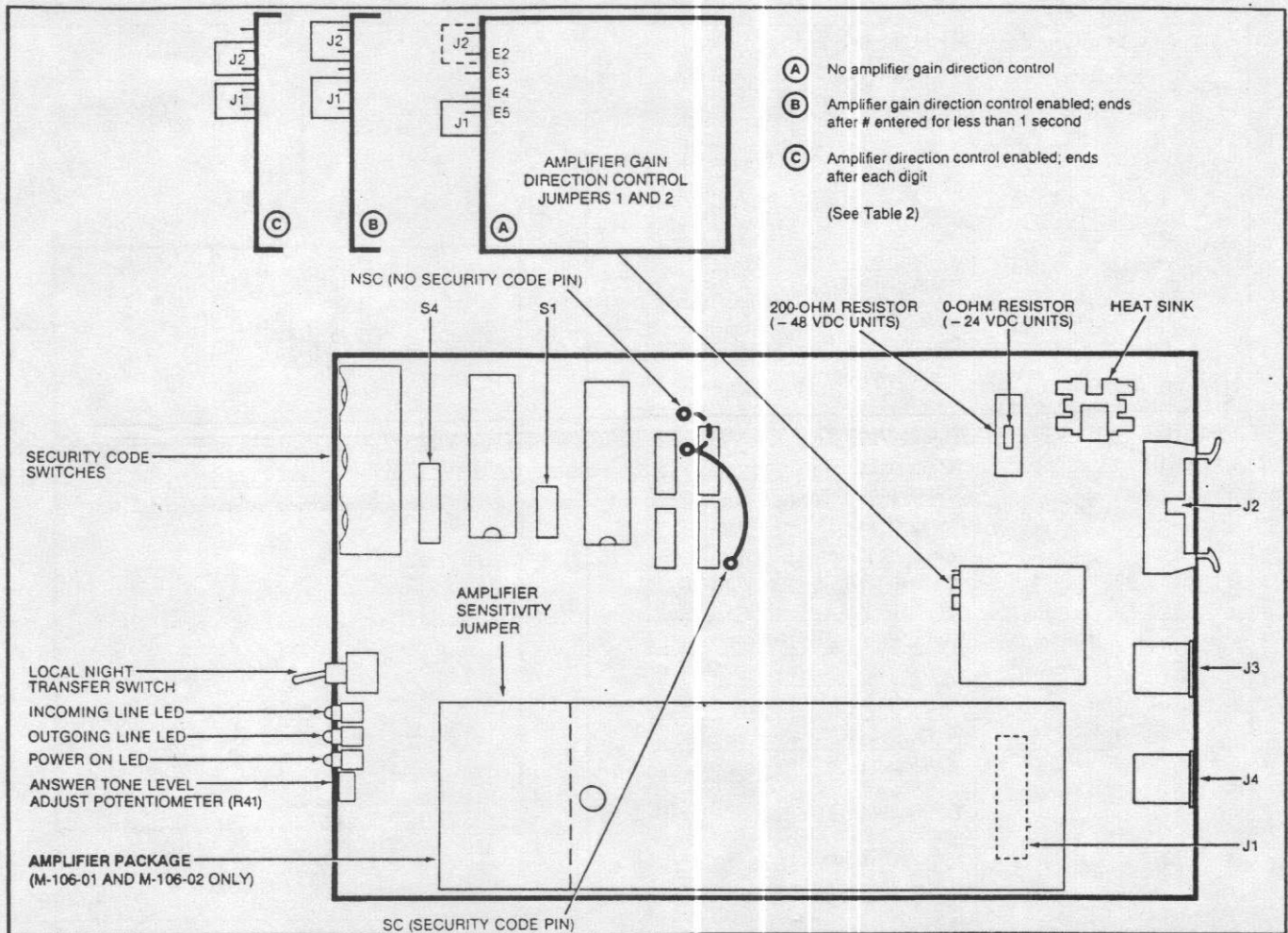
**4.10** Adjust the gain of the amplifier by setting the four switches on the small card attached to one end of the main amplifier card. See Figure 6. These switches provide gains of 1, 2, 4, and 8 dB respectively. For example, if the switches are set as shown in Figure 6, the gain of the amplifier is 4 dB plus 8 dB, for a total of 12 dB.

**Note:** The amplifier automatically reduces the gain when input signals become large enough to exceed -9 dBm after amplification at the programmed gain. If the input signal is -9 dBm or greater, the gain of the amplifier is 0 dB.

**4.11** Adjust the sensitivity of the amplifier by positioning the movable jumper on the small card. For the turn-on level change associated with each position, see Table 3. Sensitivity adjustments do not affect turn-on levels above about -40 dBm.

**4.12** Reattach the amplifier to the M-106 card.

Table 3 Amplifier Sensitivity Adjustments				
Option	Change in Turn-On Levels (dB)		Typical 1 kHz Turn-On Levels (dBm)	
	Called Side	Calling Side	Called Side	Calling Side
1	—	—	-44	-44
2S	-2	+4	-42	-48
2O	+4	-2	-48	-42
3S	-3	+7	-41	-51
3O	+7	-3	-51	-41



**Figure 5 M-106 Circuit Card**

#### D. Mechanical Installation

**NOTE: POSITION SENSITIVE.** Because the M-106 contains position-sensitive, mercury-wetted relay contacts, ensure when mounting the unit that J2 is at the top of the back panel and the plane of the panel is perpendicular to the floor.

