FLUKE networks™

D9912

SMART-PRO® OPERATIONS MANUAL

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NOTICE

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1.   GENERAL

1.01 This practice provides instructions for the installation, configuration, operation, and maintenance of the FLUKE NETWORKS D9912 Smart-Pro®.

1.02 The Smart-Pro® is a Central Office - located telephone line number identification and transmission test unit, providing two channels each of the following capabilities :

   a. Automatic number identification, with number transmission in patented DaVaR® compatible DTMF format, via C.O. switch **ANI trunk** interface (analog loop or E&M); **Call Trace** via C.O. switch V.24 maintenance port interface, or **CND** (Calling Number Delivery) service, both over a standard POTS dial-up interface.

   b. Voice number announcement using any of the three techniques listed above, in any of four user-selectable languages, switch configurable at any time.

   c. Automatic insertion of a stored, preset area code into the ANI number for both DTMF and voice response modes.

   d. Transmission testing on the calling line, whether through the trunk *or* POTS line interface; including Milliwatt, Quiet Termination; 3 tone, 10 tone, configurable N-tone, and 100 Hz sweeps; SmartTone™ composite tone burst; and Callback function, to enable a *single craftsperson* to perform DaVaR® loss & noise, or C9925 loss, gain-slope, noise, Loop Analysis, and Caller I.D. testing on subscriber loops from the field.

   e. Primary security via coded dialed-number steering, with additional Voice Number Announcement security provided with optional 1 to 7 digit password entry feature.

   f. Voice number announcement steerable to MDF speaker amplifier, vs. calling line.

   g. Rear panel switches allow ANI Trunk circuit type and voice language selection. Password, ANI mode, and protocol configuration are available via local terminal connection to V.24 serial port of either channel.

1.03 **ANI Trunk Mode Number Identification** - In a typical number verification application where the local exchange switch is equipped with an analog ANI trunk (ref. Fig. 1), either a DaVaR® field controller or craftsperson using a manual instrument dials a 3 to 7 digit telephone number previously programmed in the switch to be routed to the ANI trunk. The Smart-Pro®, connected to this trunk circuit, receives the called and calling line telephone numbers from the switch in multifrequency (MF) coded format. If number identification was requested, the Smart-Pro® sends an asterisk (*) DTMF tone through the switch connection to the calling party. If a DaVaR® field controller made the request, it will automatically respond to this DTMF tone with a corresponding DTMF " # " tone, causing the Smart-Pro® to send the calling number information in DTMF coded format, recognizable by the controller.   If the request was initiated by a craftsperson, no automatic " # " tone response will be received by the Smart-Pro®, and the calling number will be returned as a voice announcement.

1.04 **V.24 Call Trace Mode Number Identification** - In a number verification application where an analog ANI trunk is not available on a digital switch, the calling number may be identified by using the "call trace" feature available at a serial maintenance port of the switch (Fig.1). In this case the calling party will dial the telephone number of a *standard* POTS line connected to the Smart-Pro®, which will in turn query the switch over a V.24 serial link for calling number information. When the Smart-Pro® receives the number, it will (as in 1.03) perform the patented DTMF tone "handshake" operation to determine the type of response desired.

1.05 **CND Mode Number Identification** - Number verification may be performed by a third technique in applications where the switch is equipped with Calling Number Delivery (CND, or Caller I.D.) service (also requiring a POTS line connection to the Smart-Pro®, Fig.1, but classed for CND service). In this application, the calling party dials the telephone number assigned to the Smart-Pro® as in the previous case, but the unit (having been configured at installation for CND operation) receives calling number information *directly* from the switch over the POTS line, and proceeds with the DTMF "handshake" sequence as before.

FIGURE 1. - SMART- PRO™ SYSTEM APPLICATIONS DIAGRAM
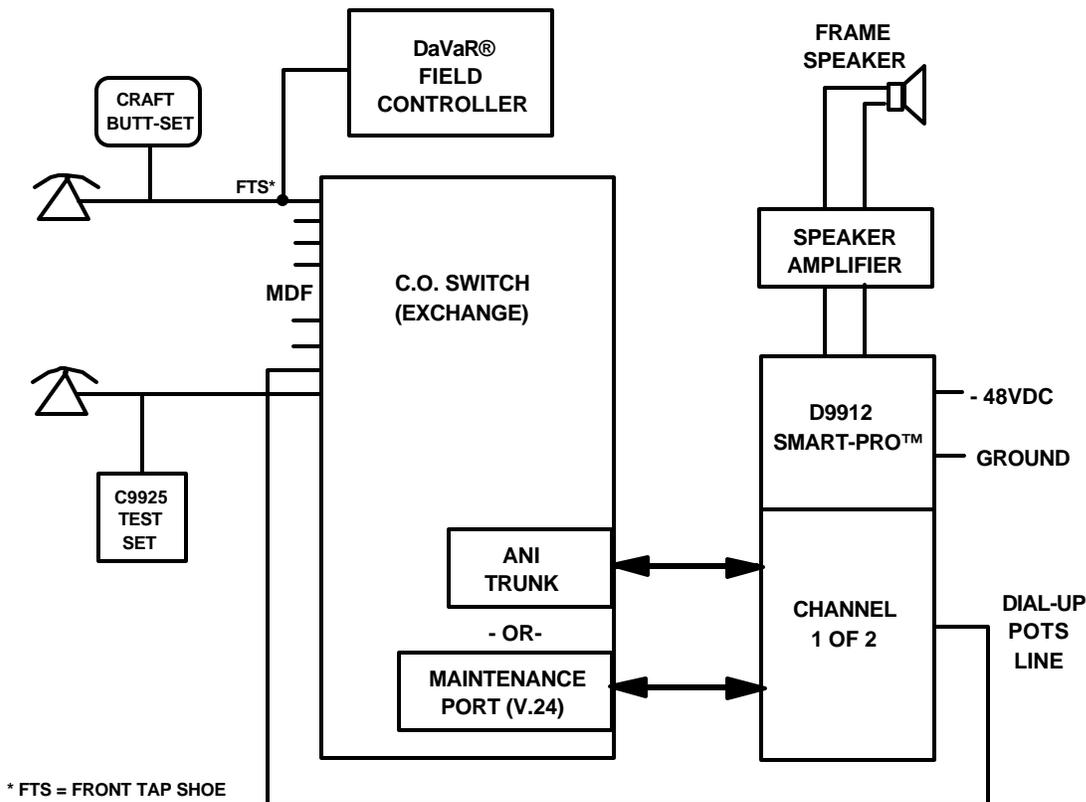
1.06 **Voice ANI Security** - A primary level of security is inherent in obtaining voice number identification, in that a unique telephone number is assigned to the ANI function itself. However, the Smart-Pro® may be configured at installation to provide an additional level of security, by requiring the craftsperson to enter a 1 to 7 digit DTMF password, followed by the "#" key, prior to receiving the calling number voice announcement.

1.07 **Transmission Testing Applications** - Smart-Pro® Transmission Test functions are accessible by a variety of dialing options for each type of C.O. configuration, and are defined in the following paragraphs. When accessed via Smart-Pro® ANI Trunk connection, test tones are sent through the *trunk-to-line* switch connection to the requesting line. When accessed via Smart-Pro® POTS line connection, test tones are sent through the *line-to-line* switch connection to the requesting line. In either case, test tones will be voiceband-limited, 900 Ohm impedance signals, with output levels adjusted (during installation, ref. 3.07) to compensate for switching losses.

The following transmission tests are available :

1. <u>Milliwatt Tone</u> - This is a 1004 Hz, 0 dBm continuous tone, that is transmitted for a settable time (20 seconds default) with POTS line configurations, or until the caller releases the line by hanging up (with ANI Trunk configurations).
2. <u>Quiet Termination</u> - This is a 900 Ohm termination applied to the POTS interface (when configured as such) for a settable time (20 seconds default), or a 600 Ohm termination applied the ANI Trunk interface until release.
3. <u>3 Tone Sequence</u> - This is a progressive sequence of 0 dBm tones (followed by Quiet Termination) applied to the line or trunk interface, for the purpose of far-end 3-Tone Slope and noise measurements. The sequence consists of 404 Hz (6 seconds, default); 1004 Hz (4 seconds, default); 2804 Hz (4 seconds, default); and QT (20 seconds, default) for POTS configurations, or until release for trunk configurations. Frequencies and duration times are settable, with defaults listed.
4. <u>10 Tone Sequence</u> - This is the same as the 3 Tone Sequence, but provides tones at 404, 804, 1004, 1204, 1404, 1604, 1804, 2004, 2804, and 3004 Hz, to more thoroughly diagnose line transmission problems. Frequencies and duration times are again settable, with defaults of 6 seconds for the first tone, 4 seconds for subsequent tones, and 20 seconds for QT.
5. <u>100 Hz Sweep</u> - This is a multiple frequency sweep of 0 dBm tones with settable duration, starting at 304 Hz and having a settable end frequency of up to 3604 Hz (34 tones total). The default setting provides 30 tones, at 2 seconds per tone, with an end frequency of 3204 Hz, followed by 20 seconds of QT. This sweep allows for even more rigorous testing, helpful for gauging analog modem performance.
6. <u>SmartTone™ Burst</u> - This is a composite signal consisting of 100 simultaneous tones of equal amplitude from 300 to 3400 Hz, applied to the interface for 10 seconds (default), and followed by QT for 20 seconds (default) or until release.
7. <u>Callback</u> - This function allows the calling party to be called back by the Smart-Pro® after a 2 second delay, giving the caller time to hang up after entering the command. The Smart-Pro® automatically determines the calling number via the configured ANI method, hangs up, waits 2 seconds, and dials the callback number. Once the call is answered, the Smart-Pro® is available to send tones or apply terminations on command. This feature is extremely useful in allowing the calling device to capture Caller I.D. information on the calling line.
8. <u>Keypad Test</u> - This function allows the calling party to perform a DTMF keypad test. Following an acknowledge voice message / tone, the caller has ten seconds to press as many as sixteen keys on the telephone keypad. At the end of the ten second period, the Smart-Pro® will announce the keys pressed (in the same order as received) followed by another acknowledge voice message / tone, signifying that more keys can then be tested or re-tested. If no further keys are pressed within the allotted time, the function is terminated.
9. <u>N -Tone Sequence</u> – This function provides the flexibility of a configurable length sequence of 0 dBm tones (from 1 to 34 tones), each having a configurable frequency (from 304 to 3604 Hz). The factory default setting provides 4 tones (404, 804, 1004, and 2804 Hz), followed by 20 seconds of QT.

1.08   **Operational Modes** - Each Smart-Pro® channel can be configured to operate in any one of *four basic modes* :

1. Perform ANI **only**.
2. Perform Transmission Tests **only**.* (The test function can be either predefined or DTMF digit selectable after the Smart-Pro® "acknowledge" tone, depending on configuration).
3. Perform ANI **followed by** a Transmission Test.* (Again, the test function can be either predefined or DTMF digit selectable after the ANI number transmission, depending on configuration).
4. Perform ANI **or** a Transmission test, as determined by the *last 4 digits* or *last digit* of the dialed access number, specified during configuration.*
 (This "dialed number steering" option is available **only** in ANI Trunk mode installations, where the switch is able to route the call to the Smart-Pro®-connected trunk based on the *first 3* dialed digits; the Smart-Pro® then decoding the *last 4 digits* [or *last digit*, absorbing intermediate digits if present] to provide the required function).

* If the selected Transmission Test function is "Callback", these configuration options allow *additional* transmission tests to be DTMF selectable after the callback call is established.

1.09   **MDF Speaker Operation** - The number identification voice announcement may be configured at installation to be routed to the MDF Speaker amplifier, instead of the calling line, for *either* (but not both) of the Smart-Pro® channels.

1.10   **Dual Channel Operation** - Each Smart-Pro® channel is virtually independent, with individual configuration parameters set up via rear panel switches and a local terminal connected to *either* V.24 serial port. One channel may be configured to operate with an ANI trunk on one switch, for example, with the other channel operating in the CND mode on a different switch. Each channel, however, can operate in only one of the *3 basic number verification modes* (**ANI trunk**, **V.24 Call Trace**, or **CND**). The only connections common to both channels are for power and MDF speaker amplifier (reference Figure 3, "COMMON" terminal block).

1.11   **Configuration** - Two types of configuration are required to install the Smart-Pro® in a particular office:

1.   <u>Rear panel switches</u> - SW1- SW8 provide a quick means of configuring *major installation parameters* such as ANI trunk type, signaling method, switching system type, and voice announcement language for each channel.

2. <u>V.24 Serial Port</u> - Either channel's V.24 serial port (when enabled by SW8 on the corresponding channel switch) may be accessed via local terminal or PC serial communications port to configure the following parameters :

    a. Number identification mode
    b. ANI signaling protocol (if R2MFC)
    c. ANI & Transmission Test number assignment
    d. Voice announcement password assignment
    e. Switching loss compensation values
    f. MDF speaker routing

1.12 **Smart-Pro® Variations** - The Smart-Pro® may be factory ordered to support either of two *basic* ANI applications, as well as custom ordered for optional language sets :

1. <u>Model # D9912-01</u> (FLUKE NETWORKS P/N 401-0097-0001) supports "R1MF" signaling for domestic ANI Trunk applications, using the standard language set (English, Spanish, & French) for voice ANI announcement.
2. <u>Model # D9912-02</u> (FLUKE NETWORKS P/N 401-0097-0002)) supports "R2MFC" signaling for international ANI Trunk applications, using the standard language set plus Portuguese for voice ANI announcement.
3. Custom language sets can be made available on special order. Consult FLUKE NETWORKS Customer Service at 1-800-866-8200 for ordering information and availibility.

2.   PHYSICAL DESCRIPTION

2.01 The Smart-Pro® consists of a single printed circuit board assembly (PCBA) housed in a metal chassis, designed to be mounted in a standard relay rack configuration. The unit is equipped with two sets of different-sized mounting brackets, allowing ease of installation in various rack sizes.

2.02 The Smart-Pro® is one standard rackspace high, 1.75 inches (4.5 cm); 16 inches wide (40.6 cm); and 12 inches deep (30.5 cm).

2.03 Front panel components (reference Figure 2.) consist of fuse alarm, power, and channel status indicators; and office battery fuse.

FIGURE 2. - FRONT PANEL COMPONENTS
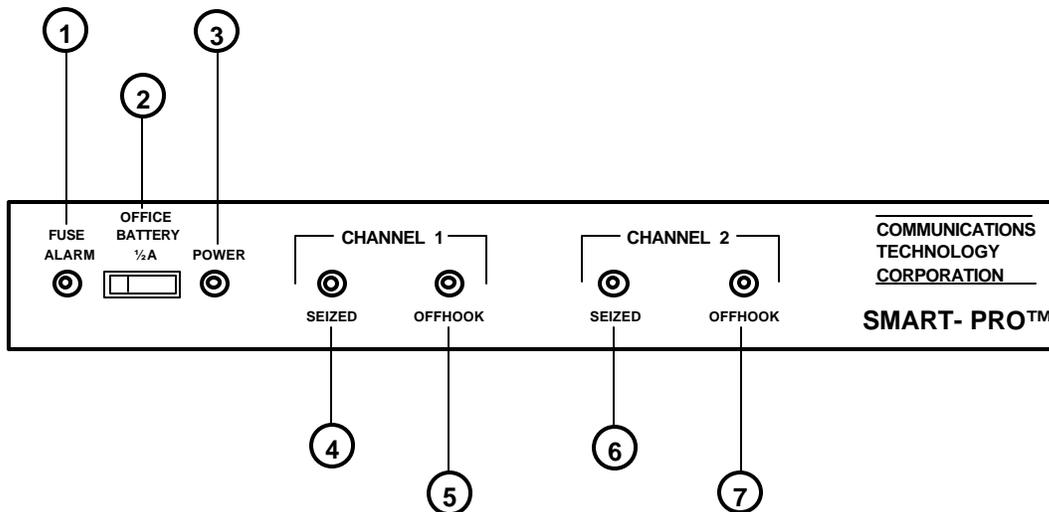
TABLE 1 - FRONT PANEL COMPONENT DESCRIPTION

ITEM	NOMENCLATURE	DESCRIPTION
1	FUSE ALARM	Red LED, when on indicating blown ½A fuse.
2	OFFICE BATTERY - ½A	½Amp fuse protecting battery wiring.
3	POWER	Green LED, when on indicating office battery present, & Smart-Pro® power supply is functional
4 (6)	SEIZED - CHANNEL 1 (2)	Green LED, when on indicating seizure of Smart-Pro™ due to incoming call on trunk or line.
5 (7)	OFFHOOK - CHANNEL 1 (2)	Green LED, when on indicating Smart-Pro® answer supervision in response to seizure.

2.04 Smart-Pro® rear panel components (reference Figure 3) consist of a COMMON terminal block plus speaker volume control; and two CHANNEL terminal blocks, V.24 serial ports, and configuration switches.

