

# M-168 TONE CONVERTER Installer's Aid



**168-201**  
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This Installer's Aid provides step-by-step instructions for the installation and testing of a TELTONE® M-168-02\* or M-168-03\* Tone Converter. Perform each applicable step in sequence, checking it off before proceeding to the next applicable step. Refer to TELTONE Technical Practice 168-100 or 168-130 if additional information is required.

**Note:** If several M-168's are to be installed at once, installing and testing them one at a time helps guard against repeated mistakes.

## Pre-Installation Checks

**Important:** Contact the Engineering Department of the operating company if Steps 1 through 5 cannot be performed using office records or standard test equipment.

- ☐ **1.** Assure that the battery supply is between -43 and -56 VDC.
- ☐ **2.** Assure that the equipment to be converted operates properly for rotary dial calls.
- ☐ **3.** Assure that the equipment to be converted returns either Precise Dial Tone (350 Hz plus 440 Hz) or a standard dial tone.
- ☐ **4.** Assure that the equipment to be converted does not incorporate Wink Start or Stop Dial features.
- ☐ **5. M-168-03 Only:** Measure the level of MF feedback encountered by the converted equipment. If the level is within the M-168's specified KP accept range (0.0245 to 0.245 VRMS), the KP option switch must be set as described in Step 7.

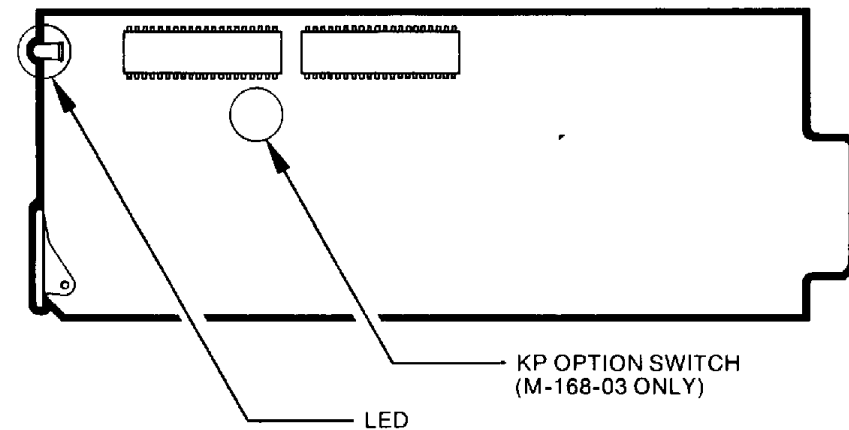
## Preliminary Procedures

**Important:** Perform Steps 6 through 8 for all the cards associated with a particular card file. Handle the cards by the edges or by the white plastic card extractors to minimize the possibility of damage caused by static electricity discharged from the body of the installer. When all cards have been set safely aside, inspect and mount the card file as described in Steps 9 and 10.

- ☐ **6.** Remove the cards, one by one, from the card file. Assure that no card has been damaged in shipping and that the ordering number stamped on the circuit side of each card agrees with the invoice and packing list.
- ☐ **7. M-168-03 Only:** Set the KP option switch as required by the application. See Figure 1. The M-168 KP Detector is enabled upon reception of the digit corresponding to the setting of the switch. (For example, if the switch is set to 7, reception of the seventh digit will enable the Detector.) The Detector will not respond to a KP signal if the switch is set to OFF, if the KP signal is received prior to the programmed digit, if the signal is too low, or if an \* or # is received after the programmed digit (see TELTONE Technical Practice 168-130).

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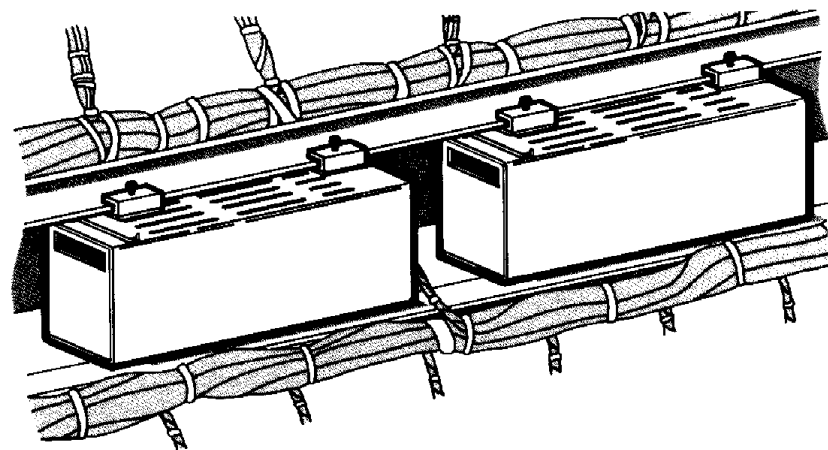