- 4.13** Resecure the M-106 card to the rear panel of the housing using the two screws removed earlier. The housing front panel need not be replaced at this time.

- 4.14** The M-106 may be wall or rack mounted.

- **Rack mounted units:** Position the top and bottom mounting brackets as required. Then mount the unit, using up to No. 12 USS (5 mm ISO) hardware (obtained locally).

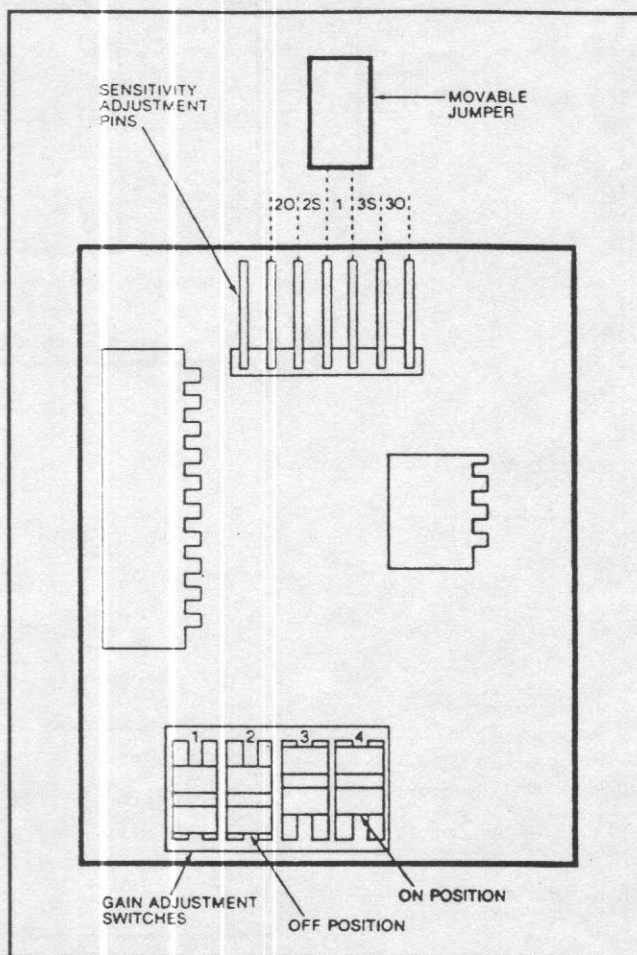
- **Wall mounted units:** Position the top and bottom mounting brackets as required. Use 3/4-inch wood screws (obtained locally) to attach the mounting brackets to a 3/4-inch-thick plywood panel that has been permanently attached to a wall of UL-approved construction.



Table 4 Power/Auxiliary Cable Connections			
Function		Lead(s)	Connection
Call Timer	Not implemented	Keyed side, black jumper	Plug position 4
	5 Min		Plug position 6
	10 Min		Plug position 7
	15 Min		Plug position 8
	20 Min		Plug position 5
Seize Feature (see Fig. 10)	Not implemented	Unkeyed side, black jumper	Plug position 16
		Orange (Note 1)	Not connected
	Seize implemented	Unkeyed side, black jumper	Plug position 14
		Orange (Note 1)	Ground
	Equipment start/stop implemented	Unkeyed side black jumper	Plug position 16
		Orange (Note 1)	Ground
		Orange/White or White/Orange (Note 1)	Equipment
Remote Switch	Not implemented	Black (Note 2)	Not connected
		Yellow (Note 2)	Ground (Note 3)
	In series with local switch	Black (Note 2)	Not connected
		Yellow (Note 2)	Remote switch
	In parallel with local switch	Black (Note 2)	Remote switch
		Yellow (Note 2)	Ground (Note 3)
Chassis ground		16 AWG Green (Note 4)	Ground stud
Power		White (Notes 2 and 5)	Negative battery (-48 or -24 VDC)

**Notes**

1. Orange, orange/white, and white/orange wires are supplied separately. Plug the wire into the connector as required per Figure 10.
2. Two leads.
3. The power supply ground that is connected to either the BLACK or YELLOW leads (not both) or to the remote night transfer switch (see Figure 10) must be referenced to either Central Office ground or earth ground.
4. Connect the green wire to an appropriate earth ground to comply with UL requirements.
5. Two leads. The circuit must be protected by installation of a fuse or wall transformer as described in paragraph 4.15.

**Figure 6 Amplifier Adjustments**

## E. Electrical Installation

**4.15** The circuit must be protected by one of the following means:

(1) Install a customer-provided 500 mA fast-blow fuse between the M-106 and the PBX or key system power supply, or:

(2) Install a UL-approved, 24- or 48-volt wall transformer capable of supplying 1/2 Ampere.

**4.16** Using Table 4 and Figures 7 through 10 as a guide, make whatever Power/Auxiliary cable connections the application requires. Then plug the cable connector into J2.

**4.17** Plug the 8-position end of the incoming line cable into J3. Then plug the other end of the cable into the incoming line USOC wall jack.

**4.18** Plug the 8-position end of the outgoing line cable into J4. Then plug the other end of the cable into the outgoing line USOC wall jack.