FIGURE 3 - REAR PANEL COMPONENTS
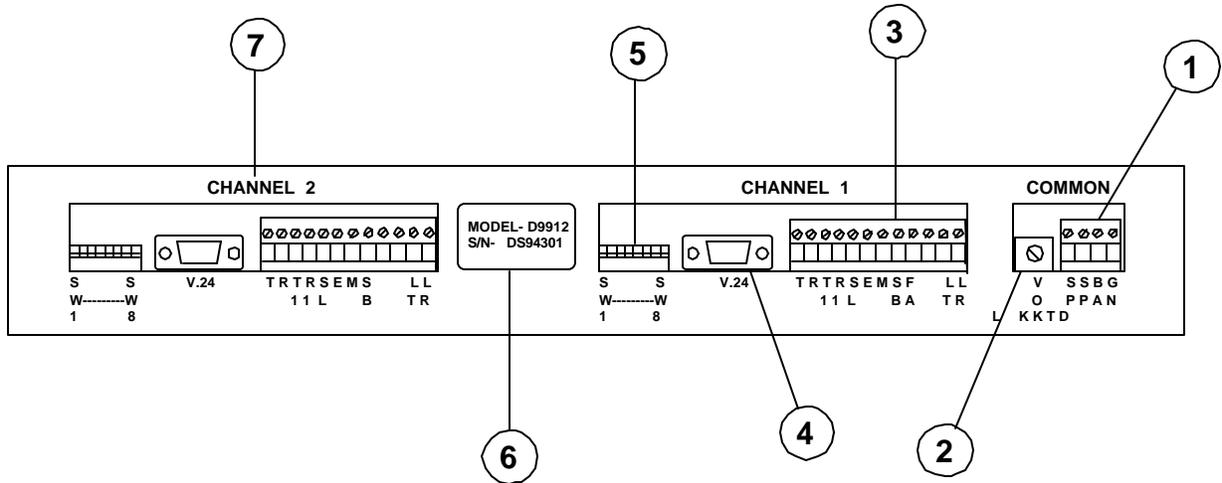
TABLE 2 - REAR PANEL COMPONENT DESCRIPTION

ITEM	NOMENCLATURE	DESCRIPTION
1	COMMON Term. Block	Frame Speaker, C.O. Battery, & Ground connections
2	COMMON VOL Control	Frame Speaker Volume Control
3	CHANNEL 1 Term. Block	ANI Trunk & POTS dial-up line connections
4	CH.1 V.24 Connector	Switch Maintenance Port serial DB-9 connector (ANI via call trace, or configuration via local terminal)
5	CH.1 SW1-SW8 Switch	Channel Configuration switch (See Table 5)
6	S/N Tag	Model & Serial Number information tag
7	CHANNEL 2 Interface	Same as Channel 1

3. INSTALLATION

3.01   Office Preparation - The Smart-Pro® requires the following for physical installation in the central office exchange (for intra-building use only) :

1. Single height rack mounting space (1.75 in., 4.5 cm) in a 19 inch (48.3 cm), 23 inch (58.4 cm), 25 inch (63.5 cm), or 27 inch (68.6 cm) relay rack.

2. A fused office battery circuit (nominally -48VDC; ref. Specifications, section 8., for voltage and current limits) and frame ground, using 24 AWG or larger wire.

3.02   ANI Trunk Assignment - If the ANI trunk number identification mode is selected, the switching system to which the Smart-Pro® is connected must be provisioned with a dedicated outgoing ANI trunk (per channel if both channels are configured the same) and associated call routing as follows :

1. Obtain assignment for one outgoing analog loop or E&M signaling-type trunk circuit for each required Smart-Pro® channel.

2. Establish a 3 to 7 digit routing code.

3. Configure the trunk to :

a. Expect 3 to 7 digits.

b. Expect called party supervision from the Smart-Pro® as an option (wink / reverse for R1MF; ref. section 4.2.2.1 Transmit Pattern for R2MFC).

3.03   V.24 Maintenance Port Assignment - If the Smart-Pro® is to provide number identification via call trace on a digital switch, a V.24 maintenance port per required channel must be assigned.

3.04   POTS Line Assignment - If number identification is to be provided with *either* the V.24 call trace *or* the CND option, a POTS line must be assigned for each required channel; *and* classed for CND service if CND Number Identification is desired.

3.05   Mounting - Remove the Smart-Pro® and associated hardware from the shipping container (reference Table 3), and install in the assigned rackspace using the mounting screws provided.

NOTE :   Install the proper combination of 19 & 23 inch mounting brackets to fit the rack being used. The two short and two long brackets may be used in combination to fit four different sizes of racks.

TABLE 3. - SHIPPED MATERIAL

FLUKE NETWORKS PART NO.	QTY.	DESCRIPTION
401-0097-00XY	1	D9912 Smart-Pro® Ass'y.: X = 0, standard language set X = 1, optional language set Y = 1, R1MF signaling Y = 2, R2MFC signaling
	2	19 inch (48.3 cm) rack mounting brackets
	2	23 inch (58.4 cm) rack mounting brackets
754-0002-0002	1	Shipping Kit, Fuses (2ea., ½A)
754-0001-0001	1	Shipping Kit, Screws (4 ea., 12-24 x 5/8)
D9422	1	Smart-Pro® Operations Manual

3.06 Wiring - Make the following connections to the Smart-Pro®, using local office exchange standard practices (Reference Figures 6 & 7, last section of manual) :

1. After removing both the office battery supply fuse and Smart-Pro® "OFFICE BATTERY" fuse, connect the battery supply and frame ground wires (24 AWG or larger) to the "BAT" and "GND" terminals on the rear panel of the Smart-Pro™.

2. Connect the "FA" (Fuse Alarm) terminal on the Smart-Pro® rear panel to the office alarm reporting system, if desired.

3. Cross-connect the assigned ANI trunks, V.24 maintenance ports, POTS lines, and Speaker Amplifier wires (as required) at the main distribution frame (MDF), route the cable to the rear of the Smart-Pro®, and connect per Table 4.

4. Re-install the office battery supply fuse, and ensure that the proper voltage (nominally -48VDC) is present between the Smart-Pro® "BAT" and "GND" terminals of the "COMMON" connector block.

5. Install the Smart-Pro® "OFFICE BATTERY" fuse.

6. Verify that the Smart-Pro® "FUSE ALARM" indicator is off, the "POWER" indicator is on, and all four "CHANNEL" status indicators flash for 4 to 5 seconds, then go off.

NOTE : If the above conditions are not present, refer to the TESTING & ACCEPTANCE FLOWCHART in FIGURE 4 for diagnostic procedures.

TABLE 4. - SMART-PRO® CONNECTIONS

SMART-PRO® SECTION	SIGNAL NAME	SIGNAL DESCRIPTION
COMMON Terminal Block	GND	Frame Ground
"	BAT	Office Battery, -48VDC (nominal, ref. sec. 8)
"	SPK	MDF Speaker Amplifier, Wire 1
"	SPK	MDF Speaker Amplifier, Wire 2
CHANNEL 1 (2) Terminal Block	T	ANI Trunk Tip
"	R	ANI Trunk Ring
"	T1	ANI Trunk Tip 1 (4W)
"	R1	ANI Trunk Ring 1 (4W)
"	SL	ANI Trunk Sleeve
"	E	ANI Trunk "E" Lead (2W/4W E&M)
"	M	ANI Trunk "M" Lead (2W/4W E&M)
"	SB	ANI Trunk Signal Battery Lead (E&M)
"	FA	Fuse Alarm Output (CH. 1 term. block only)
"	LT	POTS Line Tip
"	LR	POTS Line Ring
CH.1 (2) V.24 Serial Port - Pin 2	RCV	V.24 Receive Data Line (from Switch)
" Pin 3	XMIT	V.24 Transmit Data Line (to Switch)
" Pin 4	DTR	V.24 Data Terminal Ready Line (to Switch)
" Pin 5	GND	V.24 Signal Ground Line
" Pin 6	DSR	V.24 Data Set Ready Line (from Switch)
" Pin 7	RTS	V.24 Request To Send Line (to Switch)
" Pin 8	CTS	V.24 Clear To Send Line (from Switch)

NOTE : Smart-Pro® V.24 Serial Connectors are DB-9 female, representing DTE in normal usage mode as shown (V.24 Maintenance Port Control). When used in the local terminal configuration mode, Pins 2 & 3 are automatically internally reversed, representing DCE, & requiring a standard serial cable to configure. Terminal block connectors are screw-clamp type, allowing rapid connection of bared solid-conductor wires such as frame or jumper wire.

3.07   Switching Loss Measurement & Compensation - When using the Smart-Pro® to send

transmission test tones through the switch, it is necessary to compensate for *switching losses* to enable it to output a precision 0 dBm level at the calling party's line circuit. This compensation will be either *trunk-to-line* or *line-to-line*, depending on the type of Smart-Pro® installation.

A portable level measuring set (HP 4937A TIMS, or equivalent) and butt-set (or other telephone instrument) are required to make the switching loss measurements for either configuration.

1. **Trunk-to-Line Compensation** - This type of switching loss is encountered when using the Smart-Pro® in the Analog Trunk configuration for ANI and / or Transmission Test functions. To determine the amount of compensation required for this configuration, perform the following procedure :

   a. Locate a POTS line on the MDF that is either not connected to the outside plant, or has the heat coils removed.
   b. Using the butt-set to dial *through* the TIMS, using the TIMS 900 Ohm line termination / holding circuit, dial the Smart-Pro® access telephone number.
   c. After the ANI spill is heard, press "1" on the butt-set to receive the milliwatt signal from the Smart-Pro®.
   d. With the TIMS holding and terminating the line via its internal *precision holding circuit*, disconnect the butt-set (or switch it to "Monitor" mode), and measure the signal level on the TIMS. Since the Smart-Pro® sends 0 dBm in its default state, the measured value represents the switching loss, which must be entered as the Trunk Interface Switching Loss per section 4.2.2.3.

      Example: If TIMS level = -3.0 dBm, enter **3.0** dB as the Trunk I/F Switching Loss

2. **Line-to-Line Compensation** - This type of loss is encountered when using the Smart-Pro® with a POTS line, as for Call Trace or CND configurations. Perform the same procedure as in 1. above, but enter the measured value as the POTS Interface Switching Loss per section 4.2.2.4.

   If the Smart-Pro® is used in the Analog Trunk configuration as in 1., *but is attached as well to a POTS line for the Callback function*, perform the following procedure to set the Callback *line-to-line* loss :

   a. Perform steps 1a. and 1b., as above.
   b. After the ANI spill is heard, press "7" on the butt-set to request the Smart-Pro® Callback function, then hang up and wait for ringing.
   c. When ringing occurs, answer the call with the butt-set.
   d. After a short answer tone is heard, press "1" and measure the level as in 1d. above, but entering the loss value as the POTS Interface Switching Loss per section 4.2.2.4.

4.   CONFIGURATION

4.1   Rear Panel Switch Configuration - An 8 pole dip-switch for each channel allows the Smart-Pro™ to be quickly configured for ANI trunk circuit type, signaling method, switching system type, and voice number announcement language (reference Table 5). Each switch also allows its associated V.24 serial port to be used with a local terminal for further password, mode, and protocol configuration (reference section 4.2, Local Terminal Configuration).

TABLE 5. - CHANNEL SWITCH CONFIGURATION

CHANNEL 1 (2) OPTION	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SWITCH DOWN	SWITCH UP
No. Wires	X								2 Wire	4 Wire
Switch Type		X							Digital / XBAR	S X S
Signaling Type			X						Loop	E&M
ANI Type				X					(See below)	(See below)
ANI Type					X				(")	(")
Language						X			(")	(")
Language							X		(")	(")
V.24 Serial Port								X	Sw. Maint. Port	Local Config.

ANI Type Switch Settings :   Use Stored Setting   -   SW4 = down, SW5 = down
                              Analog Trunk ANI   -   "   = down,   "   = up
                              Caller ID ANI   -   "   = up   ,   "   = down
                              Call Trace ANI   -   "   = up   ,   "   = up
Language Switch Settings :   English Language   -   SW6 = down, SW7 = down
                              Spanish Language   -   "   = down,   "   = up
                              French Language   -   "   = up   ,   "   = down
                              Portuguese Lang.*   -   "   = up   ,   "   = up

    * Model # D9912-02 only

4.2   Local Terminal Configuration - In order to configure the Smart-Pro™ for specific options not covered by the rear panel switches, it is necessary to use a data terminal or PC with a standard RS-232 / V.24 port, running a serial communications program. To gain access to the Smart-Pro™ Configuration menu, perform the following steps :

    1. Connect the data terminal to the "V.24" connector of either channel, using a standard serial cable.

    2. Set SW8 of the selected channel to the "up" position.

3. Configure the data terminal as follows :

    a. 1200 BAUD
    b. 8 data bits
    c. No parity
    d. Half-duplex

4. Type "CONFIG", then press "ENTER"; the terminal screen will display the following

Channel Selection Menu :

```
1 -  Configure Channel  # 1
2 -  Configure Channel  # 2

Selection :
```

5. Type "1" or "2", depending on which channel is to be configured, then press
   "ENTER". The screen will display a brief description of the selected channel's
   current configuration, followed by the following Smart-Pro™ **Main Menu** :

```
1 - Configure ANI Parameters
2 - Configure Transmission Test Parameters
3 - Configure Steering Codes

Selection  :
```

6. Each branch of the menu tree will be explained in the following sections under
   Configuration, starting with the ANI Parameters selection. When configuration is
   completed, remove the data terminal serial connection, and set the corresponding
   SW8 switch to the "down" position. (This allows the V.24 port to be used as a
   switching system interface for call-trace ANI. If the port is not required for
   subsequent use, the data terminal may be left connected, but *its SW8 must be left
   in the "down" position for normal channel operation.)*

4.2.1 **Configure ANI Parameters** -

From the Smart-Pro™ Main Menu, type "1" to view or edit the ANI Parameters,
then press "Enter". The following **ANI Parameters Menu** will be displayed:

```
   1 - ANI Type                  (Analog Trunk, R1MF)
   2 - ANI Area Code             (OFF)
   3 - ANI Return                (7 Digits)
   4 - Voice ANI Security        (OFF)
   5 - Voice ANI Pause Format    (XXX-XXXX)
   6 - POTS DN for Call Trace    (2221111)
   7 - MDF Speaker Option        (OFF)
   8 - DTMF Transmit Level       (0.0 dBm)


   Selection  :
```

ANI Parameters are listed in the left-hand column, with corresponding current
settings in the right-hand column. The screens shown contain default settings, with
the "R1MF" ANI version shown in this example for Model # D9912-01; the default
for Model # D9912-02 is "R2MFC" (for international applications). Pressing "Enter"
again will return the program to the Smart-Pro™ Main Menu.

1. <u>ANI Type</u> - Selections of Analog Trunk, Call Trace ANI, CND ANI, or No ANI.
2. <u>ANI Area Code</u> - Selection of ON, OFF, and Edit ANI Area Code.
3. <u>ANI Return</u> - Selection of number of ANI digits to be returned to caller, 3 to 15.
4. <u>Voice ANI Security</u> - Selections of On, Off, and Edit Voice ANI Password.
5. <u>Voice ANI Pause Format</u> - Allows model entry: X's for digits, dashes for pauses.
6. <u>POTS DN for Call Trace</u> - Allows entry of POTS line directory number.
7. <u>MDF Speaker Option</u> - Allows routing of voice ANI to MDF speaker vs. line.
8. <u>DTMF Transmit Level</u> - Allows entry of desired DTMF level : +1.5 to -6 dBm.

4.2.1.1 <u>ANI Type Configuration</u> -

From the above ANI Parameters Menu, type "1" and press "Enter" to select the ANI
Type. The following **ANI Type Menu** will be displayed :

```
    1 -  Analog Trunk With MF Signaling
    2 -  Call Trace Via Serial Port
    3 -  Caller ID  Via POTS Line
    4 -  No ANI

    Selection  :
```

From the ANI Type Menu, select the desired method (1,2,or 3) of performing the ANI function for the channel, or select option 4 to omit the ANI function :

1. Analog Trunk With MF Signaling - For domestic R1MF applications, this selection has no further sub-menu's, and will return to the ANI Parameters Menu (proceed to section 4.2.1.2). Reference Figures 8 and 9 (in last section of Manual) for R1MF ANI Timing Diagrams for specific digital & electromechanical switches. **For R2MFC applications, further configuration is required to specify Transmit and Receive digit patterns, as shown below.**

2. Call Trace Via Serial Port - This selection is followed by menu's which prompt the user through the entry of Switch type and standard V.24 serial port parameters, including Baud rate, # data bits, # stop bits, and parity. Following these entries, the ANI Parameters Menu will again be displayed (proceed to section 4.2.1.2).