**Figure 1 M-168 Circuit Card**

- ☐ **8.** Examine the card contacts for cleanliness. Any foreign substances should be carefully removed using alcohol on a clean cloth. Set the clean cards aside in a clean, safe location. Do not return them to the card file until Step 22.
- ☐ **9.** Examine the card file and any associated items to assure that they are undamaged and correct for the application.
- ☐ **10.** Mount the card file as follows:

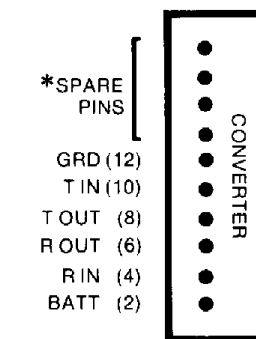
**CF-168-31:** Select a site for the card file on the Linefinder frame (usually behind the switches and just above the cable trough). See Figure 2. If more than one card file is to be mounted on a particular frame, mount, wire, and test the card files one at a time. Begin at the left of the frame (when viewed from the back) and leave a four-inch space between files to facilitate the use of wire wrap tools. If special mounting adapters have been ordered (see TELTONE Technical Practice 168-100 or 168-130), install those adapters at this time. Then mount the card file by tightening the screw clamps with a screwdriver or a relay wrench (W.E. Co. 417A or the equivalent).

**CF-168-12 or -22:** Select a site for the card file on the relay rack. If more than three files are to be mounted on a particular rack, leave one or two mounting plate spaces between them for



**Figure 2 CF-168-31 Card Files Mounted Behind a Linefinder Bank**

**VIEW FROM WIRING SIDE**



**\* DO NOT USE SPARE PINS AS TIE POINTS**

**Figure 3 Card Connector Pins**

proper ventilation. If special adapters are required for mounting a 23-inch file on a 27-inch rack (see TELTONE Technical Practice 168-100 or 168-130), install those adapters at this time. Then mount the card file, with the cable ports on the bottom, by securing it to the front of the rack with the four screws provided.

### Power Connections

- ☐ **11.** Remove the fuse through which power will be supplied to the M-168. If this is the same fuse through which power is supplied to the equipment to be converted, busy out the equipment before removing the fuse.
- ☐ **12.** Using Figure 3 as a guide, make battery and ground connections as follows:

**CF-168-31:** Connect a 22-gauge solid wire from the battery pin (Pin 2) of the card connector to the protected side of the empty fuseholder. Connect a similar wire from the ground pin (Pin 12) of the card connector to power supply ground. These two wires should be a twisted pair.

**CF-168-12 or -22:** These card files have both their battery pins (Pin 2's) and their ground pins (Pin 12's) wired together in groups of five. Connect the battery wires to the protected side of the empty fuseholders. Connect the ground wires to power supply ground.

- ☐ **13.** Install the power fuse as follows:
  - Individually wired cards require a 1/3-ampere fuse.
  - Groups of five cards require a 1-1/3 ampere fuse.
- ☐ **14.** Using a voltmeter, test the polarity of card connector Pin 2 and Pin 12. Assure that Pin 2 is 43 to 56 volts more negative than Pin 12.
- ☐ **15.** Remove the power fuse. Do not reinstall until Step 22.

### Tip and Ring Connections

**Important:** The M-168 is usually wired by one of the two methods described in Step 17. For CF-168-31, use the Linefinder Wiring Method.

For CF-168-12 or -22, use either the Linefinder Wiring Method or the Intermediate Distribution Frame (IDF) Wiring Method. Because the polarity of the Tip and Ring connections is critical to the operation of the M-168, these steps should be performed with particular care.