**4.19** Attach all three cables to the nylon tie-down saddle on the M-106 back panel to provide strain relief.

## F. Installation Tests

**4.20** Perform (in sequence) the tests described in Table 5. The tests will require the following equipment:

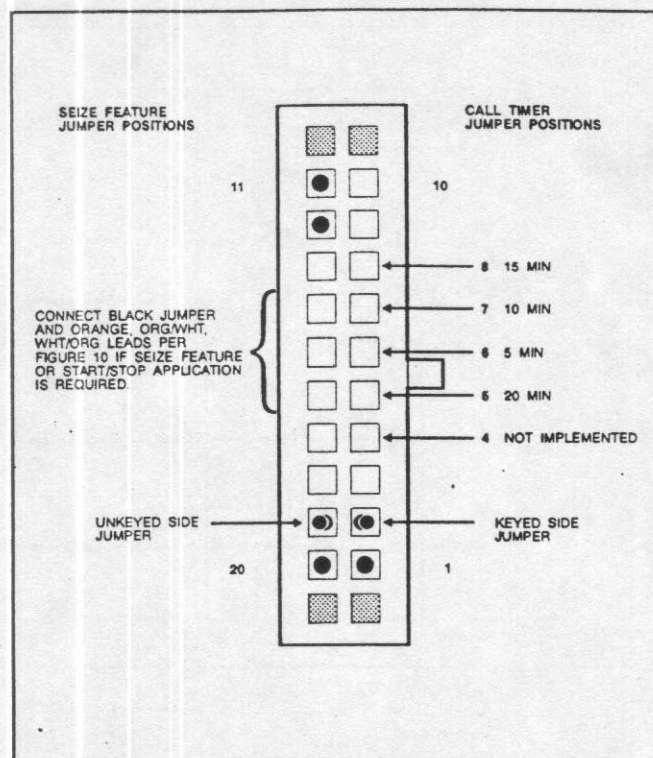
- (1) A voltmeter with needle probes
- (2) An ohmmeter
- (2) A wristwatch or clock with a second hand
- (3) A polarity-guarded pushbutton DTMF telephone or tone generator located in the vicinity of the M-106.

## G. Final Procedures

**4.21** Set the security code switches as required. The top switch represents the first digit, the middle switch the second, and the bottom switch the third.

**4.22** Replace and lock the front panel of the housing.

**4.23** To put the M-106 into service, set the night transfer switch(es) as required by the application and the time of day.