3. Caller ID Via POTS Line - This selection requires specification of the type of Caller ID to be employed, in response to the following **Caller ID Type Menu** :

```
 1 - Type 1 :  Receive  FSK  Data  AFTER  1st Ring  (USA)
 2 - Type 2 :  Receive DTMF Data BEFORE 1st Ring  (EUROPE)
 3 - Type 3 :  Receive DTMF Data  AFTER  1st Ring  (COLOMBIA)
 4 - Type 4 :  Receive DTMF Data  AFTER rev batt  and BEFORE  1st Ring (FIJI)

 Selection   :
```

After type selection, pressing "Enter" will cause the program to return to the ANI Parameters Menu (proceed to section 4.2.1.2).

4. No ANI - This selection has no further sub-menu's, and will return to the ANI Parameters Menu. Since no ANI function is required, press "Enter" at the ANI Parameters Menu to return to the Main Menu for configuring Transmission Test Parameters (proceed directly to section 4.2.2).

R2MFC Application : Analog Trunk With MF Signaling - From the ANI Type menu, type "1" and press "Enter" to configure the R2MFC ANI trunk parameters for the Model D9912-02; and the following **R2MFC Pattern Menu** will be displayed :

```
 1 - Transmit Pattern            *+6*(1)13W5
 2 -  Receive Pattern            X( ) FXX
 3 -  Dial Pulsing                (NO)
 4 -  Transmit Delay Time        (50 MS)

 Selection   :
```

a. **Transmit Pattern** - The Transmit Pattern is the multi-frequency (MF) digit sequence that the Smart-Pro™ will *transmit to* the ANI trunk during a number identification session. In "compelled" signaling applications (R2MF<u>C</u>), the trunk circuit applies its transmit MF frequency pair until it is "compelled" to remove it by the simultaneous application of the Smart-Pro™ transmit MF pair. To change the R2 ANI trunk transmit pattern, type "1", press "Enter", type the new pattern desired, then press "Enter" when complete. The above screen will again be displayed, but with the new transmit pattern. The following is an explanation of the default pattern :

+6- The *...* pattern indicates a *modified* R2MFC format, in which the *Smart-Pro™ sends the first* MF digit in response to a seizure by the trunk; as opposed to a normal sequence, in which the trunk will send the first digit. The modified format may contain MF digits, line reversals (R), and wait states (W). The normal digit time duration is 150 milliseconds; a "+" preceding the digit indicates an extension of the time duration to 500 milliseconds, and the "6" is the first digit sent.

(1) - indicates the MF digit the Smart-Pro™ will send to request the next **calling** party digit. This "request ID" digit will be sent for *each digit* of the calling party number until all digits are received.

1 - indicates a digit required by the switch that the Smart-Pro™ sends after collecting all ID digits.

3 - indicates another digit required by the switch in some applications.

W - indicates that in this application an additional wait time of 250 milliseconds is required by the trunk before the Smart-Pro™ sends the final digit.

5 - is the final digit sent by the Smart-Pro™ to end the sequence.

In addition to the characters described above, the transmit pattern **could** *contain the following :*

1.) "**R**", indicating that *called party supervision* is required from the Smart-Pro™ before the trunk will send the next digit. The supervision will take the form of a line reversal if utilizing a Loop Trunk, or a grounded E-lead if using an E&M Trunk. In either case, the line will remain in this modified state until the next "R" is encountered in the Transmit Pattern, or the trunk is released.

2.) "**[1]**", indicating the MF digit that the Smart-Pro™ will send to request the next **called** party digit. This "Request ID" digit will be sent for each digit of the called party number until all digits are received.

b. **Receive Pattern** - The receive pattern is the MF digit sequence that the Smart-Pro™ will *receive from* the ANI trunk during a number identification session. From the R2MFC Pattern Menu, type "2" and press "Enter" to change the R2 ANI trunk receive pattern. After typing the desired receive pattern, press "Enter", and the **R2MFC Pattern Menu** will again be displayed with the new receive pattern. The following is an explanation of the default Receive Pattern :

```
 ┌─────────────────────────────────────────────────┐
 │                                                   │
 │   1 - Transmit Pattern          *+6*(1)13W5       │
 │   2 -  Receive Pattern           X( ) FXX         │
 │   3 -  Dial Pulsing               (NO)            │
 │   4 -  Transmit Delay Time        (50 MS)         │
 │                                                   │
 │    Selection   :                                  │
 │                                                   │
 └─────────────────────────────────────────────────┘
```

X -   The first "X" indicates an expected digit in response to the first Smart-Pro™ transmit digit ("6" in the above example), which must be acknowledged by the Smart-Pro™, but whose value is unimportant.

( ) -   The digits received at this point in the Receive Pattern sequence make up the *calling party* ID number.

F -   This digit represents a terminator digit, signifying that the complete ID number has been transmitted by the trunk.

X -   This digit is an expected digit of unimportant value, received in response to the last "1" digit in the transmit sequence.

X -   Another "don't care" digit, received in response to the transmitted "3" digit, and the final receive digit in this case.

In addition to the characters described above, the receive pattern could contain "**[ ]**", indicating the digits received at this point in the Receive Pattern sequence make up the *called party* ID number.

Reference Figures 10 and 11 (in last section of Manual) for examples of Normal and Modified R2MFC Transmit / Receive Pattern sequences.

c. **Dial Pulsing** - Normally the ANI sequence will not incorporate dial pulsing.

However, in some applications, the first ANI digit may be pulse-dialed by the trunk circuit. In these cases, the dialed digit may be normal (loop open during pulsing); or inverted (loop closed during pulsing). From the R2MFC Pattern Menu type "3" and press "Enter" to change the Dial Pulsing configuration; the screen will display the following menu :

```
 1 - Dial Pulsing OFF
 2 - Dial Pulsing Normal
 3 - Dial Pulsing Inverted

 Selection   :
```

Select the desired option & press "Enter" to return to the R2MFC Pattern Menu.

d. **Transmit Delay Time** - This is the delay which occurs *after* the Smart-Pro™ receives an MF digit from the trunk circuit, *before* it transmits an MF response digit. The normal delay is 50 milliseconds, but in some applications a longer delay is required. From the R2MFC Pattern Menu, type "4" and press "Enter" to change this parameter. The screen will display the following message :

```
 Enter the Transmit Delay Time  (1 to 5000 MS)   :
```

Enter the desired delay in milliseconds (1 second = 1000 milliseconds), then press "Enter" to complete the Analog Trunk ANI Type configuration.

Press "Enter" again to return to the **ANI Parameters Menu**, for ANI Return configuration :

```
 1 - ANI Type                      (Analog Trunk, R1MF)
 2 - ANI Area Code              (OFF)
 3 - ANI Return                   (7 Digits)
 4 - Voice ANI Security        (OFF)
 5 - Voice ANI Pause Format    (XXX-XXXX)
 6 - POTS DN for Call Trace  (2221111)
 7 - MDF Speaker Option       (OFF)
 8 - DTMF Transmit Level      (0.0 dBm)

 Selection   :
```

4.2.1.2 <u>ANI Area Code</u> -

From the ANI Parameters Menu, type "2" and press "Enter" to configure the Smart-Pro™ to prefix the ANI return with a stored 3-digit area code. The screen will display the following menu :

```
1 - ANI Area Code ON
2 - ANI Area Code OFF
3 - Edit ANI Area Code   ( )

Selection  :
```

Selecting "1" or "2" and pressing "Enter" will enable or disable the ANI Area Code feature. Pressing "Enter" again will return the program to the ANI Parameters Menu.

Selecting "3" and pressing "Enter" will cause the Area Code Entry message to be displayed :

```
Enter the ANI Area Code  (3 digits)   :
```

After entering the desired area code and pressing "Enter", the same Area Code Entry screen will again be displayed. Pressing "Enter" again will return the program to the ANI Parameters Menu.

4.2.1.3 <u>ANI Return Configuration</u> -

After obtaining the **_calling party_** number in MF digit format, the Smart-Pro™ will transmit the number in DTMF digit format (or voice) _through the switch connection to the calling party_. The number of digits returned is selectable, from 3 to 15 digits, allowing the option of stripping off leading digits when not pertinent to the application. If the number of return digits selected (n) is less than the number received by the Smart-Pro™ during identification, it will return the _last "n"_ digits from the string. (i.e., if the identified number was "55107823" and the ANI Return was selected to be "4", then the DTMF number returned would be "7823".)

In applications where the Smart-Pro™ is providing ANI service for _multiple_ switches (via inter-switch trunking) which have _different dialing plans_ (i.e., 6-digit dialing on one and 7-digit on the other), the Smart-Pro™ must be configured to return _all digits received from the ANI Trunk,_ to guarantee capturing all digits from either switch. This is called a "variable length return".

From the ANI Parameters Menu, type "3" and press "Enter" to configure the number of ANI digits to return to the calling party. The screen will display the following message :

> **Enter the number of ANI return digits (3 - 15),**
> **or enter "X" for variable length return :**

Select the desired number or enter "X" (if multiple switches with different dialing plans are involved), then press "Enter", and the ANI Parameters Menu will again be displayed.

4.2.1.4 Voice ANI Security Configuration -

From the ANI Parameters Menu, type "4" and press "Enter" to configure the Smart-Pro™ for Voice ANI Security. The screen will display the following menu :

> **1 - Voice ANI Security ON**
> **2 - Voice ANI Security OFF**
> **3 - Edit Voice ANI Password   ( )**
>
> **Selection :**

Selecting "1" or "2" and pressing "Enter" will enable or disable the voice ANI password security feature, and return to this menu. Pressing "Enter" again will return the program to the ANI Parameters Menu.

Selecting "3" and pressing "Enter" will cause the Password Entry message to be displayed :

> **Enter the Voice ANI Password (1 to 7 digits) :**

After entering the desired password and pressing "Enter", the same Password Entry screen will be displayed. Pressing "Enter" again will return the program to the ANI Parameters Menu.

4.2.1.5 Voice ANI Pause Format Configuration -

From the ANI Parameters Menu, type "5" and press "Enter" to change the voice ANI pause format, i.e., the placement of pauses between spoken numbers to distinguish certain meaningful groupings (for example, to distinguish exchange code from 10,000 number group : NXX from XXXX). The following screen will be displayed :

```
+-----------------------------------------------+
|                                               |
|   Enter the Voice ANI Pause Format   :        |
|                                               |
+-----------------------------------------------+
```

Entering a capital "X" signifies a numeric digit, and a "-" (dash) signifies a pause. There is a default pause format for each length of ANI return number; and if the "ANI Return" number of digits is changed (section 4.2.1.2), the program will automatically change the pause format to the default format.

Example : 7 digit = XXX-XXXX

4.2.1.6 POTS DN for Call Trace -

From the ANI Parameters Menu, type "6" and press "Enter" to change the POTS line directory number (DN) assigned to the Smart-Pro™ for the purpose of V.24 serial port "call trace" ANI. The following screen will be displayed :

```
+--------------------------------------------------------+
|                                                        |
|   Enter the Smart-Pro POTS Line Directory Number  :    |
|                                                        |
+--------------------------------------------------------+
```

Enter the number (3 to 15 characters, numeric digits only), and press "Enter". The ANI Parameters Menu will again be displayed.

4.2.1.7 MDF Speaker Option -

From the ANI Parameters Menu, type "7" and press "Enter" to enable or disable the MDF speaker routing feature. The screen will display the following message :

```
+--------------------------------------------------------+
|                                                        |
|  Do you want to route ANI voice to the MDF speaker  ?   (Y or N) :  |
|                                                        |
+--------------------------------------------------------+
```

After entering the desired choice and pressing "Enter", the ANI Parameters Menu will again be displayed.

4.2.1.8 DTMF Transmit Level -

From the ANI Parameters Menu, type "8" and press "Enter" to set the ANI return

DTMF transmit signal level. The following message will be displayed :

> **Enter the DTMF Transmit Level in .1 dB increments (+1.5 to -6 dBm) :**

After typing the desired level and pressing "Enter", the ANI Parameters Menu will again be displayed. To return to the Main Menu, press "Enter" again.

4.2.2 **Configure Transmission Test Parameters** -

From the Smart-Pro™ Main Menu, type "2" and press "Enter" to view or edit the

Transmission Test Parameters. The following **Transmission Test Parameters Menu** will be displayed :

```
┌─────────────────────────────────────────────┐
│                                             │
│   1 - Test Type              (DTMF SELECT)  │
│   2 -  Interface Type        (TRUNK I/F)    │
│   3 - Switching Loss, TRUNK  (0.0 dBm)      │
│   4 - Switching Loss, POTS   (0.0 dBm)      │
│   5 – Tone Durations                        │
│                                             │
│   Selection  :                              │
│                                             │
└─────────────────────────────────────────────┘
```

1. <u>Test Type</u> - Specifies single transmission function or steering via DTMF digit.
2. <u>I/F Type</u> - Specifies whether Trunk or POTS interface.
3. <u>Switching Loss, TRUNK</u> - Allows entry of specific trunk-to-line switching loss.
4. <u>Switching Loss, POTS</u> - Allows entry of specific line-to-line switching loss.
5. <u>Tone Durations</u> –Allows entry of specific times for the 1st and subsequent tones.

4.2.2.1 <u>Test Type Configuration</u> -

From the above Transmission Test Parameters Menu, type "1" and press "Enter" to select the desired Transmission Test Type, and the following **Test Type Menu** will be displayed :

```
┌─────────────────────────────────────┐
│                                     │
│     1 - Milliwatt                   │
│     2 - Quiet Termination           │
│     3 - 3 Tone Sweep                │
│     4 - 10 Tone Sweep               │
│     5 - 100 Hz Sweep                │
│     6 - Smart Tone                  │
│     7 - Callback                    │
│     8 - Keypad Test                 │
│     9 - N-Tone Sweep                │
│    10 - Select Test by DTMF         │
│    11 - No Transmission Test        │
│                                     │
│    Selection  :                     │
│                                     │
└─────────────────────────────────────┘
```

Selections 1, 2, 6, 7, 8, 10, & 11 require no further inputs, and if selected will return the program to the Transmission Test Parameter Menu.

Test Type selection 9 (Select Test by DTMF) allows the field operator to select *by dialed DTMF digit* the function to be applied to the line *after* the initial ANI sequence (or acknowledgement tone, if "No ANI" selected, ref. section 4.2.1.1).

The following is a list of "over-dialed" DTMF Test Selection digits and associated Smart-Pro™ functions :

<u>"Select Test"</u>
<u>DTMF Digit</u>   <u>Smart-Pro™ Function</u>

    1………… Send Milliwatt Tone
    2………… Connect Quiet Termination
    3………… Send 3 Tone Sweep
    4………… Send 10 Tone Sweep
    5………… Send 100 Hz Sweep
    6………… Send SmartTone™ Burst
    7………… Perform Callback
    8………… Perform Keypad Test
    9………… Send N-Tone Sweep

Test Type selections 3, 4, and 9 (3 Tone, 10 Tone, and N-Tone Sweeps) allow the ability to edit the default sweep frequency values via the following prompt :

> **Do you wish to view or edit the tone frequencies ? (Y or N) :**

If "**Y**" is chosen following the selection of Test Type "**3**" for 3 Tone Sweep, the following **Tone Edit Menu** will be displayed :

> **1 - Tone # 1**   **(404 Hz)**
> **2 - Tone # 2**   **(1004 Hz)**
> **3 - Tone # 3**   **(2804 Hz)**
>
> **Selection :**

Default frequencies are listed in brackets on the right. After typing the desired selection number and pressing "Enter", the following prompt will be displayed :

> **Enter frequency from 304 to 3604 Hz (must end with "04") :**

After typing the frequency and pressing "Enter", the previous Tone Edit Menu will again be displayed, allowing further editing of the tones. Pressing "Enter" again will cause the program to return to the Transmission Test Parameter Menu. The

10 Tone Sweep frequencies may be edited in like fashion, by selecting Option 4 from the Test Type Menu. The last frequency of the 100 Hz Sweep may also be entered, in like fashion, by selecting Option 5. (Reference 4.2.2.5 for setting Tone Duration values.) Selecting Option 9 (N-Tone Sweep) also allows the ability to select the number of tones in the sequence, from 1 to 34, as well as the described ability to configure each frequency.

4.2.2.2 Interface Type Configuration -

The Interface Type, whether Trunk or POTS Line, is *normally* defined by the ANI Type selected (reference section 4.2.1.1). When "No ANI" is selected, however, the Interface Type must be defined along with the other Transmission Test Parameters. Type "2" and press "Enter" to display the **I/F Type Menu** as shown :

> **1 - Trunk Interface**
> **2 - POTS Interface**
>
> **Selection   :**

After selecting the I/F Type, press "Enter" to return to the Test Parameters Menu.