- **16.** Prepare the M-168 Tip and Ring leads as follows:

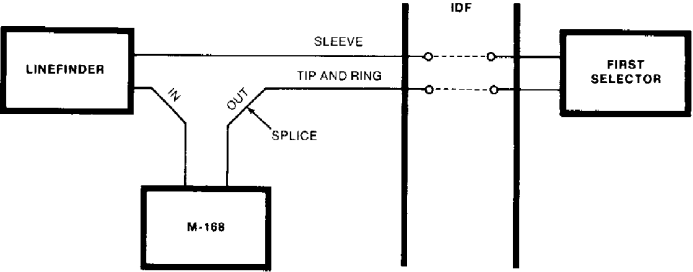
**Linefinder Wiring Method:** Connect a 24-gauge solid wire to card connector Pin 10 (Tip IN). Connect a similar wire to card connector Pin 4 (Ring IN).

**IDF Wiring Method:** Connect a 24-gauge solid wire to card connector Pin 10 (Tip IN). Connect similar wires to card connector Pin 4 (Ring IN), Pin 8 (Tip OUT), and Pin 6 (Ring OUT).

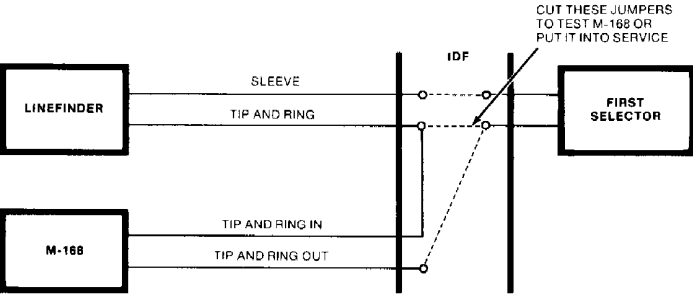
- **17.** Make Tip and Ring connections as follows:

**Linefinder Wiring Method** (see Figure 4):

- (1) Busy out the equipment to be converted.
- (2) At the Linefinder jack, disconnect the Tip and Ring leads going to the First Selector. Route these leads to the M-168, splicing additional lengths of 24-gauge solid wire if required. Connect the Tip lead to card connector Pin 8 (Tip OUT). Connect the Ring lead to card connector Pin 6 (Ring OUT).
- (3) Route the two leads, connected in Step 16, to the Linefinder jack. Connect Tip IN (from card connector Pin 10) to the terminal from which the Tip lead to the First Selector was



**Figure 4** Linefinder Wiring Installation Method



**Figure 5** IDF Wiring Installation Method

just disconnected. Connect Ring IN (from card connector Pin 4) to the terminal from which the Ring lead to the First Selector was just disconnected.

**IDF Wiring Method** (see Figure 5): Route the four leads, connected in Step 16, to the IDF and proceed as follows:

- (1) Connect the Tip IN lead (from card connector Pin 10) directly to the Linefinder Tip terminal on the IDF.
- (2) Connect the Ring IN lead (from card connector Pin 4) directly to the Linefinder Ring terminal on the IDF.
- (3) Connect the Tip OUT lead (from card connector Pin 8) to an unused terminal on the IDF and then add a jumper of 24-gauge solid wire from this terminal to the First Selector Tip terminal (on the opposite side of the IDF).
- (4) Connect the Ring OUT lead (from card connector Pin 6) to an unused terminal on the IDF and then add a jumper of 24-gauge solid wire from this terminal to the First Selector Ring terminal (on the opposite side of the IDF).
- (5) If Step 19 does not apply, busy out the converted equipment and cut the original Tip and Ring jumpers between the Linefinder side of the IDF and the First Selector side of the IDF.

- **18.** Use a voltmeter to assure that the ground reference of card connector Pins 6 (Ring OUT) and 8 (Tip OUT) is correct. When no test phone is off-hook, Pin 6 should be 43 to 56 volts more negative than Pin 12 (ground) and Pin 8 should be at equal potential to Pin 12 (ground).
- **19.** If it is necessary temporarily to interrupt installation and testing of the M-168, rotary dial service can be restored by providing a parallel connection between the Linefinder and the First Selector, as follows:

**Linefinder Wiring Method:** Add a short jumper of 24-gauge solid wire between card connector Pins 10 (Tip IN) and (Tip OUT). Add a similar jumper between card connector Pins 4 (Ring IN) and 6 (Ring OUT).

**IDF Wiring Method:** Leave uncut the original Tip and Ring jumpers from the Linefinder side of the IDF to the First Selector side of the IDF.

In either case, make a rotary dial test call to assure that there are no wiring errors which impair service. Install the power fuse and unbusy the converted equipment. Be sure to undo these special procedures before resuming installation and testing.