**Figure 7 Power/Auxiliary Cable Jumper Connections**



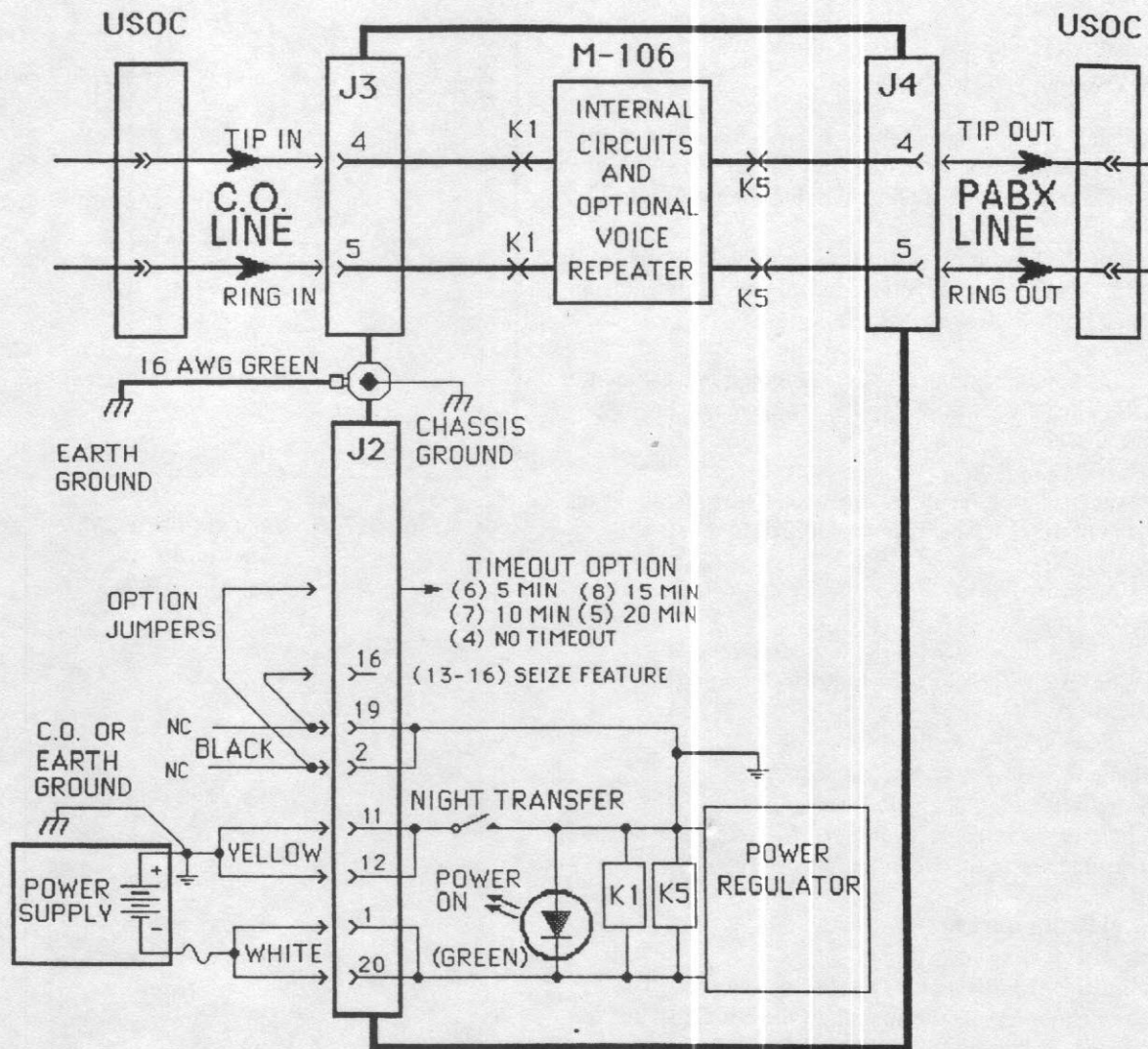
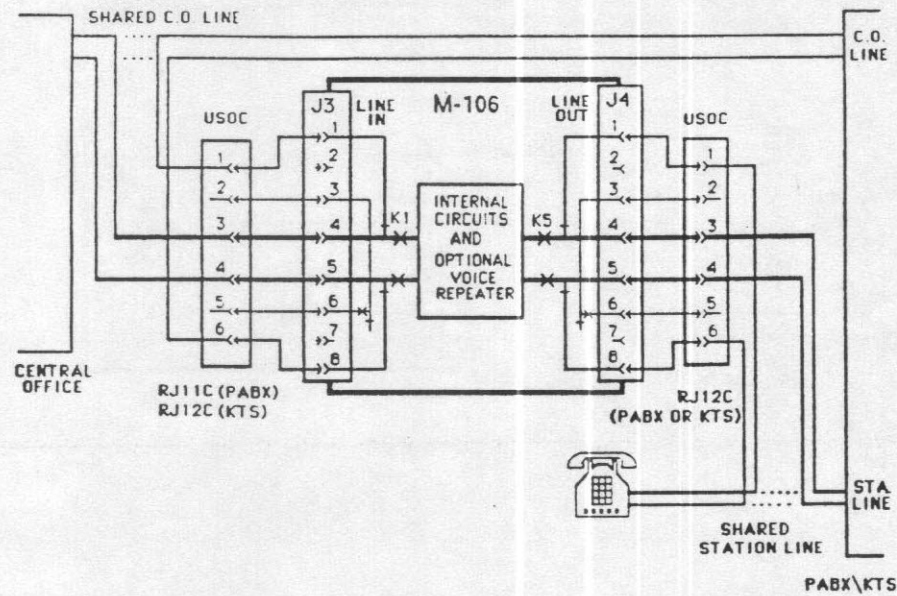
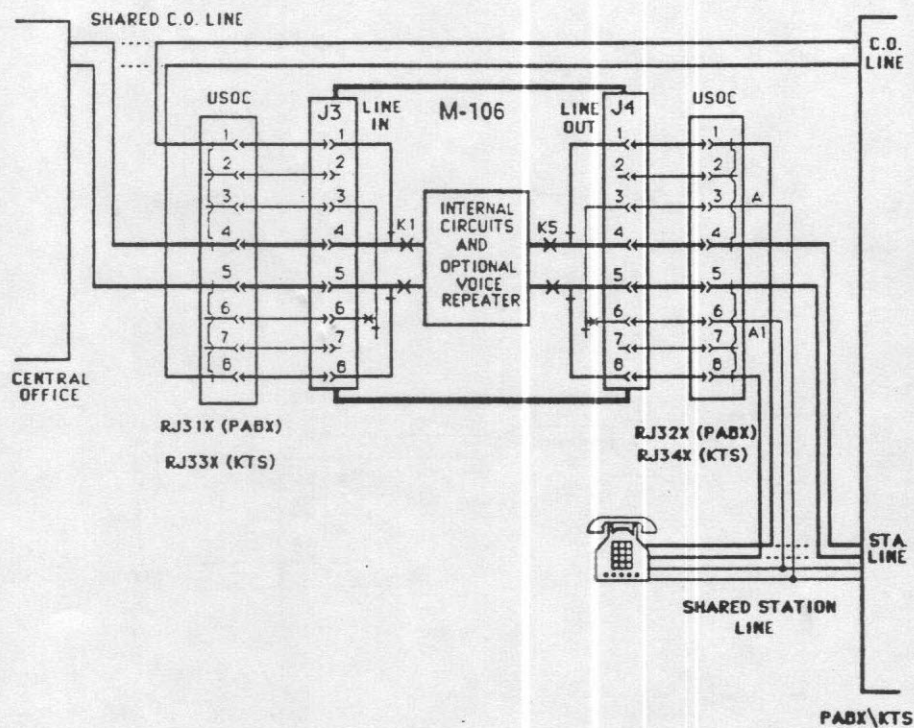


Figure 8 Typical Wiring for M-106 with Dedicated Incoming and Outgoing Lines



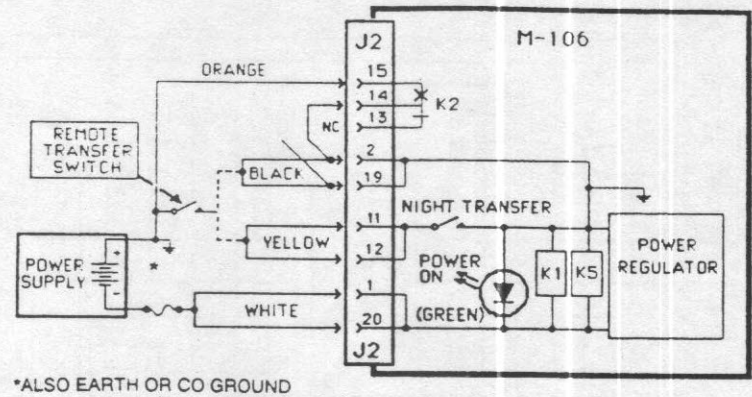
A. Non-Shorting USOC with 6 pin to 8 pin cable