4.2.2.3 Switching Loss Configuration, Trunk -

From the Transmission Test Parameters Menu, type "3" and press "Enter" to record the typical trunk-to-line switching loss for the particular application; so that the applied tone level may be automatically adjusted by the Smart-Pro™ to yield a 0.0 dBm level at the calling party's line interface to the Switch. (Reference section 3.07 for loss measurement procedure).

After selecting the Trunk Loss parameter, the following prompt will be displayed :

> **Enter the Switching Loss in .1 dB increments (3 dB MAX) :**

After entering the loss compensation value (as determined during Installation, section 3.07), press "Enter", and the Transmission test Parameter Menu will again be displayed. To return to the Main Menu, press "Enter" again.

4.2.2.4   Switching Loss Configuration, POTS - (Same as Trunk, ref. section 4.2.2.3)

4.2.2.5   Tone Duration Configuration –

From the Transmission Test Parameters Menu, type "5" and press "Enter" to enter desired tone durations, and the following menu will be displayed :

```
1 – 3/10/N Tone Sweep, 1st Tone     (6 SEC)
2 – 3/10/N Tone Sweep, Nth Tone     (4 SEC)
3 - 100 Hz Sweep, 1st Tone          (2 SEC)
4 - 100 Hz Sweep, Nth Tone          (2 SEC)
5 - Smart Tone                     (10 SEC)
6 – Milliwatt                      (20 SEC)
7 – Quiet Termination              (20 SEC)

Selection   :
```

When a selection is entered, the following prompt appears :

```
Enter the tone duration in seconds     (1 – 30)
```

4.2.3 **Configure Steering Codes** -

The Smart-Pro can be configured to perform ANI or a particular transmission test based on the *last digit* or *last 4 digits* of the number used to dial the unit. ***This feature is available, however, only when the unit is configured for the Analog Trunk ANI Mode***. From the Main Menu, type "3" and press "Enter" to display the following **Number Steering Menu** :

```
1 - Number Steering Off             (X)
2 - Steer on Last Digit Dialed      ( )
3 - Steer on Last 4 Digits Dialed   ( )

Selection   :
```

4.2.3.1 Number Steering Off -

Type "1" and press "Enter" to disable the Number Steering feature.

4.2.3.2 <u>Steer on Last Digit Dialed</u> -

Type "2" and press "Enter" to select the *single digit steering* mode. In this mode, the Smart-Pro™ will respond with either ANI or a transmission test function based on the *last digit* of the dialed number. The steering codes are defined as follows :

<div align="center">

<u>Last Digit Dialed</u> <u>Smart-Pro™ Response</u>

0………… Send ANI Return digits
1………… Send Milliwatt Tone
2………… Connect Quiet Termination
3………… Send 3 Tone Sweep
4………… Send 10 Tone Sweep
5………… Send 100 Hz Sweep
6………… Send SmartTone™ Burst
7………… Perform Callback
8………… Perform Keypad Test
9………… Send N-Tone Sweep

</div>

4.2.3.3 <u>Steer on Last 4 Digits Dialed</u> -

Type "3" and press "Enter" to select the *four digit steering* mode. In this mode, the Smart-Pro™ will respond with either ANI or a transmission test function based on the *last four digits* of the dialed number. *This mode (in contrast to the single-digit steering mode described above) allows for a **unique, four digit access code** to be assigned to each Smart-Pro™ response, providing an **additional** level of security.* The following **Access Code Assignment Menu** will be displayed :

```
 1 - ANI Number              ( )
 2 - Milliwatt Number        ( )
 3 - Quiet Term. Number      ( )
 4 - 3 Tone Sweep Number     ( )
 5 - 10 Tone Sweep Number    ( )
 6 - 100 Hz Sweep Number     ( )
 7 - Smart Tone Number       ( )
 8 - Callback Number         ( )
 9 - Keypad Test Number      ( )
10 - N-Tone Sweep Number     ( )

 Selection  :
```

After selecting one of the menu items, press "Enter". A screen will be displayed prompting the user to enter the last four digits of the access number associated with the selected function. Press "Enter" after entering the 4 digit number, and the Access Code Assignment Menu will again be displayed, but with the new code added. When all desired access codes have been entered, press "Enter" to return to the Smart-Pro™ Main Menu.

After all items in the Main Menu have been configured, press "Enter" to return to the Channel Selection Menu. When both channels have been configured, press "Enter" from the Channel Selection Menu to exit the configuration mode. *Return SW8 of the channel used for V.24 local terminal configuration to the "down" position for subsequent normal channel operation.*

5.   TEST AND ACCEPTANCE

5.01 Figure 4 is a multi-page flow diagram of the steps necessary for acceptance testing of the Smart-Pro®. It also serves as a maintenance and diagnostic tool if a problem should occur in the Smart-Pro®, ANI Trunk circuit, or switching system during normal operation.