### Installation Tests

**Important:** The following tests require a rotary dial test telephone (Steps 20 and 21), a DTMF test telephone (Steps 22 through 29), and some means of connecting these phones at the Linefinder test jack. If the operation of the First Selector and other forward equipment cannot be easily monitored from the test jack site, use the circuit card LED (see Figure 1) as an indicator of the M-168's performance. The LED is steadily lighted when the M-168 is enabled, and steadily dark when the M-168 is idle; it blinks at 10 Hz when the M-168 is outputting, and at 20 Hz when the M-168 is released.

- **20. System Interface:** Assure that the M-168 is in series with the converted equipment by connecting a rotary dial test phone at

the Linefinder test jack. Go off-hook. Dial tone should not be connected. Go back on-hook.

**Note:** The connection of dial tone means that the M-168 is wired in parallel with the converted equipment. Check for a Tip or Ring jumper overlooked in undoing Step 19, and remove it if found. Retest.

- **21. Rotary Dial Transparency:** With the same care in handling required in Steps 6 through 8, assure that the M-168 circuit card contacts have remained clean. Then insert the card into the card file (components to the right), sliding it along its card guides until it catches securely in the card connector. Go off-hook with the test phone. Dial tone should be connected. Dial a test number. Dial tone should be cut off and the call should go through. Assure that the called party (or answer tone) can be heard. Go back on-hook and disconnect the rotary dial test phone.

**Warning:** Do not check this step until the above tests have been successfully performed. The failure of dial tone to be either connected or cut off indicates a wiring fault which will impair rotary dial service and possibly damage the M-168 if the power fuse is installed. See the troubleshooting procedures in Figure 6 and TELTONE Technical Practice 168-100 or 168-130.

- **22. DTMF Conversion:** Install the power fuse removed in Step 15. Connect a DTMF test phone at the Linefinder test jack and go off-hook. The M-168 LED should light, indicating detection of an off-hook condition. Signal a test number. The LED should blink once for each unit of digit value (nine times for a digit 9, eight times for a digit 8, etc.) and the call should go through. Go back on-hook.

**Note:** The inability of a DTMF digit to break dial tone usually indicates a nonstandard dial tone or a reversed Tip-Ring pair to or from the M-168. Check Tip IN and Ring IN by reversing the polarity of the test phone at the test jack and retesting. Check Tip OUT and Ring OUT as described in Step 18. The ability of a DTMF digit to break dial tone but not to complete a call usually indicates a reversed Tip-Ring pair in the forward equipment. If either fault persists, substitute a known-good M-168 card for the original card and retest. See also TELTONE Technical Practice 168-100 or 168-130.

- **23. Time-Out Release:** Go off-hook with the test phone. Wait 10 seconds and signal a digit. The LED should blink at 10 Hz, indicating that the digit is being outputted. Wait 20 seconds. The LED should begin blinking at 20 Hz (and continue blinking at 20 Hz, even if a digit is signaled), indicating that the M-168 has released. Go back on-hook.
- **24. On-Hook Inhibit:** Go off-hook with the test phone and signal several high-value digits. Go back on-hook when the LED begins blinking at 10 Hz. The LED should go dark before all of the digits have been outputted, indicating that the M-168 has reverted to the idle condition.
- **25. Dial Pulse Release:** Go off-hook with the test phone, wait three or four seconds, and then flash the switchhook to simulate a rotary dial pulse. Dial tone should be broken and the LED should blink at 20 Hz. Signal a digit. The LED should continue blinking at 20 Hz, indicating that the M-168 has released. Go back on-hook.
- **26. End of Dialing Release:** Go off-hook with the test phone and signal a digit. The LED should blink at 10 Hz. Then signal an \* followed by several digits. The LED should blink at 20 Hz,