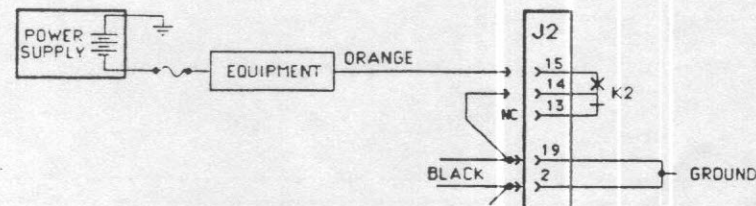
B. Shorting USOC with 8 pin to 8 pin cable

Figure 9 M-106 with Shared Incoming and Outgoing Line

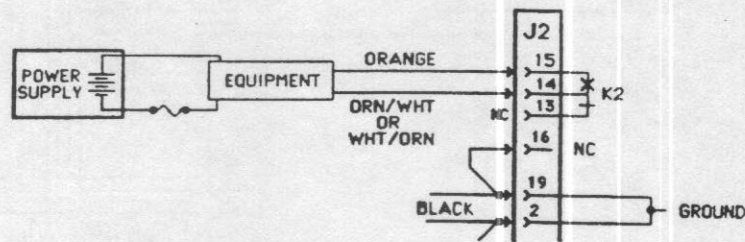




A. Seize Feature with Remote Transfer Switch



B. Ground Start External Equipment—Start/Stop Feature



C. Isolated Contact Closure for External Equipment—Start/Stop Feature

Figure 10 Optional Connections

Table 5 Installation Tests (Sheet 1 of 3)

**Note:** Be sure to contact Teltone and obtain a Material Return Authorization (MRA) number before returning defective units.

Test		Action if "NO"
<b>INSTRUCTIONS:</b> Check off each step as it is completed. If a failure is encountered, perform the action indicated.		
<b>1. POWER:</b> Set the local power ON/OFF switch ON (up). If implemented, set the remote power ON/OFF switch ON. Does the green POWER ON LED light?	<input type="checkbox"/> YES	Test the white, yellow, and (if applicable) black cable leads as instructed in Table 6, Step 2.
<b>2. REMOTE SWITCH:</b> If the optional remote switch is not implemented, go on to Test 3. If implemented, test all possible combinations of it and the local switch.  If the switches are connected in series, is the M-106 enabled when both switches are set to ON and disabled when either switch is set to OFF?	<input type="checkbox"/> YES	Ensure that the wiring of the remote switch is correct. Test the yellow cable leads as instructed in Table 6
If the switches are connected in parallel, is the M-106 enabled when either switch is set to ON and disabled when both switches are set to OFF?	<input type="checkbox"/> YES	Ensure that the wiring of the remote switch is correct. Test the black cable leads as instructed in Table 6
<b>3. CHASSIS GROUND :</b> Unplug the power/auxiliary cable from J2. Using a voltmeter, test the plug position housing the GREEN lead. Does the test reveal ground?	<input type="checkbox"/> YES	Test the green lead and its associated terminal for continuity to earth ground.
<b>4. INCOMING LINE:</b> Reinsert the plug into J2. Go to a telephone set where the M-106 LED's can be seen. Place a call to the M-106. Does the red INCOMING LINE LED light?	<input type="checkbox"/> YES	Perform Table 7 Steps 1 and 3.
<b>Note:</b> All subsequent tests require DTMF signals. Tests 5 through 8 are for M-106 units with security code access and call time out implemented. If these tests don't apply to the unit under test, go on to Test 9.		
<b>5. ANSWER TONE:</b> If security code access is not implemented, go on to Test 8. If implemented, is the M-106 Answer Tone (440 Hz lasting 1.5 seconds) heard shortly after the indicator lights?	<input type="checkbox"/> YES	(1) Suspect unit ground not connected to either central office or earth ground (see Figure 8.) Connect and retest. (2) Suspect a defective M-106 card.
<b>Note:</b> The tone level can be adjusted by rotating the adjustment slot of potentiometer R41 clockwise (to increase level) or counterclockwise (to decrease level). See Figure 5.		
<b>6. SECURITY TIMER:</b> Wait for approximately 20 seconds. Does the INCOMING LINE LED go dark, indicating that the M-106 has automatically disconnected?	<input type="checkbox"/> YES	Check the security jumper (Figure 5). If properly connected, suspect a defective M-106 card.
<b>7. SECURITY CODE:</b> Reaccess the M-106. Within 15 seconds after the answer tone ceases, key the three digits (in the order top to bottom) appearing on the unit's security code switches. Does the red OUTGOING LINE LED light?	<input type="checkbox"/> YES	If no tones are heard in the test phone earpiece when the security code is keyed, a polarity-guarded test phone or a tone generator is required. If the trouble persists, suspect a defective M-106 card.
<b>8. CALL TIMER:</b> Calculate when the timer is set to time out. About 30 seconds before time out, begin monitoring the line through the M-106. (Time permitting, Tests 9 through 19 can be conducted in the interim.) Is the M-106 warning tone (440 Hz lasting 1.5 seconds) heard, and does the unit automatically disconnect approximately 20 seconds after the tone ceases?	<input type="checkbox"/> YES	Test the call timer black jumper as instructed in Table 6, Step 2.