FIGURE 4.A - SMART-PRO TEST & ACCEPTANCE FLOW DIAGRAM

```
                        ┌─────────────┐
                        │    START    │
                        └──────┬──────┘
                               │
                        ┌──────▼──────────┐
                        │ INSTALL SMART-PRO™ │
                        │  PER SECTION 3.  │
                        └──────┬──────────┘
                               │
                        ┌──────▼──────────┐
                        │ INSERT "OFFICE BATTERY" │
                        │    1/2 AMP FUSE  │
                        └──────┬──────────┘
                               │
                          ◇ RED                    ┌──────────────────┐
                      "FUSE ALARM" LED ──Y──────►  │ REMOVE FUSE AND  │
                          ON                       │  VERIFY BLOWN    │
                          ?                        └──────────────────┘
                          │N
                          ▼
                      ◇ GREEN              ◇ OFFICE BATTERY &
                     "POWER" LED ──N──►    GROUND PRESENT ──Y──►
                        ON                       ?
                        ?                        │N
                        │Y                       ▼
                        │            ┌────────────────────┐
                        │            │ REPAIR WIRING AS REQ'D.; │
                        │            │  RESUME TESTING AT │
                        │            │  POINT OF FAILURE  │
                        │            └────────────────────┘
                        ▼
                   ◇ GREEN
                  "STATUS" LED'S ──N──►
                  FLASH 4-5 SECONDS
                        ?
                        │Y
                        ▼
                      ( 2 )  (FIG. 4.B)      ┌──────────────────┐
                                             │ REPLACE SMART-PRO™ │
                                             │  PER SECTION 6.  │
                                             └──────────────────┘
```
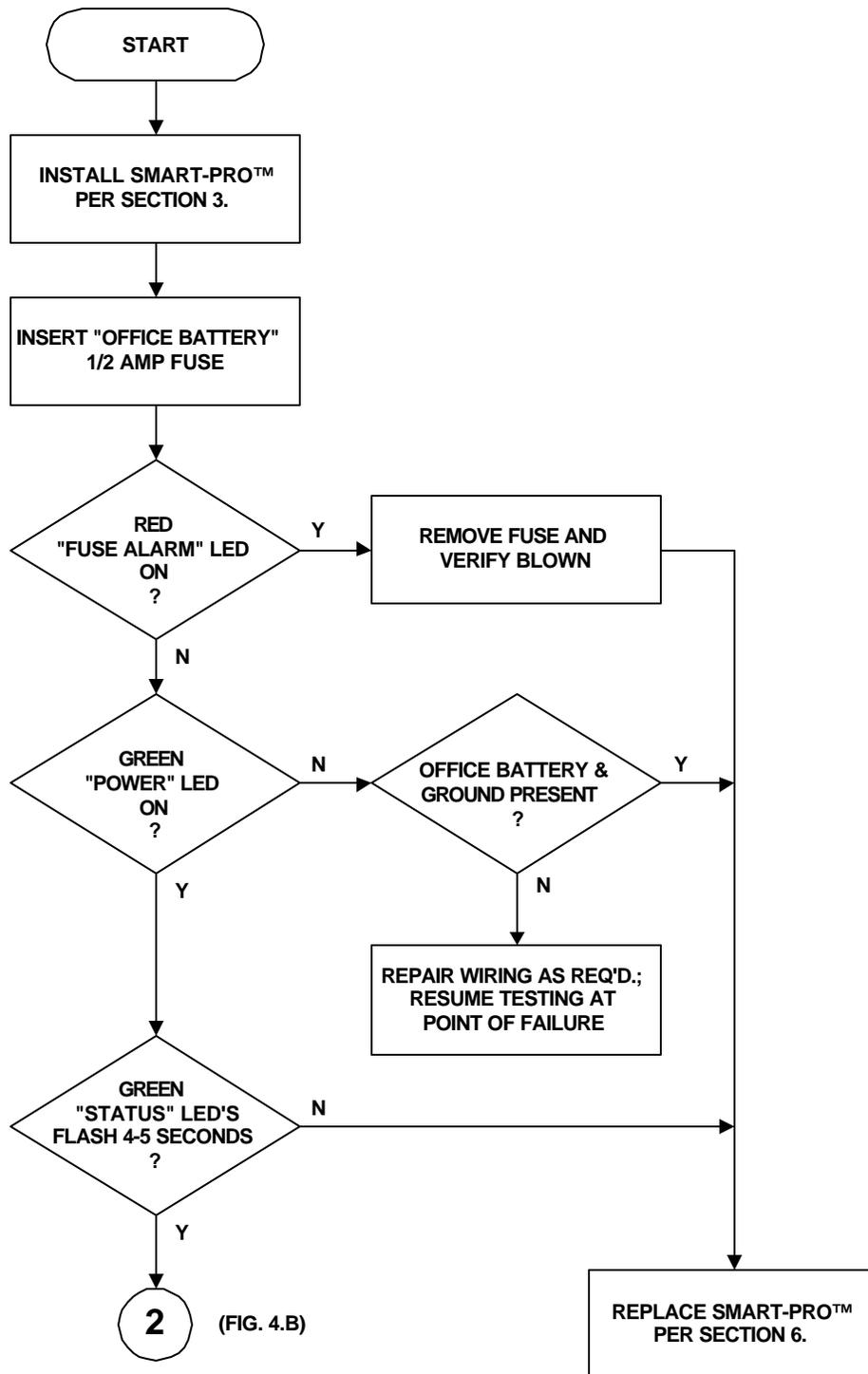
FIGURE 4.B - SMART-PRO™ TEST & ACCEPTANCE FLOW DIAGRAM
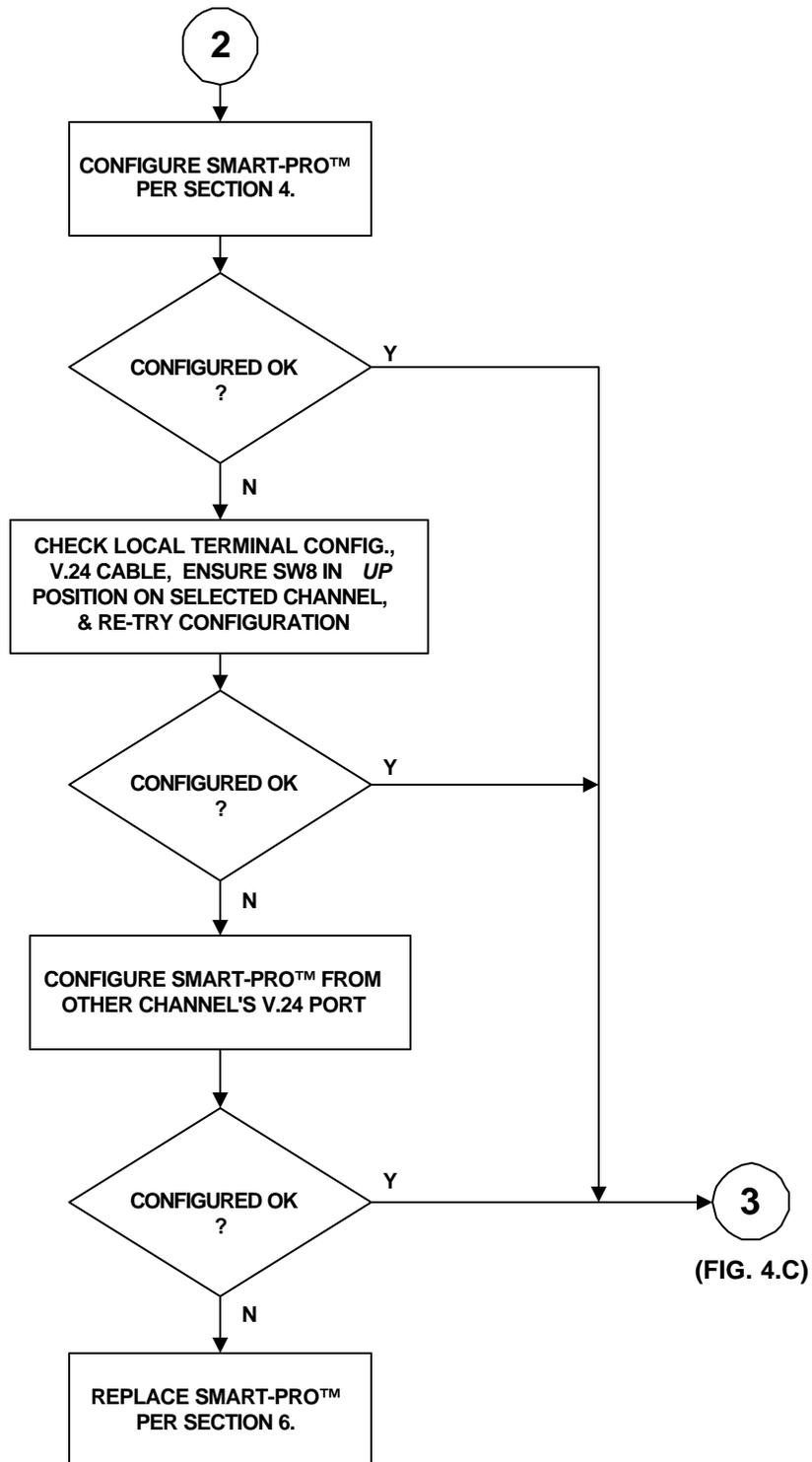
FIGURE 4.C - SMART-PRO™ TEST & ACCEPTANCE FLOW DIAGRAM

```
                        ( 3 )
                          │
                          ▼
                      ╱───────╲
                     ╱  ANALOG  ╲      N
                    ⟨ TRUNK ANI I/F ⟩ ───────────────▶ ( 5 )
                     ╲ (R1 OR R2) ╱
                      ╲    ?    ╱              (FIG. 4.E)
                          │ Y
                          ▼
          ┌──────────────────────────────┐
          │ SHORT "T" & "R" TERMINAL BLOCK │
          │ LEADS OF SELECTED CHANNEL, OR  │
          │ CONNECT -48VDC BATTERY TO "M"  │
          │ LEAD IF R1 TYPE E&M SIGNALING  │
          └──────────────────────────────┘
                          │
                          ▼
                      ╱───────╲
                     ╱ "SEIZED" ╲     N
                    ⟨  LED ON     ⟩ ─────────────────┐
                     ╲ STEADY ?  ╱                    │
                          │ Y                         │
                          ▼                           │
                      ╱───────╲                       │
                     ╱"OFFHOOK" ╲                      │
                    ╱ LED ON STEADY,╲  N               │
                   ⟨ OR WINKS IF R1  ⟩────────────┐    │
                    ╲ ESS OR XBAR  ╱              │    │
                     ╲    ?    ╱                  ▼    ▼
                          │ Y          ┌─────────────────────┐
                          ▼            │  REPLACE SMART-PRO™  │
          ┌──────────────────────┐     │   PER SECTION 6.     │
          │ REMOVE SHORT / BATTERY│     └─────────────────────┘
          │ & VERIFY STATUS LED'S │
          │      GO OFF           │
          └──────────────────────┘
                          │
                          ▼
                        ( 4 )

                     (FIG. 4.D)
```
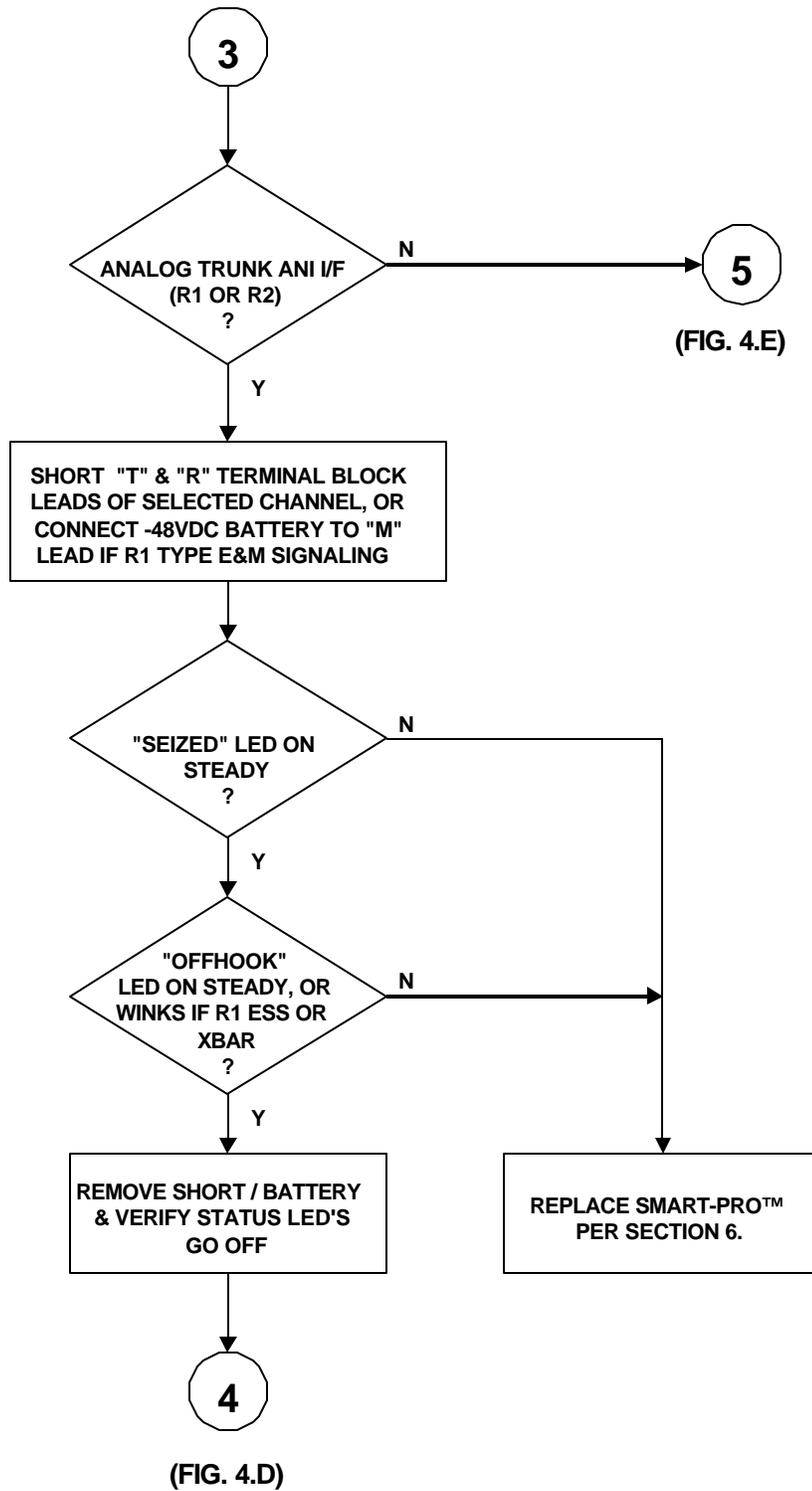
FIGURE 4.D - SMART-PRO™ TEST & ACCEPTANCE FLOW DIAGRAM
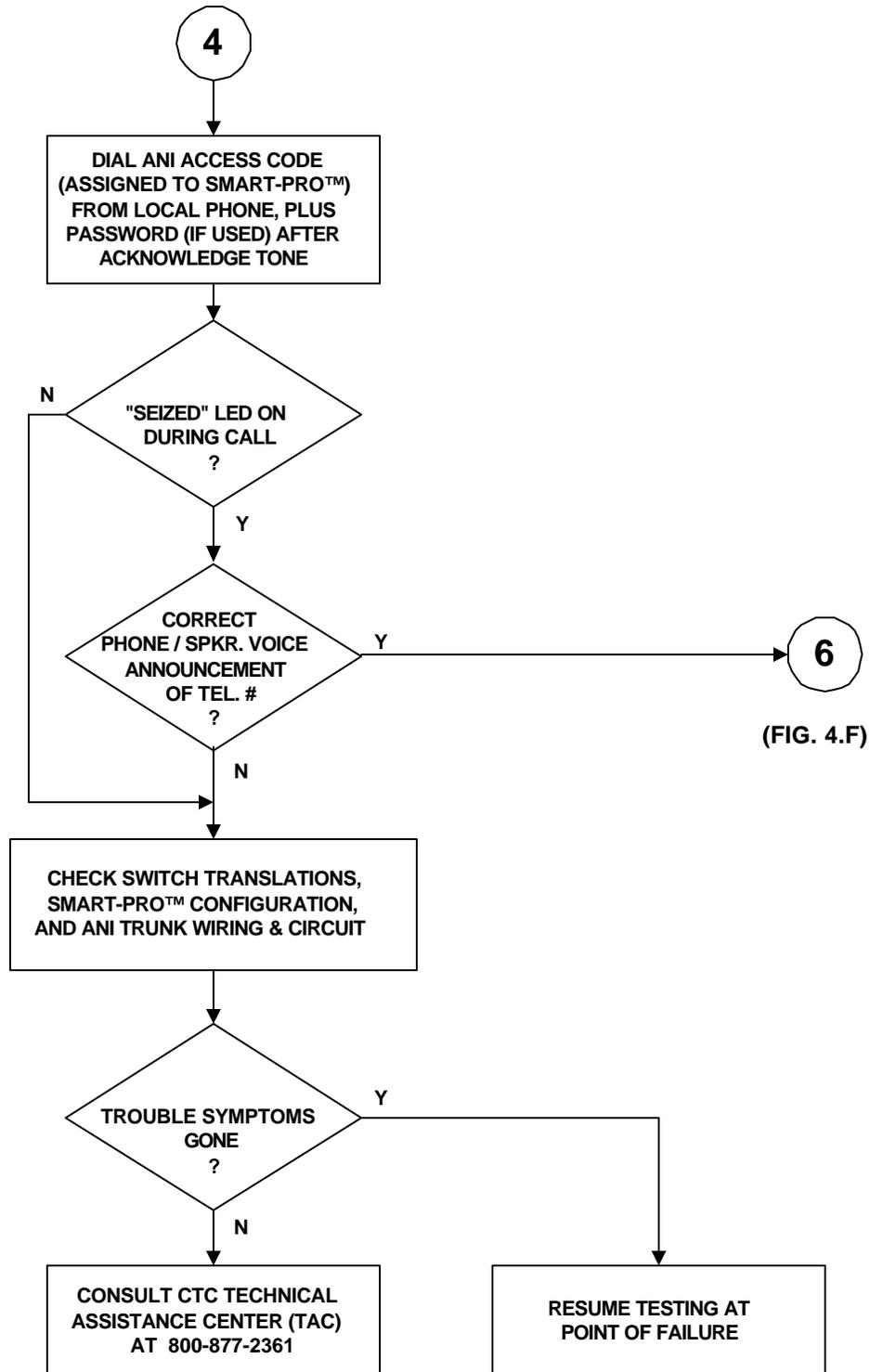
FIGURE 4.E - SMART-PRO™ TEST & ACCEPTANCE FLOW DIAGRAM
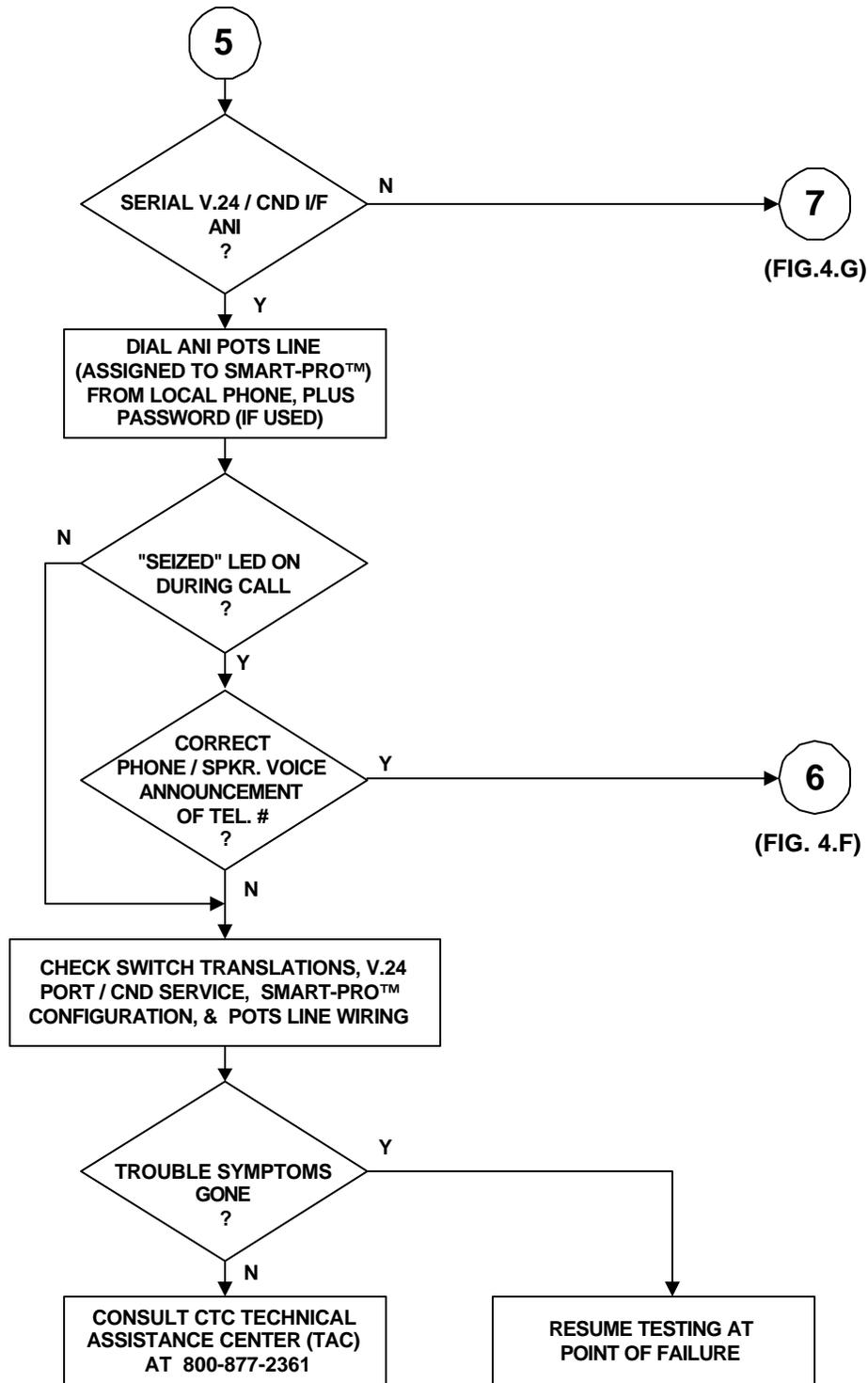
FIGURE 4.F - SMART-PRO™ TEST & ACCEPTANCE FLOW DIAGRAM
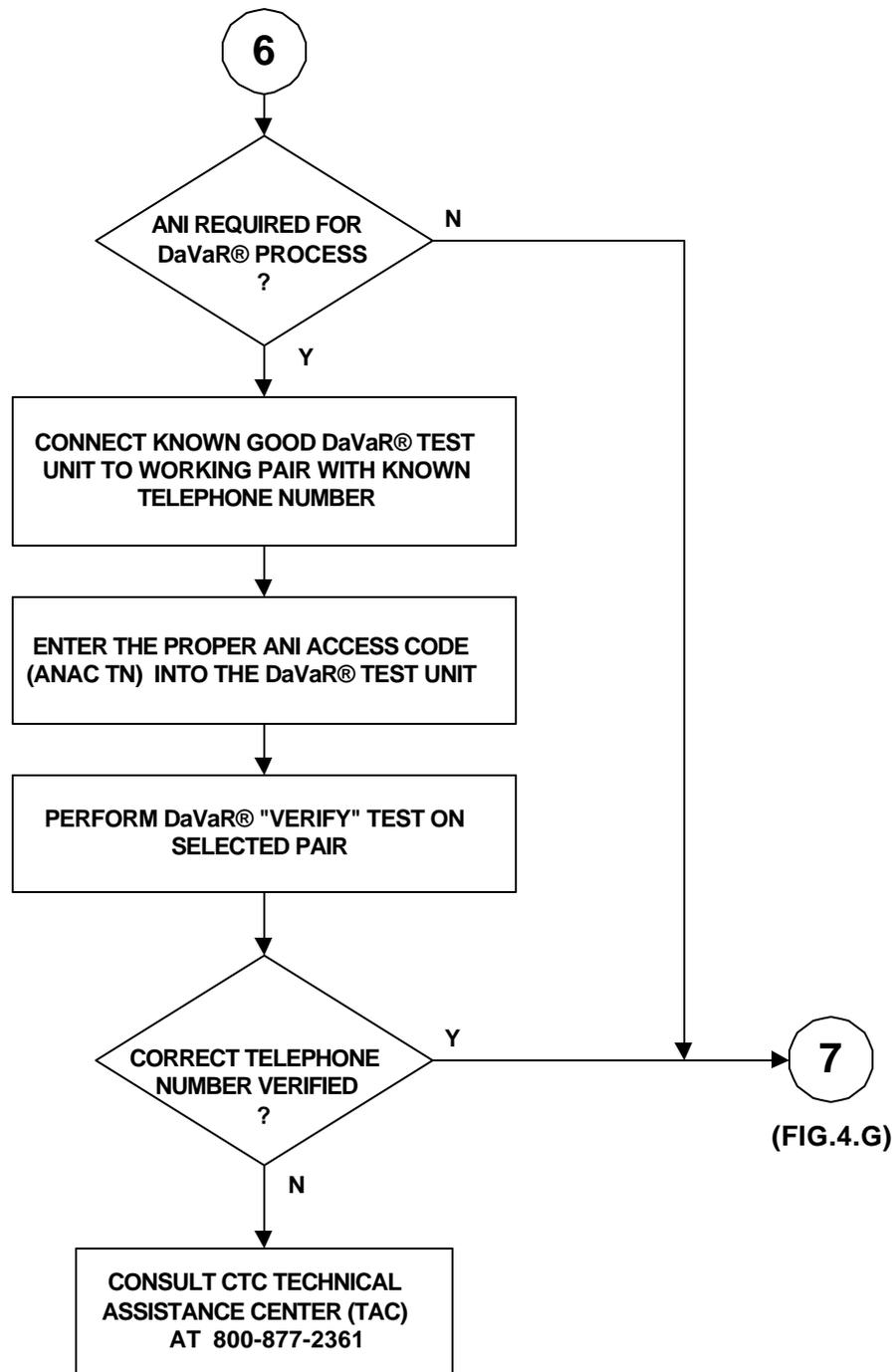
FIGURE 4.G - SMART-PRO™ TEST & ACCEPTANCE FLOW DIAGRAM

(**7**)

TEST TONE ENABLED
?

N

Y

ACCESS TEST TONE (PREFERABLY MILLIWATT)
VIA BUTT-SET OR C9925, FROM A WORKING LINE
TERMINATED INSIDE THE C.O. EXCHANGE. USE
METHOD CONFIGURED IN SECTION 4.

MEASURE THE TERMINATED TONE LEVEL
(USING NOMINAL LINE CIRCUIT IMPEDANCE)

LEVEL = 0 dBm ± .5 dB
?

Y

N

RE-CONFIGURE SWITCHING LOSS TO YIELD A
0 dBm MEASUREMENT AT THIS POINT.
(ENSURE NO ATTACHED CABLE OR BRIDGE TAP
ON LINE DURING MEASUREMENT)

LEVEL = 0 dBm ± .5 dB
?

Y

N

CONSULT CTC TECHNICAL
ASSISTANCE CENTER (TAC)
AT 800-877-2361

ACCEPTANCE
TEST COMPLETE

6. OPERATION

6.01 **ANI Trunk Installations** - Both ANI and Transmission Test functions are available with the Smart-Pro® connected to an ANI Trunk, and are accessible for various testing programs as defined during configuration :

1. DaVaR® Applications :
    a.) *Automatic Number Verification* - In order to perform the basic DaVaR® Verification function, configure the Smart-Pro® channel for "Analog Trunk" ANI type, specify the proper number of ANI Return digits (normally 7), and modify the appropriate C.O. Switch translation tables for routing based on an assigned 3 to 7 digit dial-up access number. Number Steering may be turned off if *only* the ANI function is required. Enter the same routing number into the "ANI" field of the DaVaR® program "Test Unit Parameters" menu. The DaVaR® Test Unit will automatically perform the patented DTMF tone "handshake" operation with the Smart-Pro® to receive DTMF (vs. voice) ANI information during working pair verification.

    b.) *Conformance Testing* - The DaVaR® Verification program also provides the ability to perform Insertion Loss and Noise testing on working pairs via dial-up Milliwatt and Quiet Termination numbers, respectively. When connected to an Analog Trunk used for ANI, the Smart-Pro® Transmission Tests are also available over the **same trunk and channel**, if the Smart-Pro® channel is configured for *Number Steering* on the last dialed digit (or last 4 digits) of the access number (ref. section 4.2.3). Each individual function access number may then be entered into the appropriate DaVaR® program fields for "ANI", "Dial-up Milliwatt" and "Dial-up QT" telephone numbers (e.g., ANI = 810, Milliwatt = 811, QT = 812, for *last digit* number steering).

