⫷⫷ *APPLICATION NOTE* ⫸⫸

Monitoring DTMF Digits Transmitted by a Phone

Introduction

This Application Note describes how to configure and connect a 930A or 930i Communications Test set for the purpose of monitoring and analyzing digits transmitted by a standard telephone set. It assumes the phone is already connected to a PBX or Central Office switching machine, and the 930A will be bridged across the phone line to monitor the dialed digits.

Configuring the 930

1. Press the TRUNK TYPE function key several times

2. Press the up or down arrow key until you see a display similar to the one illustrated below:
   ```
   NORMAL  LOOP  BRIDGE  CONTACT 2W 900
   ```

3. If "*BATTERY*" appears over softkey 3, go to step 4. Otherwise, press softkey 3 to change it to "*BATTERY*".   **Note:** The reason you are selecting "BATTERY" is because you need to emulate the central office (battery) end in order to trap DTMF digits transmitted by the telephone (contact) end.

4. If the telephone's termination impedance value appears over softkey 4, go to step 5. Otherwise, press softkey 4 repeatedly to change it to match the telephone's impedance. Note that a telephone's impedance is typically 600 ohms.

5. If the PBX sources approximately 48 volts DC between the two leads of the telephone wire, go to the "CONNECTING the 930" section of this document. Otherwise, go to step 6 of this instruction.

6. You must adjust the 930 supervision thresholds for reliable Digit Receiver operation. Press the OPTION MENU button several times, then use the numeric keypad to enter "7", then press the OPTION MENU button again to see the function name as illustrated below:
   ```
   OPTION MENU #:  7 SUPERVISION THRESHOLDS
   ```

7. To enter the function, press any softkey under the display. You will then see the display below:
   ```
   NO INDICATION IF LOOP <  3  V    DEFAULT
   ```

8. This threshold is used to set the tip-to-ring voltage at which the 930 presumes it is ***not*** connected to a working telephone pair of wires. You should be able to leave this value alone. If "<3 V" is not displayed, you may wish to press softkey 4 (DEFAULT). Otherwise, press softkey 1, 2 or 3 to move on to the next supervision parameter. You should then see a screen similar to the one below:
   ```
   ORIG OFF HOOK IF LOOP REVERSES
   ```

9. The above parameter is not adjustable and is displayed for informational purposes only. Press any softkey under the display to see the next supervision parameter, illustrated below:

    `TERM OFF HOOK IF LOOP < 39  V     DEFAULT`

10. You should set this parameter about 7 to 10 volts less than the open circuit (on-hook) voltage between the pair of telephone wires. To change this threshold setting, use the 930 numeric keypad to enter the desired voltage, then press the grey "ENT" key. Now, press softkey 1, 2 or 3 to move to the final function setting, displayed below:

    `60 Hz SUPERVISION FILTER:   ON     OFF`

11. The 60 Hz Supervision Filter reduces the sensitivity of 930 signaling circuitry to 60 Hz interference. It should always be ON. Press softkey 3 to insure this function is ON. Doing so will exit the Supervision Thresholds setup and display the following screen:

    `OPTION MENU #:  7 SUPERVISION THRESHOLDS`

12. Proceed to the next section of this document: "*CONNECTING the 930*"

Connecting the 930

1. As shown in *Figure 1* below, connect a cord between the 930 "TR" jack and the pair of telephone wires connecting the phone to the PBX.
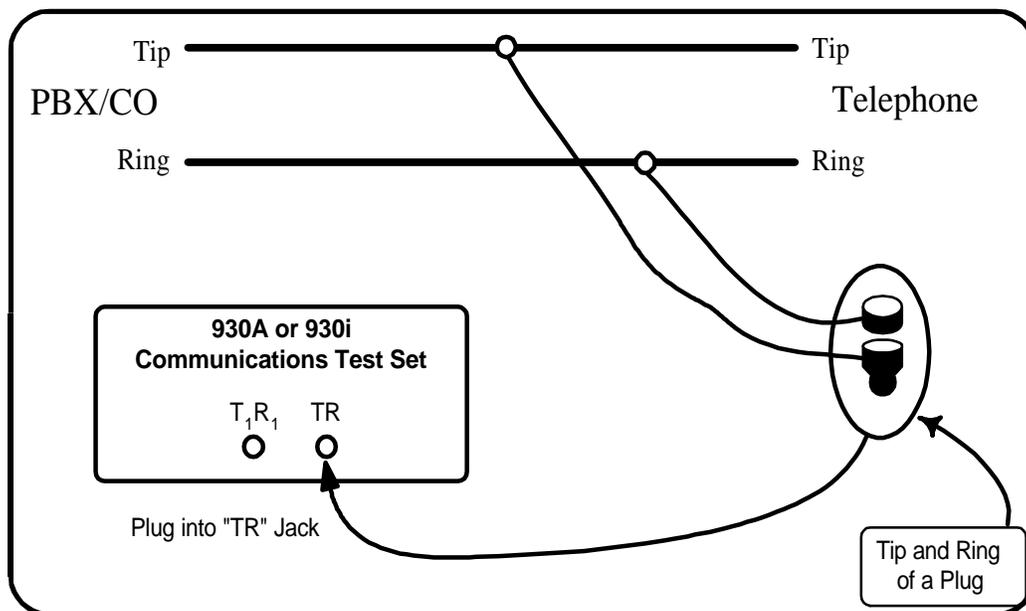
Figure 1 — Bridging Connections