Table 5 Installation Tests (Sheet 2 of 3)

9. <b>OUTGOING LINE:</b> Place a call through the M-106. Is the call successful?	<input type="checkbox"/> YES	Hold down the buttons of the keypad or use the HIGH setting of the tone generator. If the trouble persists, set the option switches for tone-to-pulse conversion with the early split option enabled and try again. Finally, perform Table 6 Steps 1 and 4.
10. <b>RETRIAL:</b> Signal a retrial by keying * for more than one second. Is the call disconnected and is dial tone heard after about 5 seconds of silence?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
11. <b>DISCONNECT:</b> With the M-106 accessed and the outgoing line seized, key # for 1 second. Do the incoming and outgoing LEDs go out?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
12. <b>FORCED DISCONNECT:</b> With the M-106 accessed and the outgoing line seized, go on-hook. Do the incoming and outgoing line LEDs go out immediately.	<input type="checkbox"/> YES	The Central Office does not provide a forced disconnect. Callers must use # to shut the M-106 off before going on-hook. If possible, order a ground start line, which will provide and forced disconnect signal.
13. <b>SWITCHHOOK FLASH:</b> If the optional simulated switchhook flash feature is not implemented, go on to Test 12. If implemented, place another call through the M-106. Then attempt to transfer the call by keying * for less than one second. Is the transfer successful?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
<b>Note:</b> Tests 14 through 19 are for M-106 units with tone-to-pulse conversion implemented. If these tests don't apply to the unit under test, go on to Test 20.		
14. <b>TONE-TO-PULSE CONVERTER:</b> Key a retrial and then the number of a dial pulse-activated service. Does the OUTGOING LINE LED flash during outpulsing, and can the service be accessed?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
15. <b>KEYED CONVERTER SHUTDOWN:</b> If the optional keyed shutdown of the converter is not implemented, go on to Test 14. If implemented, key a retrial. Then key # for less than one second, followed by two or three high-value digits. Does the OUTGOING LINE LED remain steadily lit?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
16. <b>TIMED CONVERTER SHUTDOWN:</b> Key a retrial and then perform one of the following steps: If the timer is set by seizure of the outgoing line, note when the OUTGOING LINE LED relights. If the timer is set by the first digit (switch S1-5 ON), key a digit for which the corresponding section of S4 is set to OFF and note when the OUTGOING LINE LED ceases flashing. After 8 seconds or 16 seconds (depending on the setting of S1-3), key several high-value digits. Does the OUTGOING LINE LED remain steadily lit?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
17. <b>CONVERTER TIMER RESET:</b> Key a retrial. Just before the timer is scheduled to time out, key a digit for which the corresponding section of S4 is set to OFF. Wait a few seconds and then key another similar digit. Conduct the same test, substituting a retrial and then a switchhook flash for the first digit. Each time, does the OUTGOING LINE LED flash, indicating that the second digit is being outpulsed?	<input type="checkbox"/> YES	Suspect a defective M-106 card.

Table 5 Installation Tests (Sheet 3 of 3)

<b>18. FIRST-DIGIT CONVERTER SHUTDOWN:</b> If all sections of S4 are set to OFF, go on to Test 19. If not, for each section of S4 that is set to ON, key a retrial, then key the digit associated with that section and then several high-value digits. Does the OUTGOING LINE LED remain steadily lit each time the high-value digits are signaled?	<input type="checkbox"/> YES	Suspect a defective M-106 card
<b>19. EARLY LINE-SPLIT:</b> If the early line-split option is not implemented, go on to Test 20. If implemented, key a retrial and then (before the converter times out) the extension numbers of DTMF-sensitive equipment lying beyond the M-106. Is the equipment unaffected by the signaling?	<input type="checkbox"/> YES	Suspect a defective M-106 card.
<b>20. SEIZE FEATURE:</b> Do not perform this test until the call timer test has been completed. Reaccess the M-106 and enter the security code (if implemented). If the optional seize feature is not implemented, go on to Test 21. If implemented to enable a particular piece of equipment, is that equipment enabled? If implemented to supply ground to the M-106, place a call and set the power switch(es) OFF (local down). Does the green power ON LED remain lighted when the power is switched OFF?	<input type="checkbox"/> YES	Test the seize feature black jumper as instructed in Table 6 Step 2.
<b>21. AMPLIFIER:</b> (M-106-01 and M-106-02 only) Exercise the amplifier by placing a call through the M-106. Is the voice transmission satisfactory?	<input type="checkbox"/> YES	Adjust the gain of the amplifier as instructed in paragraph 4.10. Re-adjust the amplifier and retest. If the trouble persists, suspect a defective amplifier.



## 5. Troubleshooting Guide

**5.01 General:** The instructions contained in Table 6 are intended to help locate the source of trouble in an M-106 that has been operating normally in service. See also the installation testing procedures in Table 5. If either set of procedures indicates a failed M-106 card, contact Teltone Product Support.

**5.02 Required Equipment:** You will need the following equipment:

- An ohmmeter with needle probes
- A voltmeter with needle probes
- A telephone set (with a modular cord and plug).