2. C9925BLT™ Applications :
    a.) *Number ANI* - To perform the C9925BLT Network Access Analyzer "Number ANI" test, configure the Smart-Pro® the same as described in 1.a (above) for DaVaR® operation, and enter the assigned 3 to 7 digit routing number in the Analyzer "Phone Numbers" list. When "Number ANI" is selected, and the assigned number auto-dialed from the "Phone Numbers" list, the analyzer will (like the DaVaR®) automatically perform the * / # "handshake" operation with the Smart-Pro® to receive and display the ANI information. *If the Analyzer (or other instrument, such as a butt-set) is used to **manually** dial the Smart-Pro®, the ANI response will be a voice announcement. **If the Smart-Pro® Voice ANI Security feature is turned on, the operator must tone dial the pre-programmed ANI password followed by the** "#" **key, after the Smart-Pro® sends the** "*" **tone.** The voice ANI announcement may then be heard over the Analyzer speaker or butt-set monitor.

b.) *Signal Tests* - To perform C9925BLT Network Access Analyzer dial-up Signal Tests, the *same* Smart-Pro® channel configured for Analog Trunk ANI may be used in either of two scenario's :

1.) Configure the Smart-Pro® channel for *Number Steering* on either the last dialed digit (or last 4 digits) of the access number, as in the DaVaR® example in 6.01-1b. When an Analyzer Signal Test function requiring dialing (such as Loop Test, Gain Slope, Signal Level, or Noise Group) is desired, select the associated (previously entered) number from the Analyzer "Phone Numbers" list, dial out, and press the "Start Test" softkey.

2.) Configure the Smart-Pro® channel to perform a DTMF-selectable Transmission Test function *after* ANI, all functions being accessed by the *same initial dial number*. Configure the channel Test Type for "Select Test by DTMF", with Number Steering off. When an Analyzer Signal Test function requiring dialing is desired, select the *same* number from the "Phone Numbers list as was selected for "Number ANI", and dial out. As soon as the Smart-Pro® voice ANI announcement is heard on the Analyzer speaker, press the DTMF digit corresponding to the desired Transmission Test function, then press the "Start Test" softkey.

C9925BLT Test Function	**DTMF Digit**	**Smart-Pro® Function**
Loop Test…………………	3, 4, or 9	…….3, 10, or N-Tone Sweeps
Gain Slope………………...	3, 4, or 9	…….3, 10, or N-Tone Sweeps
Signal Level……………….	1	…………………….....Milliwatt
Noise Group………………	2	……………..Quiet Termination
Loop Analysis…………….	6	…………...SmartTone™ Burst
Caller ID*…………………..	7	…………………….....Callback
DTMF Keypad Test………	8	…………………...Keypad Test

The above functions may also be accessed using the Analyzer "Manual Dial" mode, or with separate dialing and test instruments (butt-set and Noise or Level Test Sets, for example).

*Since the line must be *on-hook* to receive the Caller ID signal, the operator must manually dial the Smart-Pro®, send the Callback steering digit "7" after the ANI voice announcement, then hang up and prepare to receive the Caller ID signal (sent by the switching system after the first ringing period of the callback call).

6.02 **POTS Line Installations** - ANI and Transmission Test functions are *also* available with the Smart-Pro® connected to a POTS line, and are configurable for various testing programs as follows :

1. <u>DaVaR® Applications</u> :

   a.) *Automatic Number Verification* - Configure the Smart-Pro® for ANI Type of either "Call Trace Via Serial Port" or "Caller ID Via POTS Line" (depending on the particular installation); specify the number of ANI Return digits; and if the Call Trace option is used, complete the "POTS DN for Call Trace" entry. Enter the assigned Smart-Pro®POTS line directory number into the "ANI" field of the DaVaR® program "Test Unit Parameters" menu.

   b.) *Conformance Testing* - DaVar® dial-up Insertion Loss and Noise testing on working pairs may be performed by dialing a Smart-Pro®channel configured for "No ANI", and to return *either* the Milliwatt signal *or* apply the Quiet Termination, respectively. The Smart-Pro® POTS line directory number may then be entered into the appropriate DaVaR® program "Dial-up Milliwatt" or "Dial-up QT" fields. If *both* dial-up Loss *and* Noise testing are desired, a separate Smart-Pro® channel, also configured for "No ANI", must be accessed with a different number.

2. <u>C9925BLT™ Applications</u> :

   a.) *Number ANI* - To access a POTS line-connected Smart-Pro® with an Analyzer for "Number ANI" testing, configure the Smart-Pro® channel the same as for DaVaR® in 6.02-1a above, and enter the assigned POTS number into the Analyzer "Phone Numbers" list. From this point, Analyzer automatic "Number ANI" operation (as well as Analyzer / butt-set manual operation and voice ANI password entry) is the same as described in section 6.01-2a.

   b.) *Signal Tests* - Analyzer access of Smart-Pro® Transmission Test functions is again provided by either of two scenario's :

   1.) Configure the Smart-Pro® channel to perform a DTMF-selectable function *after* ANI, by setting the channel Test Type for "Select Test by DTMF". In this scenario, the same Smart-Pro® channel can be used for *both* Analyzer "Number ANI" and Transmission Test functions. Operation is the same as described in the second scenario of section 6.01-2b.

   2.) If *only* Transmission Test functions are required, the Smart-Pro® channel may be configured for "No ANI", again with Test Type set to "Select Test by DTMF". With this scenario, the ANI sequence is replaced with a Smart-Pro® *"acknowledge"* voice message / tone when the access number is dialed, after which the operator may press the DTMF digit for the desired function.

7. MAINTENANCE

7.01 The Smart-Pro® requires no routine maintenance; however, if through following the diagnostic steps of Figure 4, or contacting the FLUKE NETWORKS Technical Assistance Center, the unit is suspected as having failed, it should be replaced with a known good unit. *Under no circumstances should the cover be removed for field repair.*

7.02 To replace a failed Smart-Pro®, perform the following steps :

1. Remove the assigned ANI trunk (if applicable) from service.

2. Remove the main office battery supply fuse to the unit, as well as the front panel "Office Battery" fuse.

3. Disconnect all "COMMON" and "CHANNEL" wiring from the associated rear panel terminal blocks, taking care to label the wires for subsequent re-connection.

4. Remove the 4 rack-mounting screws, and remove the Smart-Pro® from the rack.

5. Mount the replacement Smart-Pro® in the rack, and re-connect all rear panel wiring.

6. Replace the main and front panel office battery fuses, and release the ANI trunk for operation (if applicable).

7. Perform Acceptance Testing on the new Smart-Pro® per Figure 4.

7.03 Tag the failed unit with a note referencing failure symptoms, and if possible which step of Figure 4 was failed.

7.04 Return Policy - To return the Smart-Pro® from locations within the U.S., call FLUKE NETWORKS Customer Service at 800-866-8200 for shipping instructions. A Customer Service representative will assign an RRA (Repair Return Authorization) identification number, which should be referenced on the shipping label. For locations outside the U.S., contact the closest authorized FLUKE NETWORKS representative for repair instructions.

8.   SMART-PRO® CIRCUIT DESCRIPTION

8.01   Figure 5 is a block diagram of the Smart-Pro®, showing the major internal functions.

8.02   V.24 Serial Port Interface - This DB-9 connectorized interface, replicated for each channel, provides a V.24 (RS-232C) serial communications link for either local terminal configuration of the Smart-Pro® after installation; or "call trace" ANI when connected to the serial maintenance port of a digital switch during normal operation. The interface consists of RS-232 drivers and receivers, connected to the microcontroller via one half of a "DUART" (dual asynchronous serial transmission controller), the other half being used for the other channel.

8.03   POTS Line Interface - Also replicated for each channel is the POTS interface over which the Smart-Pro® is called to provide serial call trace ANI, CND (Calling Number Delivery or "Caller ID") ANI, or the tone sending function. This interface consists of a ringing voltage detector, integrated into the CND receiver; an electronic loop holding circuit; and a voice frequency coupling transformer, shared with the Analog Trunk Interface, to couple the circuits to either the voice / tone generator, DTMF tone transceiver, or MF tone transceiver circuits via a switched analog buss for each channel. The CND circuit is directly connected to Tip and Ring of the POTS line, and provides ringing detection when the line is accessed for "Caller ID" ANI, call trace ANI, or the tone sending function. The circuit passes the ringing detect signal through the V.24 port "DUART" to the microcontroller, and if the CND option is enabled, decodes calling number information in the silent interval between ringing cycles. This information is then converted to serial format, and passed to the V.24 port "DUART" receive data line for input to the microcontroller. If the call trace ANI option is being used or tone sending option is enabled, the loop holding circuit is instructed to go offhook, tripping the ringing signal and allowing either ANI information or test tones to be transmitted to the POTS line.

8.04   Analog Trunk Interface - This circuit, again replicated for each channel, provides the loop or E&M signaling interface to the switching system analog trunk circuit, for the purpose of obtaining calling number information via ANI trunk. This circuit provides loop current detection from seizure by the trunk, loop reversal of battery feed for wink or steady answer supervision, sleeve lead ground detection, and E&M signaling for type I through V circuits.   The circuit allows transmission of MF signaling tones via 2 wire loop or E&M (T & R) or 4 wire E&M (T1 & R1) between the trunk circuit and the switched analog buss, through the shared voice frequency coupling transformer (ref. 8.03).

8.05   MDF Speaker Routing - This circuit allows the voice ANI message from *either* channel (but not both) to be routed to the MDF speaker amplifier instead of the

calling line interface (whether POTS line or Analog trunk). The rear panel volume control provides level adjustment for this speaker signal.

8.06   Voice / Tone Generator - This circuit, also replicated for each channel, consists of a microcontroller-driven EPROM containing both transmission test tone data and stored speech information for all 10 numeric digits, in each of four languages. The EPROM parallel-digital output is first converted to serial-digital data via shift register; connected to a shared serial-digital-input Codec and gain control circuit; and the resultant analog signal connected to the previously described switched VF coupling transformer to either the POTS, Analog trunk, or MDF speaker interface. The EPROM may be programmed to contain either the standard language set (English, Spanish, French, and Portuguese), or a custom set, depending on the Smart-Pro® model number ordered.

8.07   DTMF Tone Transceiver - This integrated circuit, also used in both channels, provides for both microcontroller-supervised generation of analog DTMF signaling tones for application to the shared gain control circuit and on to the POTS or Analog trunk interfaces; as well as reception and decoding of analog DTMF tones from these interfaces and delivery of the equivalent parallel-digital codes to the microcontroller.

8.08   Dual MF Tone Transceiver - This function is provided for both channels by a single integrated circuit having dual internal channels. It operates in the same fashion as the DTMF transceiver circuit described in 8.07, with the exception that its MF tone outputs are in serial-digital format, and require routing through the shared codec's in each channel to be converted into analog signals appropriate for subsequent application to their respective switched coupling transformers. The transceiver will provide either the R1 or R2 frequency set (requiring a different part number component for each type), depending on the Smart-Pro® model number ordered.

8.09   Microcontroller - The microcontroller provides stored program control for all Smart-Pro® functions.

8.10   DC-DC Converter - This circuit consists of a switching power supply which converts Office Battery (nominally -48 VDC) to +5 VDC, -5 VDC, +12 VDC, and -12 VDC to power the Smart-Pro® electronics.

FIGURE 5.- SMART-PRO™ BLOCK DIAGRAM
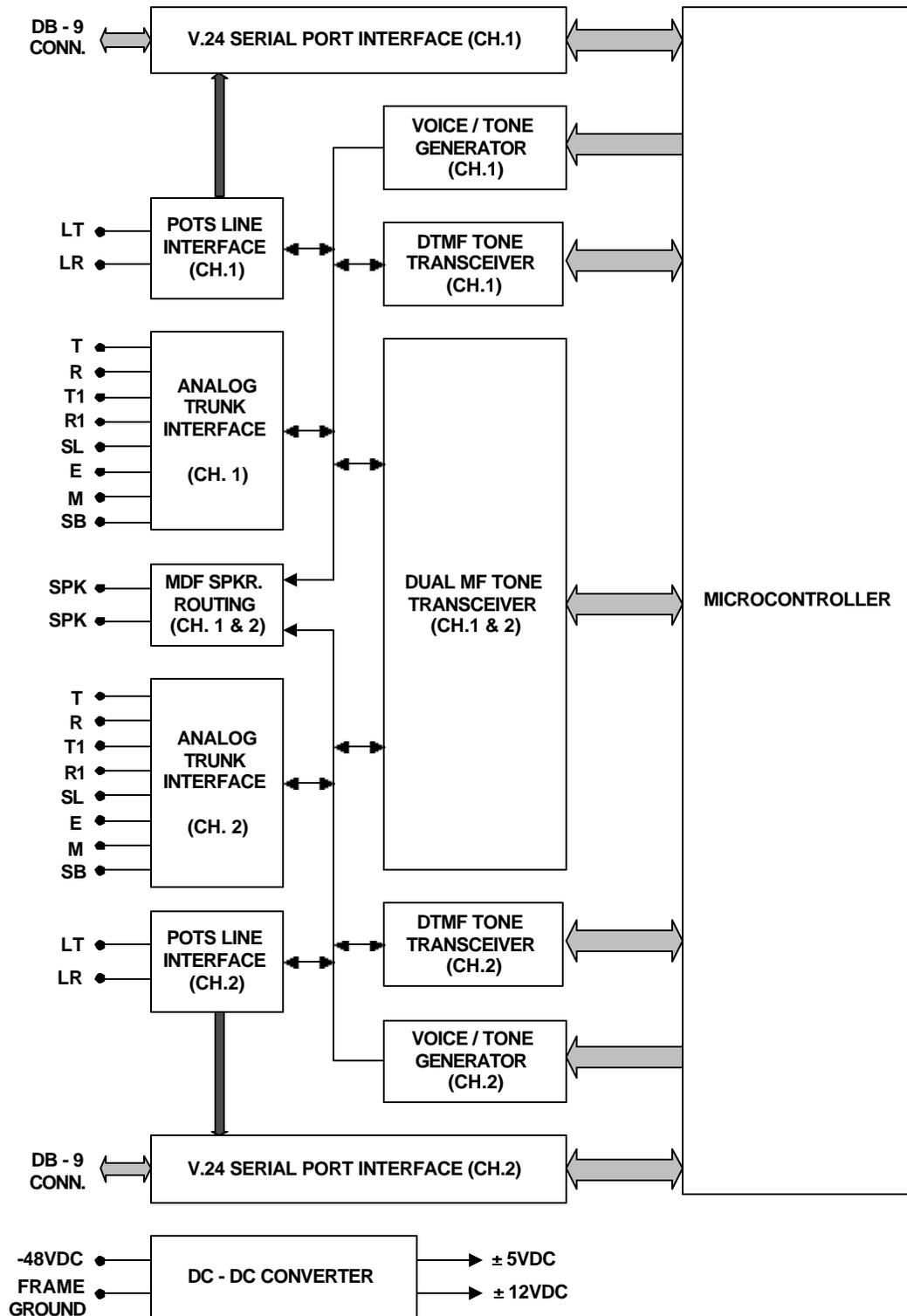
9.   SPECIFICATIONS

9.01   Size -

    1. Height……………………………………………… ….…..…1.75 in. (4.5 cm)
    2. Width…………………………………………….. ………...16.0 in. (40.6 cm)
    3. Depth…………………………………………….. ………...12.0 in. (30.5 cm)
    4. Weight…………………………………………….. ….……..…4.18 lb. (1.9 kg)

9.02   Power Requirements -

    1. Office Battery Voltage…………………………….. ……..…..-44 to -56 VDC
    2. Supply Current, quiescent……………………….. ………..…100 mA (typical)
    3. Supply Current, maximum……………………….. ……..………..150 mA
    4. Office Battery Fuse……………………………….. …….…………0.5 A, GMT
    5. Fuse Alarm Output…………………………….. .600 Ohms to Ofc. Battery

9.03   Environmental -

    1. Operating Temperature…………………………... ...32 to 144° F (0 to 55° C)
    2. Humidity…………………………………………… ...0 to 85 %, non-condens.