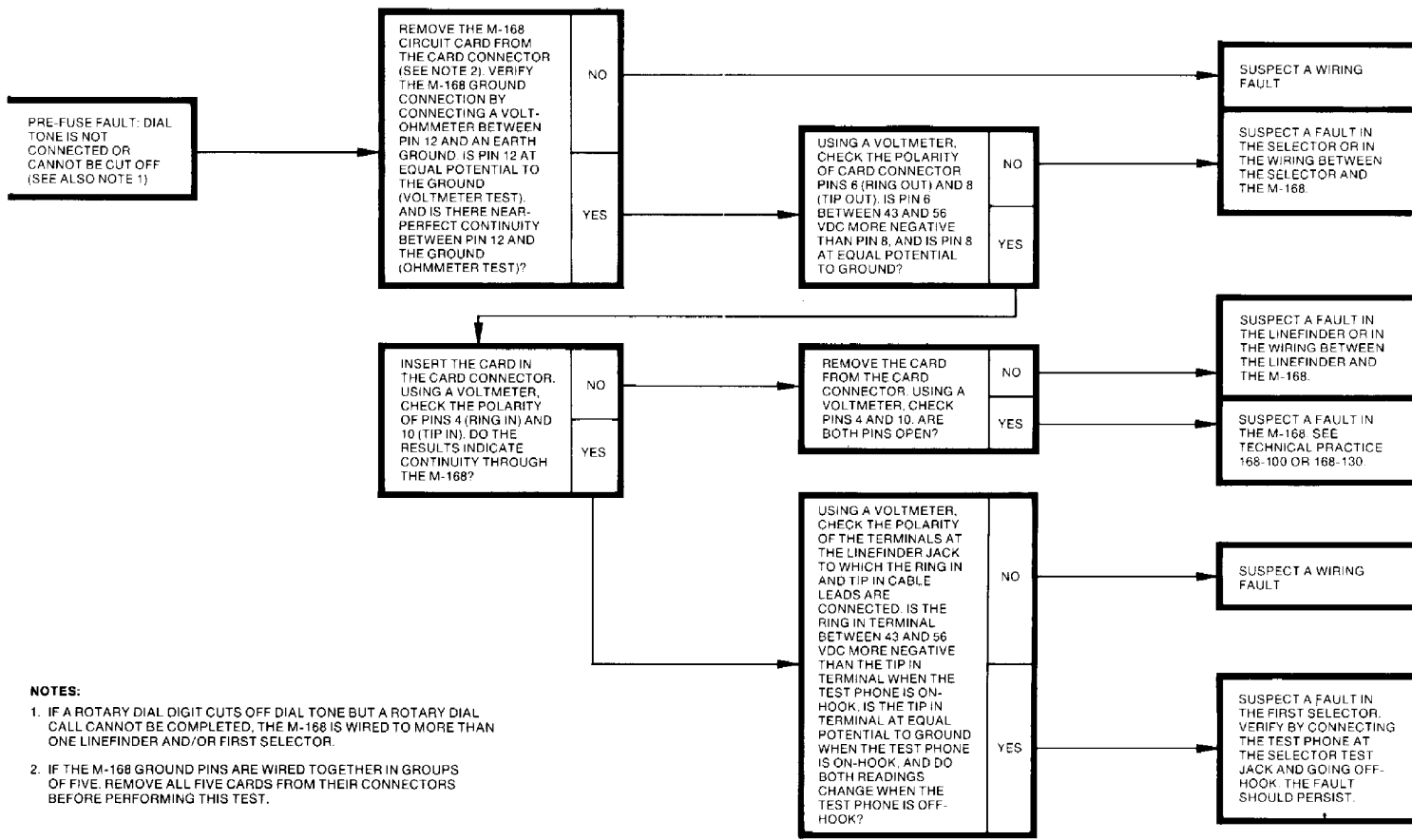


Figure 6 Troubleshooting Procedure

- indicating that the M-168 has released. Go on-hook and repeat the test, substituting a # for the\*. Go back on-hook.
27. **Answer Supervision Release:** Go off-hook with the test phone and signal a test number which will return Answer Supervision before the M-168 times out. When the called party answers, the LED should begin blinking at 20 Hz, indicating that Answer Supervision was returned and the M-168 has released. Go back on-hook.
28. **KP Release (M-168-03 Only):** Go off-hook with the test phone and place a call which will return MF feedback to the M-168. After outpulsing has ceased, the LED should light steadily and then begin blinking at 20 Hz, indicating that a KP signal has been detected and the M-168 has released. Go back on-hook.
29. **ANI Forwarding:** Test for an ANI indication at the forward equipment as described in the appropriate BSP or local

practice. The M-168 forwards an ANI indication only while the line is split — that is, during outpulsing and the interdigital times when one or more digits remain in memory.

Final Procedures

30. When all installation tests have been completed, disconnect the test phone from the Linefinder test jack.
31. Unbusy the converted equipment to put the M-168 into service.

For technical assistance on this product please call:

(206) 827-9626 (Kirkland, WA)  
Mountain and Pacific time zone customers

(404) 997-5617 (Atlanta, GA)  
Central and Eastern time zone customers