**5.03 Additional Equipment:** Troubleshooting will be facilitated if the following equipment is also on hand:

- Spare modular cables for connecting J3 and J4 to their USOC jacks
- Spare leads for the power/auxiliary cable (AWG 22 solid) and a Berg HT-80 tool for removing leads from the cable plug
- A spare M-106 card (see paragraph 4.07)

**5.04** Figure 10 shows the wiring for the M-106 options.

Table 6 Troubleshooting Procedures (Sheet 1 of 2)

STEP 1: MODULAR CABLE TEST		
Remove the cables connecting J3 and J4 to the USOC jacks and then proceed as follows:  If spare cables are available, use them to reconnect J3 and J4 to their respective USOC jacks. Test the M-106 for normal operation. If the trouble persists, go on to Step 2.  If spare cables are not available, check the existing cables for evidence of shorting and use the ohmmeter to check the continuity of each lead. See Figure 9. Do all leads check out?	NO →	The trouble is in the cable(s). Replace and retest.
YES ↓		
STEP 2: POWER TEST		
Unplug the power/auxiliary cable from J2. Using the voltmeter, one by one check the plug positions for the polarity appropriate to the installation scheme. See Figures 8 and 10. Do all positions have the proper polarity?	NO →	The trouble is in the cable leads or at the terminal strip. Disconnect the leads from the terminal strip, check them for evidence of shorting, and check for continuity using an ohmmeter. Replace leads as necessary and retest. If the trouble persists, troubleshoot the terminal strip according to local practices. Retest.
YES ↓		
STEP 3: INCOMING LINE TEST		
Perform one of the following:  <b>If the incoming line jack* is RJ11C or RJ12C</b> , plug the telephone set into the jack and attempt to place a call via the central office.  <b>If the incoming line jack* is RJ31X or RJ33X</b> , go to a station and attempt to place a call via the central office.  Can a ringback tone, busy tone, answer tone, or dial tone be heard?  *The wall jack to which the M-106 is connected (not M-106 J3 jack).	NO →	The trouble is in the incoming line, or the USOC jack. Troubleshoot according to local practices. Retest. If the trouble persists, contact the telephone company and request service for the line and/or jack. Retest.
YES ↓		



Table 6 Troubleshooting Procedures (Sheet 2 of 2)

STEP 4: OUTGOING LINE TEST		
<p>Perform one of the following:</p> <p><b>If the outgoing line jack* is RJ11C or RJ12C</b>, plug the telephone set into the jack and attempt to access the equipment to which the M-106 is attached.</p> <p><b>If the outgoing line jack* is RJ33X or RJ34X</b>, go to a station and attempt a call using the M-106's outgoing line.</p> <p>Can a ringback tone, busy tone, answer tone, or dial tone be heard?</p> <p>*The wall jack to which the M-106 is connected (not M-106 J3 jack).</p>	NO →	<p>The trouble is in the USOC jack. Troubleshoot according to local practices. Retest. If the trouble persists, contact the telephone company and request service for the jack. Retest.</p>
YES ↓		
Suspect a failed M-106 card.		

## 6. MAINTENANCE, WARRANTY, AND REPAIR

**6.01** The M-106 requires no routine maintenance. Refer to Parts 4 and 5 for option changes and troubleshooting information.

**6.02 Removal from Service:** If trouble is detected, or to take the M-106 out of service for other reasons, remove the mating plugs from the two USOC wall jacks rather than from the M-106 jacks (J3 and J4). The shorting bars in the USOC jacks assure normal PBX/KTS operation when cables are disconnected from them.

**6.03 Warranty Information:** Teltone warrants this product to be free from defects in material and workmanship for a period of one year, given proper installation and usage. At its sole discretion, Teltone will repair or replace free of charge any unit found to be defective during the warranty period. Units found defective beyond the warranty period will be repaired or replaced at a flat rate.

**6.04 Return Procedures:** If a unit is found to be defective, contact Teltone Repair Order Entry at 1-800-426-3926 or (206) 487-1515 to obtain a Material Return Authorization (MRA) number. When returning units, provide the following information:

- Unit model number, part number, and serial number
- Teltone MRA number
- All fault information available
- Complete shipping and billing address
- Repair purchase order



## 7. SPECIFICATIONS

## ENVIRONMENTAL REQUIREMENTS

Temperature 0° to 55° C

Relative Humidity Up to 85% (non-condensing)

## POWER REQUIREMENTS

## Input Voltage

-48 VDC unit -44 to -56 VDC

-24 VDC unit -20 to -28 VDC

## Supply Current

idle  $\leq 160$  mA

in use  $\leq 240$  mA

External Fusing 500 mA fast blow (Customer-provided fuse. Alternatively, a UL-approved, filtered wall transformer may be installed. See paragraph 4.15.)

## OPERATIONAL CHARACTERISTICS

## Ringing Voltage Requirements

Voltage 40-150 VRMS

Frequency 16-66 Hz

Ring trip 280-518 ms after detection of ringing voltage

## Holding Coil

DC impedance 210  $\pm 30$  ohms, after ring trip

AC impedance 925  $\pm 75$  ohms (see Note 1)

Loop current required  $\geq 17$  mA

Release time 450  $\pm 50$  ms after loss of loop current

## Answer Tone (with Security Code implemented)

Start 2.4  $\pm 0.1$  sec after ring trip

Stop 4.0  $\pm 0.1$  sec after ring trip

Frequency 440  $\pm 5$  Hz

Level -30 to -10 dBm (field-adjustable)