9.04   Analog Trunk Interface -

    1. 2- Wire Loop
        a. Loop Detect Range……………………………. ……..……0 to 2000 Ohms
        b. Signaling Format……………………………….. ……..…..R1MF or R2MFC

    2. 2-Wire or 4-Wire E&M………………………………… ……..………....Type I - V

9.05   MF Transceiver - (R1 and R2 versions)

    1. Receive Sensitivity……………………………….. ...-4 to -34 dBm,composite
    2. Transmit Level…………………………………….. -9 dBm ±1 dB, 600 Ohms

9.06   R1 Frequency Pairs - Hz   (Accuracy = ±1.5% ± 5 Hz)
    1.   Digit "1"……………………………………………… ..……………...700 +   900
    2.   Digit "2"……………………………………………… …...…………...700 + 1100
    3.   Digit "3"……………………………………………… …..…………...900 + 1100
    4.   Digit "4"……………………………………………… …..…………...700 + 1300
    5.   Digit "5"……………………………………………… …..…………...900 + 1300
    6.   Digit "6"……………………………………………… …..………...1100 + 1300
    7.   Digit "7"……………………………………………… …..…………...700 + 1500
    8.   Digit "8"……………………………………………… …..…………...900 + 1500
    9.   Digit "9"……………………………………………… …..………...1100 + 1500
    10. Digit "0"……………………………………………… …..………...1300 + 1500
    11. Control "KP"………………………………………… …..………...1100 + 1700
    12. Control "ST" ……………………………………….. …..………...1500 + 1700
    13. Control "STP"………………………………….….. …..…………...900 + 1700
    14. Control "ST2P"……………………………………. …..………...1300 + 1700
    15. Control "ST3P"……………………………………. …..………...700 + 1700

9.07   R2 Backward Freq. Pairs - Hz (acc. same as 9.06)
    1.   Digit "1"……………………………………………… ………………1140 + 1020
    2.   Digit "2"……………………………………………… ………………1140 + 900
    3.   Digit "3"……………………………………………… ………….…...1020 + 900
    4.   Digit "4"……………………………………………… ………………1140 + 780
    5.   Digit "5"……………………………………………… ………………1020 + 780
    6.   Digit "6"……………………………………………… ………….…....900 + 780
    7.   Digit "7"……………………………………………… ………………1140 + 660
    8.   Digit "8"……………………………………………… ………….…...1020 + 660
    9.   Digit "9"……………………………………………… ……….……....900 + 660
    10. Digit "0"……………………………………………… ………….…....780 + 660
    11. Digit "B"……………………………………………… ………………1140 + 540
    12. Digit "C"……………………………………………… ………………1020 + 540
    13. Digit "D"……………………………………………… …………….…...900 + 540
    14. Digit "E"…………………………………………….. ………….……...780 + 540
    15. Digit "F"…………………………………………….. …………….…...660 + 540

9.08   R2 Forward Freq. Pairs - Hz (acc. same as 9.06)

   1.   Digit "1"…………………………………………………… ….…..…………1380 + 1500
   2.   Digit "2"…………………………………………………… ….…..…………1380 + 1620
   3.   Digit "3"…………………………………………………… ….…..…………1500 + 1620
   4.   Digit "4"…………………………………………………… ….…..…………1380 + 1740
   5.   Digit "5"…………………………………………………… ….…..…………1500 + 1740
   6.   Digit "6"…………………………………………………… ….…..…………1620 + 1740
   7.   Digit "7"…………………………………………………… ….…..…………1380 + 1860
   8.   Digit "8"…………………………………………………… ….…..…………1500 + 1860
   9.   Digit "9"…………………………………………………… ….…..…………1620 + 1860
  10. Digit "0"…………………………………………………… ….…..…………1740 + 1860
  11. Digit "B"…………………………………………………… ….…..…………1380 + 1980
  12. Digit "C"…………………………………………………… ….…..…………1500 + 1980
  13. Digit "D"…………………………………………………… ….…..…………1620 + 1980
  14. Digit "E"…………………………………………………… ….…..…………1740 + 1980
  15. Digit "F"…………………………………………………… ….…..…………1860 + 1980

9.09   DTMF Transceiver -

   1. Receive Sensitivity.…………………………………….. …….……....+2 to -28 dBm
   2. Receive Duration - ms (minimum)…………………… ….…..……….40 on, 40 off
   3. Receive Twist (maximum allowable)………………… …….……………..± 10 dB
   4. Transmit Level……………………………………… ….…..……0.0 dBm ± .5 dB
                                         POTS I/F = 900 Ohms
                                         Trunk I/F = 600 Ohms
   5.Transmit Duration - ms (nominal)…………………….. ….……………60 on, 60 off
   6. Transmit Frequency Accuracy.………………………… …….……..± 1.5% ± 5 Hz

9.10   DTMF Frequency Pairs - Hz

1. Digit "1"……………………………………………… …..…………..697 + 1209
2. Digit "2"……………………………………………… …..…………..697 + 1336
3. Digit "3"……………………………………………… …..…………..697 + 1477
4. Digit "4"……………………………………………… …..…………..770 + 1209
5. Digit "5"……………………………………………… …..…………..770 + 1336
6. Digit "6"……………………………………………… …..…………..770 + 1477
7. Digit "7"……………………………………………… …..…………..852 + 1209
8. Digit "8"……………………………………………… …..…………..852 + 1336
9. Digit "9"……………………………………………… …..…………..852 + 1477
10. Digit "0"……………………………………………… …..…………..941 + 1336
11. Digit " * "……………………………………………… …..…………..941 + 1209
12. Digit " # "……………………………………………… …..…………..941 + 1477

9.11   Test Tone Sending Circuit -

1. Frequency Range………………………………………… …..…………304 to 3604 Hz
2. Frequency Resolution…………………………………. …..…………………1 Hz
3. Transmit Level (nominal, 0dB switching loss config.) ……………………..0.0 dBm
4. Level Range (max. switching loss compensation)…. …..…………………3 dB
5. Level adjustment Steps……………………………….. …..…………………0.1 dB
6. Level Accuracy………………………………………… …..……………..± 0.1 dB
7. Transmit Impedance…………………………………… …....POTS I/F = 900 Ohms
                                                    Trunk I/F = 600 Ohms

9.12   3 Tone Sweep -
1. Default Frequencies - Hz :
   Tone 1…………………………………………… …..…………………..404
   Tone 2…………………………………………… …..…………………1004
   Tone 3…………………………………………… …..…………………2804
2. Default Tone Duration - seconds (Range = 1-30) :
   Tone 1…………………………………………… ……………….………..6
   Tones 2-3……………………………………… ……………..………….4

9.13   10 Tone Sweep -

1. Default Frequencies - Hz :
   Tone 1…………………………………………… …………………………404
   Tone 2…………………………………………… …………………………804
   Tone 3…………………………………………… …………………………..1004
   Tone 4…………………………………………… …………………………..1204
   Tone 5…………………………………………… …………………………..1404
   Tone 6…………………………………………… …………………………..1604
   Tone 7…………………………………………… …………………………..1804
   Tone 8…………………………………………… …………………………..2004
   Tone 9…………………………………………… …………………………..2804
   Tone 10………………………………………….. …………………………..3004
2. Default Tone Duration - seconds (Range = 1-30) :
   Tone 1…………………………………………… …………………………6
   Tones 2-10……………………………………… …………………………4

9.14   N-Tone Sweep -

1. Default Frequencies - Hz :
   Tone 1…………………………………………… …………………………404
   Tone 2…………………………………………… …………………………804
   Tone 3…………………………………………… …………………………..1004
   Tone 4…………………………………………… …………………………..2804
2. Default Tone Duration - seconds (Range = 1-30) :
   Tone 1…………………………………………… …………………………6
   Tones 2-N……………………………………… …………………………4
3. Default Number of Tones…………………………….. …….4 (1 to 34 selectable)

9.15   100 Hz Sweep -

1. Default Frequencies – Hz (Range = 304 to 3604)….. 304 to 3204,100 Hz steps
2. Default Tone Duration - seconds (Range = 1-30)..…… …………………………2

9.16   MDF Speaker Interface -

1. Output Level   (adjustable via "VOL" control)………. ………..0 dBm (maximum)
2. Output impedance……………………………………. …………….600 Ohms

9.17   Voice ANI Output Level -………………………………. ……….- 12 dBm (nominal)

FIGURE 6. - ANALOG TRUNK CONNECTIONS : LOOP AND E&M TYPE I - III
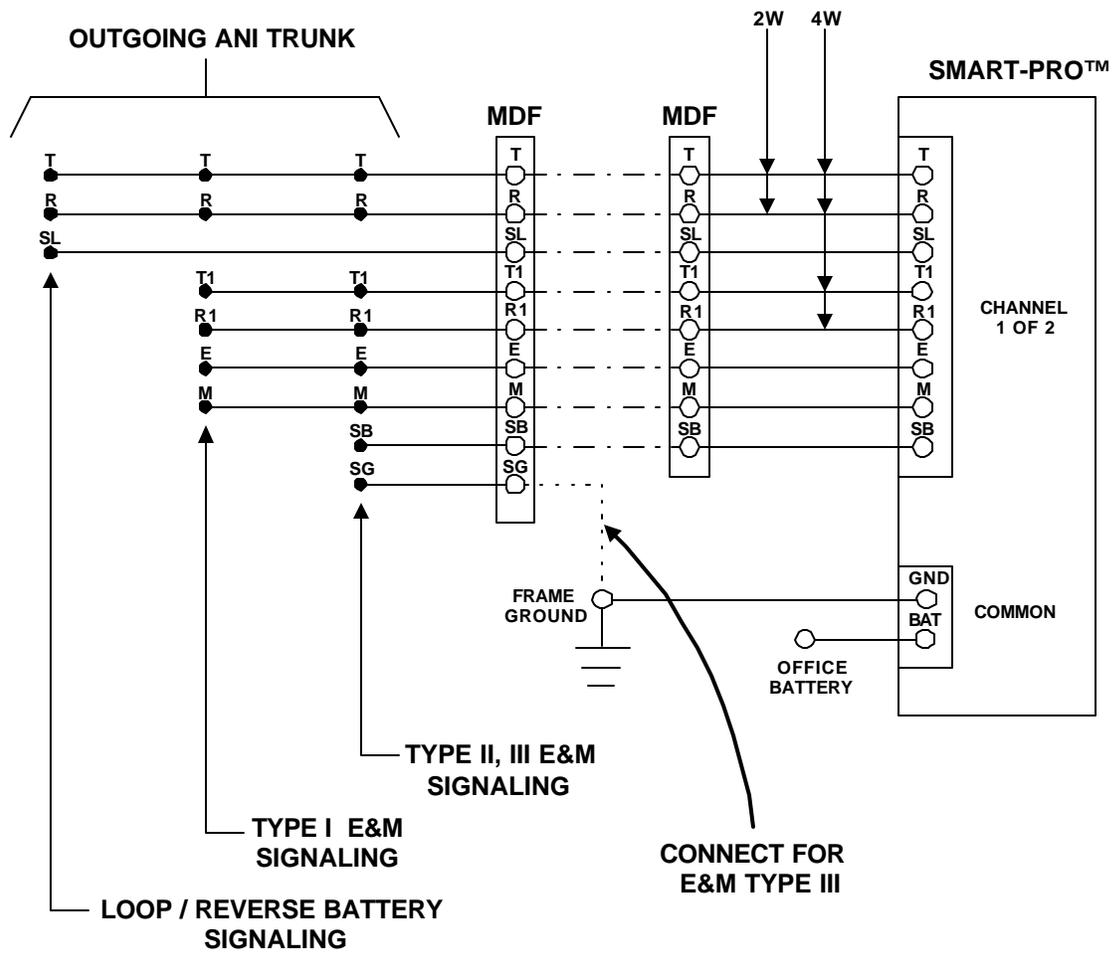
FIGURE 7. - ANALOG TRUNK CONNECTIONS : E&M TYPE IV - V
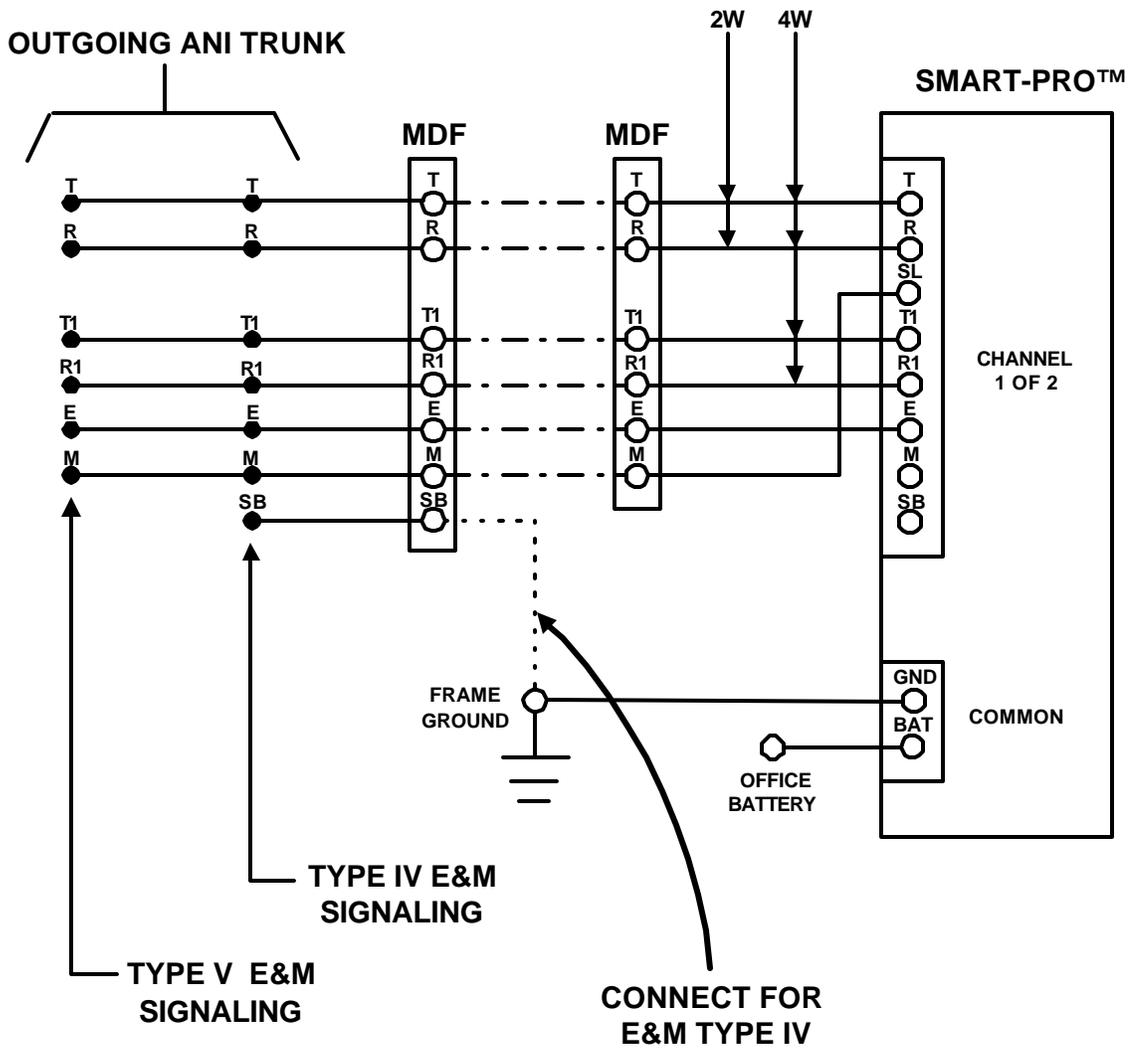
FIGURE 8 - CALLER I.D. CONNECTIONS