Performing the Test
DIGIT RECEIVER Setup

1. Press the OPTION MENU button several times, then use the numeric keypad to enter "4", then press the OPTION MENU button again to see the function name as illustrated below:

    `OPTION MENU #:  4 DIGIT RECEIVER`

2. To enter the function, press any softkey under the display. You will then see the display below:

    `SET-UP RECEIVE ANALYZE   EXIT`

3. Press softkey 1 (SET-UP). You should now see a display similar to the one below:
   SET RECEIVE: PARAMETERS SEQUENCE EXIT

4. Press softkey 2 (PARAMETERS). You should then see the display similar to the one below:
   RECORD: 1   18 DIGITS   MF   EXIT

5. Press softkey 3 repeatedly until "DTMF" is displayed, then use the numeric keypad to enter the expected digit string length, and press the grey "ENT" key.

6. Now, press softkey 4 (EXIT). You will then see the display below:
   SET RECEIVE: PARAMETERS SEQUENCE EXIT

7. Press softkey 3 (SEQUENCE). You should now see a display similar to the one below:
   WINK   OFF-HK   MORE

8. If there are any characters to the left of "WINK", press the grey "CLR" key, then use the numeric keypad to enter the digit "1" and press the "ENT" key.

9. Now, press the OPTION MENU button two times. You should now see the display illustrated below:
   SET-UP RECEIVE ANALYZE   EXIT

10. Press Softkey 2 (RECEIVE). You should then see a display similar to the one below. (Do not be concerned if you see any digits to the left of "REC#1" — they will be cleared when the digit receiver function captures the next digit string)
    REC#1   HOLD   GATED

11. The Digit Receiver function is now waiting for an off-hook by the telephone.

12. When a digit string has been captured, you should see a display similar to the one below, where the received digits are displayed to the left of "REC#":
    1234567890   REC#1   HOLD   GATED

13. To analyze the frequencies and timing of the digits, press the OPTION MENU button. You will see the display illustrated below:
    SET-UP RECEIVE ANALYZE   EXIT

14. Press softkey 3 (ANALYZE), and you will see a screen similar to the one below:
    TIME ON --- ms   DTMF 4

15. Repeatedly press softkey 4 (MF 4) to cycle through to "DTMF1". You should now see the "captured" digits. You can use the up- and down-arrow keys to view the various digit parameters, and the left- and right-arrow keys to move from digit to digit.

PRINTING Digit Receiver Results to a Printer or Personal Computer
You can have the Digit Receiver function print the results to a serial printer or personal computer for logging. To do so, execute the following steps:

1. Press the OPTION MENU button several times, then use the numeric keypad to enter "3", then press the OPTION MENU button again to see the function name as illustrated below:
   OPTION MENU #: 3 REMOTE CONTROL

2. To enter the function, press any softkey under the display. You will then see a display similar to the one below:

    REMOTE MODE: OFF   SET-UP   EXIT

3. Repeatedly press softkey 2 (OFF) until you see "PRINTER" displayed. The display should now look like the one below:

    REMOTE MODE: PRINTER SET-UP   EXIT

4. Now, press softkey 3 (SET-UP) and you will see the screen illustrated below:

    SELECT   BAUD RT PARITY BIT#   EXIT

5. Press softkey 1 (BAUD RT). You will see a display similar to the one below:

    SET BAUD RATE: 38400

6. Using the numeric keypad, enter the desired baud rate (you may enter any standard baud rate between 300 and 38400), then press the softkey 2. You will then return to the display illustrated below:

    SELECT   BAUD RT PARITY BIT#   EXIT

7. Press softkey 2 (PARITY). You will see the display below:

    PARITY: NONE   EVEN   ODD

8. Select the desired parity setting by pressing the softkey directly below it. You will then be returned to the display shown below:

    SELECT   BAUD RT PARITY BIT#   EXIT

9. Press softkey 3 (BIT). You will see the display below:

    BITS PER CHARACTER: 7   8

10. Select the desired number of data bits by pressing softkey directly below it. You will then see the display below:

    STOP BITS: 1   1-1/2   2

11. Select the desired number of stop bits by pressing softkey directly below it. You will then be returned to the display shown below:

    SELECT   BAUD RT PARITY BIT#   EXIT

12. Press softkey 4 (EXIT) two times. You will then see a display similar to the one below:

    PRINT: ERRORS   DIGITS ANALYSIS

13. The "ERRORS" selection will cause the 930 to print announcements of major E1 error messages such as code errors and loss of the E1 signal. The "DIGITS" selection will print only the digits, without any information about the digit timing parameters or frequencies of the component tones in each digit. When you select "DIGITS", you will see "ANALYSIS" appear as an additional optional selection. Selecting "ANALYSIS" prints out all the digit parameters that the Digit Receiver function calculates. Once you have made your selection(s), press the OPTION MENU button to implement your selections. You will then see the display illustrated below:

    OPTION MENU #: 3 REMOTE CONTROL

Now, when you use the Digit Receiver function, the 930 will print a formatted report to a serial printer or personal computer.

NOTE: If the number of digits in the received string is less than the number you specified in the Digit Receiver "PARAMETERS" setting, the 930 will not immediately start printing the results. In this case, you may wish to transmit an upper case "W" over the serial cable to the 930, to force immediate printing.