## Security Code Timer (with Security Code implemented)

## Disconnect Time

incomplete code 19.2  $\pm 0.1$  sec after ring trip

incorrect code  $\leq 100$  ms after button-up of the third digit

Connect Time  $\leq 100$  ms after button-up of the third digit

## Call Timer Disconnection

5 min setting 5 min, 26  $\pm 2$  sec after ring trip

10 min setting 10 min, 33  $\pm 2$  sec after ring trip

15 min setting 15 min, 40  $\pm 2$  sec after ring trip

20 min setting 20 min, 47  $\pm 2$  sec after ring trip

No setting Indefinite call length

## Warning Tone

Start 17 sec before disconnection

Stop 15.4  $\pm 0.1$  sec before disconnection

Frequency 440  $\pm 5$  Hz (same as Answer Tone)

Level -30 to -10 dBm (same as Answer Tone)

## Speech Path Characteristics

Insertion Loss at 1500-3500 Hz,  $\leq 1$  dB  
(see Note 2)

at 350-1500 Hz,  $\leq 2$  dB

Gain (see Note 3) 0 to 15 dB  
(M-106-01/-02 only)

Direction control (M-106-01/-02 only)

automatic	Amplifies calling party signal until button-up of first DTMF digit, and when subsequent valid DTMF signals are present
manual	Amplifies calling party DTMF signals until # is received

### DTMF Input Signal Requirements

Signal level (per tone) -22 to +4 dBm, 0.06 to 1.2 VRMS

Signal duration  $\geq 40$  ms

DTMF interdigital time  $\geq 45$  ms

Twist -8 to +6 dB (see Note 4)

Tone frequency tolerance

must accept  $\pm(1.5\% + 2 \text{ Hz})$

must reject  $\pm(3.5\% + 2 \text{ Hz})$

Dial tone tolerance -12 dBm per tone, 0.2 VRMS

Signal-to-noise ratio 22 dB (see Note 5)

### DC Output Signaling Characteristics

Early line-split  $\leq 16$  ms after reception of tone

Outpulse rate  $10 \pm 0.5$  pps

Outpulse ratio  $60 \pm 2\%$  break

Outpulse interdigital time  $735 \pm 25$  ms

Talk path restoral time 40 ms following last break of last digit outpulsed

Memory capacity 20 digits (recirculating)

## REGULATORY SPECIFICATIONS

Meets requirements of FCC Part 68, Part 15 Class A, UL 1459, and CSA.

## NOTES

1. Before entry of the Security Code (if implemented) and with the outgoing line split.

2. Measured across a resistive load of 910 ohms in series with a  $2.2 \mu\text{F}$  capacitor.

3. The gain setting of the optional VF amplifier may be adjusted from 0 to 15 dB in 1 dB steps. As the output signal level approaches -9 dBm, or 0 dBm when direction control is invoked, the amplifier gain is reduced to 0 dB.

4. Level of the high frequency component relative to the low frequency component.

5. Maximum noise level not to exceed -35 dBm.



## 8. ORDERING

Table 7 Ordering Information	
Ordering Number	Description
M-106-01	Remote Service Access Unit, -48 VDC with voice amplifier. Typically designed for use with PBX installations. Power/auxiliary cable included.
M-106-02	Remote Service Access Unit, -24 VDC with voice amplifier. Typically designed for use with key systems installations. Power/auxiliary cable included.
M-106-05	Remote Service Access Unit, -48 VDC; same as M-106-01 but without voice amplifier.
M-106-06	Remote Service Access Unit, -24 VDC; same as M-106-02 but without voice amplifier.
Modular cables (2 required)	
740-00053-03	8-position to 8-position modular 7-foot cable for connection between J3 and/or J4 and USOC wall jacks RJ31C
740-00053-04	8-position to 8-position modular 25-foot cable for connection between J3 and/or J4 and USOC wall jacks RJ31C
740-00053-06	6-position to 8-position modular 7-foot cable for connection between J3 and/or J4 and USOC wall jacks RJ11C or RJ21C.
740-00053-07	6-position to 8-position modular 25-foot cable for connection between J3 and/or J4 and USOC wall jacks RJ11C or RJ21C.
Spares	
M-106-03	Voice amplifier
M-106-SP48	M-106 circuit card, maintenance spare for -48 VDC units M-106-01 or -05.
M-106-SP24	M-106 circuit card, maintenance spare for -24 VDC units M-106-02 or -06.
208-00058-01	Power/auxiliary cable: 20-position keyed plug and 7-foot cable for connection between J2 and the PBX/KTS terminal strip.
M-106-04	User instruction cards
106-121UL	Technical practice

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Any suggestions you can offer to improve the usefulness and accuracy of this practice for your application will be appreciated and duly considered.

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COMMENTS \_\_\_\_\_

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☐ Please have a representative call.

☐ Please send information on other Teltone products: \_\_\_\_\_

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POSITION			MAKE AND MODEL OF INTERFACING EQUIPMENT
COMPANY			
ADDRESS			
CITY	STATE	ZIP CODE	REFERENCE DRAWING OF INTERFACING EQUIPMENT
TELEPHONE		EXT	

How do you use this practice?

- ☐ Product familiarization  
☐ Installation  
☐ Training  
☐ Maintenance  
☐ Other \_\_\_\_\_

Do you find this practice suitable for your needs?  
☐ Yes ☐ No

Please check any specific criticism(s), give page number(s), and explain below.

- ☐ Clarification needed, page(s) \_\_\_\_\_  
☐ Additional information needed, page(s) \_\_\_\_\_  
☐ Information not required, page(s) \_\_\_\_\_  
☐ Error(s), page(s) \_\_\_\_\_