* POTS Line must have Caller ID feature enabled
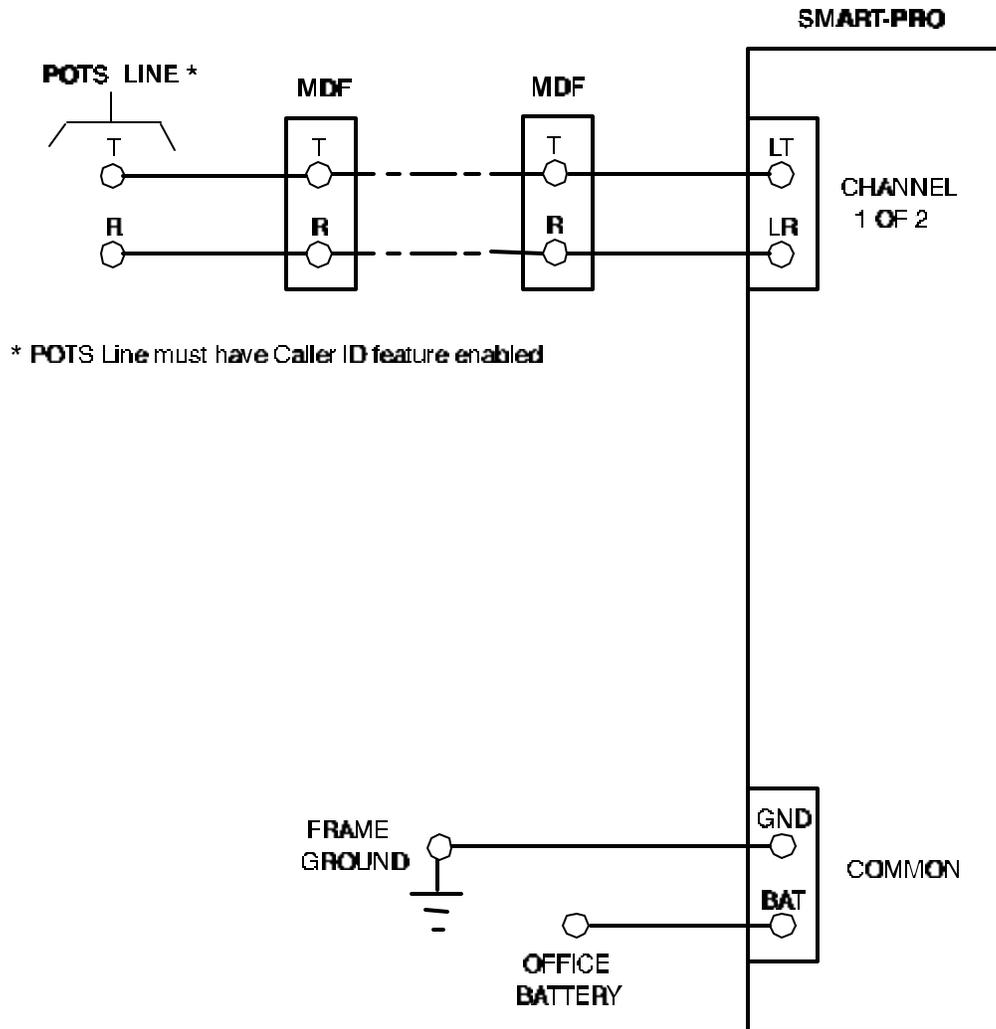
FIGURE 9 - CALL TRACE CONNECTIONS
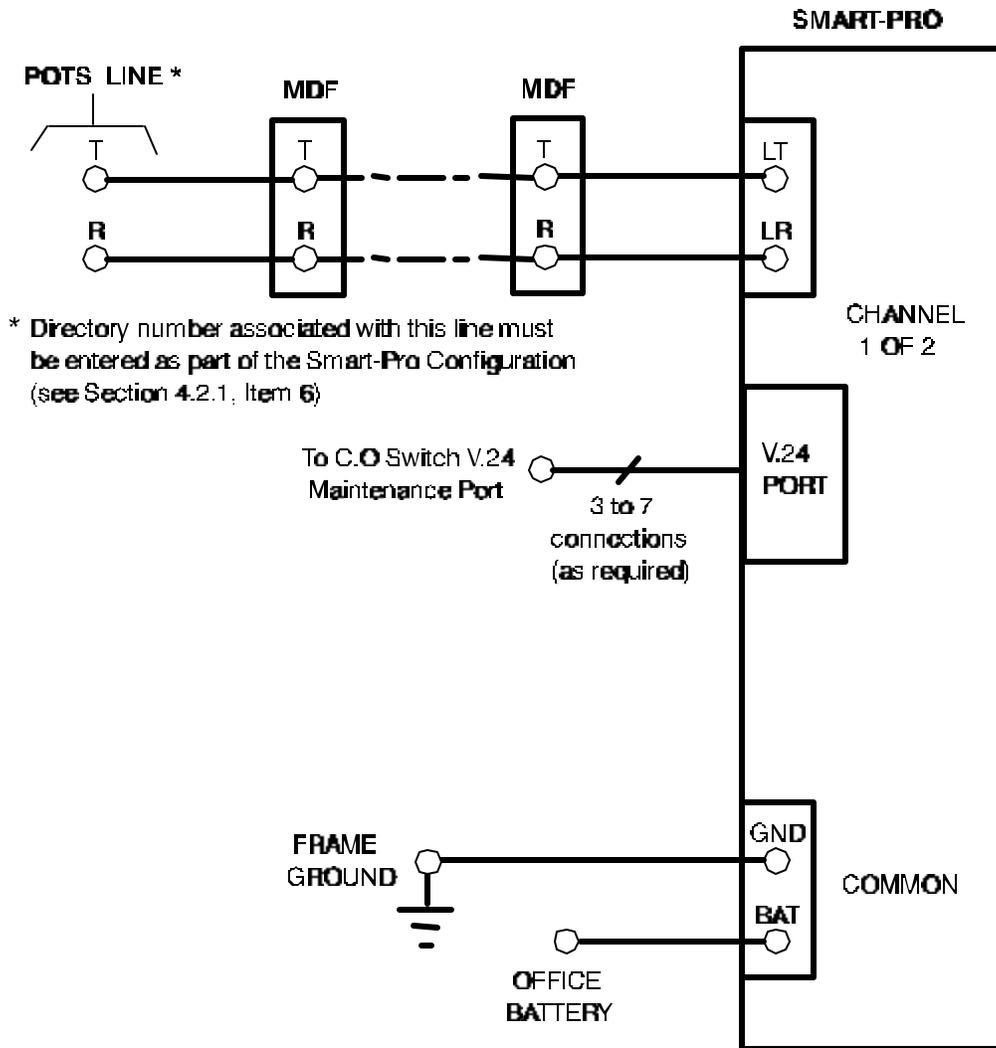
FIGURE 10 - R1MF ANI TIMING DIAGRAM : ESS, DIGITAL, & CROSSBAR SWITCHES
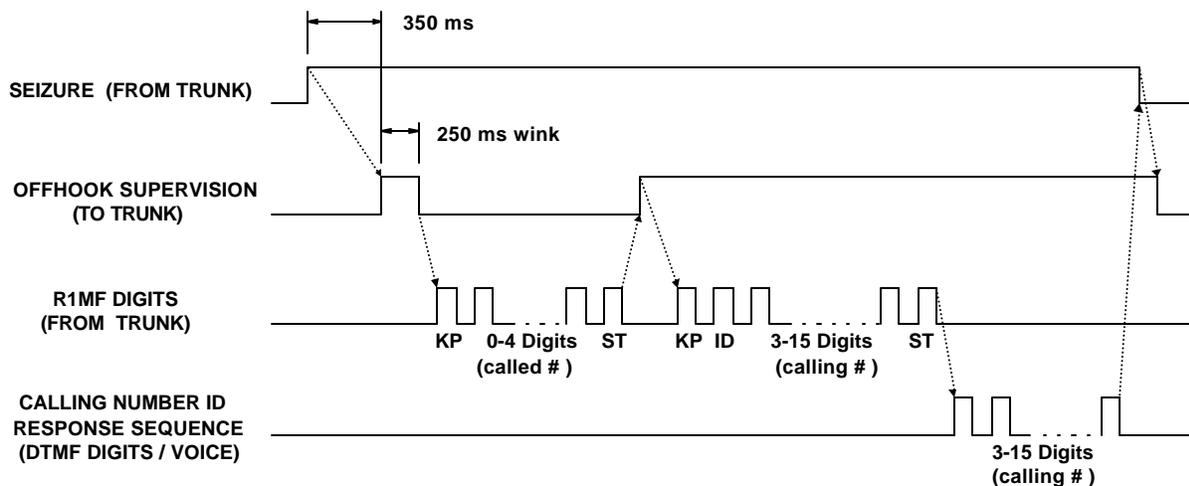
1. Upon receipt of the Smart-Pro® access number, the switching system will seize the outgoing ANI trunk assigned to the Smart-Pro®, causing its "SEIZED" indicator to come on.

2. The Smart-Pro® will wait 350 milliseconds, then respond with a 250 millisecond offhook wink, during which time its "OFFHOOK" indicator will also be on.

3. The trunk circuit will detect the wink, send the MF "KP" tone, 0 to 4 MF digits (constituting the *called* number, depending on the access number length of 3 to 7 digits), and the MF "start" tone ("ST", "STP", "ST2P", or "ST3P") to the Smart-Pro®.

4. After receiving the "ST" tone, the Smart-Pro® will return a *steady* offhook to the trunk, along with illuminating its "OFFHOOK" indicator.

5. This will cause the trunk to send the "KP" MF tone, an "ID" MF digit, the *calling* number MF digits, and finally another "ST" MF digit.

6. The Smart-Pro® will then send the "*" DTMF tone through the switching system to the calling party, and then either the calling number in DTMF or voice depending on the response to the "*".

7. When the calling party (whether DaVaR® unit or craftsperson) hangs up, the switching system will release the trunk, causing the Smart-Pro® "SEIZED" indicator to go out, and the Smart-Pro® will return to the on-hook state, turning off its "OFFHOOK" indicator.

FIGURE 11 - R1MF ANI TIMING DIAGRAM : SxS Switches
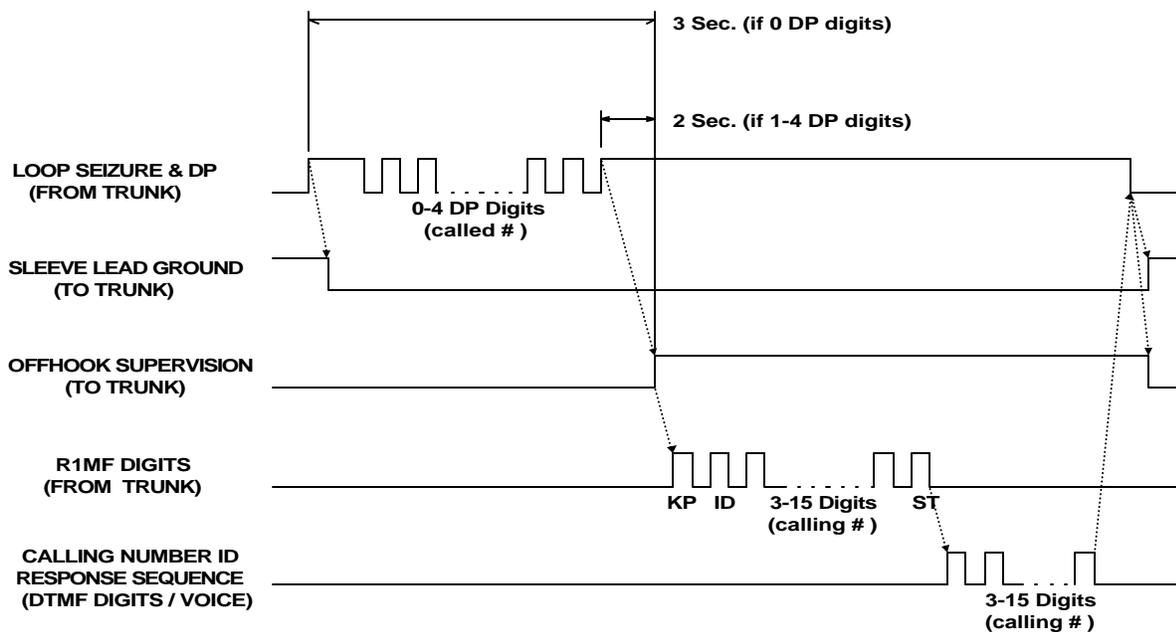
1. Upon receipt of the Smart-Pro® access number, the switching system will initially seize the trunk (apply a loop resistance), then outpulse the *called* number (0 to 4 digits) over the ANI trunk assigned to the Smart-Pro™, followed by a steady seizure. The Smart-Pro® "SEIZED" indicator will follow the dialpulsing, then remain steady.

2. When the Smart-Pro® senses the initial seizure, it will apply a ground to the sleeve lead (required in some applications), then wait for 2 seconds following the last dial pulse (or 3 seconds after seizure if no dial pulses), and return a steady "off-hook" condition to the trunk (reverse battery feed), and illuminate its "OFFHOOK" LED.

3. The trunk circuit will detect the steady off-hook, send the MF "KP" tone, 3 to 15 MF digits constituting the *calling* number, and the MF "start" tone ("ST", "STP", "ST2P", or "ST3P") to the Smart-Pro®.

4. Upon sensing the "ST" tone, the Smart-Pro® will then send the "*" DTMF tone through the switching system to the calling party, and then either the calling number in DTMF or voice depending on the response to the "*".

7. When the calling party (whether DaVaR® unit or craftsperson) hangs up, the switching system will release the trunk, causing the Smart-Pro® "SEIZED" indicator to go out, and the Smart-Pro® will return to the on-hook state, turning off its "OFFHOOK" indicator.

FIGURE 12 - R2MFC ANI SEQUENCE, NORMAL PATTERN

Normal Pattern Example : Transmit Pattern   = 5(9)6
Receive Pattern   = 2X( )F
Calling Party ID # = 1234567

TRUNK   **SMART-PRO®**

Seizure --- >
2 -- >
                         < -- 5
X -- >
                         < -- 9
1 -- >
                         < -- 9
2 -- >
                         < -- 9
3 -- >
                         < -- 9
4 -- >
                         < -- 9
5 -- >
                         < -- 9
6 -- >
                         < -- 9
7 -- >
                         < -- 9
F -- >
                         < -- 6
                         < ----------------- Send DTMF / Voice ID #
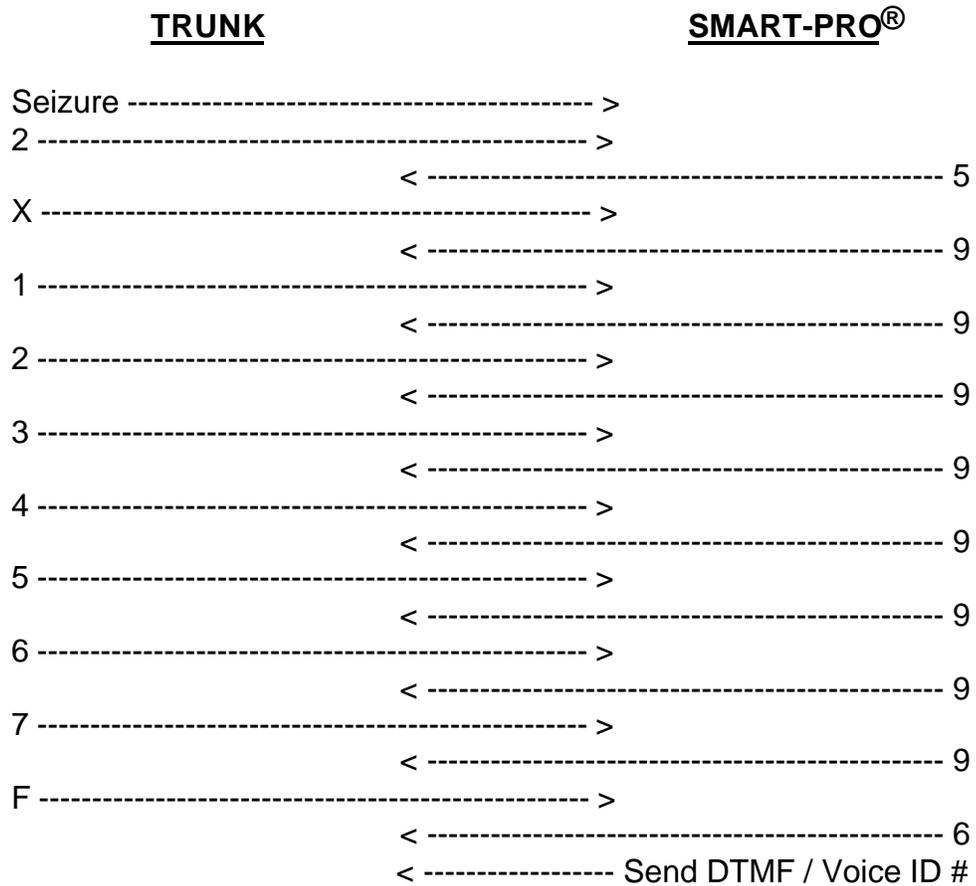
## FIGURE 13 - R2MFC ANI SEQUENCE, MODIFIED PATTERN

Modified Pattern Example : Transmit Pattern   = *R+6*(1)RW131
                                              Receive Pattern   = X( )FXX
                                              Calling Party ID # = 1234567

TRUNK   **SMART-PRO®**

Seizure -- >
                                    < -------------------------- (Line Reversal) R
                                    < -------------------------- (500 MS Digit) +6
X -- >
                                    < --- 1
1 -- >
                                    < --- 1
2 -- >
                                    < --- 1
3 -- >
                                    < --- 1
4 -- >
                                    < --- 1
5 -- >
                                    < --- 1
6 -- >
                                    < --- 1
7 -- >
                                    < --- 1
F -- >
                                    < -------------------------- (Line Reversal) R
                                    < -------------------------- (Wait 250 MS) W
                                    < --- 1
X -- >
                                    < --- 3
X -- >
                                    < --- 1
                                    < ----------------- Send DTMF / Voice ID #