

USER'S GUIDE

# MODEL 5212A

LOOPBACK RECEIVER



***Signalcrafters***  
TECH, INC

**SIGNALCRAFTERS TECH, INC.**

57 Eagle Rock Avenue, East Hanover, NJ 07936

Tel: 973 - 781 - 0880 or 800 - 523 - 5815

Fax: 973 - 781 - 9044

<http://www.signalcrafters.com>



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## 1.0 GENERAL:

The Model 5212A Loopback Module is a Wescom 400/Tellabs Type 10 compatible plug-in pc card. It uses one single chassis slot. Optional accessories include a Relay Expander. Each occupies a single chassis slot adjacent to the Model 5212A Loopback Module.

The Model 5212A allows remote testing and diagnostics of telecommunications networks. Testing of leased telephone lines, microwave and other communication paths for measuring of signal strength, loss, noise level and sinad.

The Model 5212A provides a method for measuring the frequency response of both outbound and inbound paths from 404 to 2804 Hz. Correct levels in the communication link can sometimes be achieved by methods which create distortion. The Model 5212A provides an easy method to detect clipping distortion, rather than depend on methods, which only measure level.

The DTMF address ability of the Signalcrafters Model 5212A allows much more complex communication networks to be analyzed; that complexity can be more easily handled by the Model 5212A's DTMF response code, identifying it's address and function. Addressing is further enhanced by the "Wild Card" feature allowing simultaneous functions by group.

A front panel keyboard allows local control of all functions. A LCD display indicates the function in progress and programming features during set up. Software updates can be downloaded via the front panel USB port utilizing Signalcrafters "Communication Program" software.



5212A front panel with keyboard,  
USB port and LCD display.

**2.0 PROGRAMMABLE FEATURES:** Section 2 describes the basic available controls. Macro programming keys inside [ ] for reference only, detailed steps in Section 5.

**2.1 ADDRESS (Assign an address to the unit): [PRGM, 1, and ENTER, Assign address,]**  
Address digits may be selected from any of the 16 DTMF possibilities (0 thru 9, A, B, C, D, \*, #). Maximum four digit address with highest operational security at four (4) characters.

**2.2 MODES (Changes operational features via a simulated 4 position switch): [PRGM, 2, ENTER, view Mode switch and select]**

Mode	Left (“L“)	Right (“R“)
1	Digit Counting	Wrong Character Reset
2	ID Function 2 Only	ID All Functions
3	Keyboard Changes Functions	Keyboard Sends DTMF
4	One Digit Function Dial Function Only DTMF 7 to stop Loopback Function Display Function & DTMF Character No Relay Expander Card Aux Relay Independent of Function Relays	Two Digit Function Dial Address and Function Dial Address and Function Display Function Only Relay Expander Card: Set *n; Reset #n Aux Relay follows Function Relays

**Notes:**

**Functions are described in Table 2.**

**Dial Function Only:** Allows a change to a new function while another function is running (Table 2).

**DTMF 7 to stop Loopback Function (“1”):** When loopback function is running you must send a 7 to stop it in Mode: XXXL.

**2.3 OUTPUT LEVEL (Adjust the transmit/output level): [PRGM, 3, ENTER]**

Level adjust from +7 dBm to -20 dBm in 1 dB steps.

**2.4 IMPEDANCE (Changes impedance to either 600Ω or 900Ω): (Requires changes on both keyboard and PC Board jumpers)**

a. Keyboard [PRGM, 4, ENTER].

b. PC Board Jumper changes.

Jumper Number	600Ω	900Ω
J8 (Rec In Load)	1 & 2	2 & 3
J10 (Rec Out Load)	1 & 2	2 & 3
J11 (TX In Load)	1 & 2	2 & 3
J12 (Loopback TX)	1 & 2	2 & 3

**2.5 ADDRESS LENGTH (Address length plus one (1) for function), [PRGM, 5, ENTER]**

Allowable entries from 1 to 5. For 4 address digit set to 5 (4 address digit plus 1 for function = 5).

NOTE: If entered number is less than 5 (four and below), the last digit sent to it (received from the sending end) must be sustained for 100 msec.

## 2.6 LOOPBACK AMPLIFIER / ATTENUATOR

(Sets the gain or loss of the retransmitted loopbacked signal(s):

[PRGM, 6, ENTER, set gain or loss]

The desired gain or loss may be adjusted in 1 dB increments from +24 dB to -31 dB.

## 2.7 FUNCTION DURATION (How long the test/function will last timewise):

[PRGM, 7, ENTER, set time]

Function Duration is the time the function will last. 0.1 min to 9.9 min (Functions: 1, 4, 5 and 7). If you select 0.0 min the functions 1, 3, 4, 5, 7, 9 and C will not time out.

## 2.8 JOKER/GROUP CALL (Allows simultaneous activation of functions by groups):

[PRGM, 8, ENTER, Set character]

The Joker setting will make a digit within an address a wildcard.

## 2.9 CONTRAST (Changes the brightness of the display): [PRGM, 9, ENTER, set brightness]

By adjusting the Contrast number between 200 to 250 changes the brightness of the LCD. Brightest is 250, shipped out of the factory set to 227.

## 2.10 VERSION INFO: [PRGM, 0, ENTER, See Version]

Will display current running software version. Visit WEB site ([www.signalcrafters.com](http://www.signalcrafters.com)) or contact factory for latest version. Refer to WEB site for downloading latest version if desired.

## 2.11 DEFAULT: [PRGM, #, ENTER, Unit returns to default settings]

ADDRESS	1590
MODE	RRLR
LEVEL OUT	0 dBm
Z	600Ω
DIGIT	5
LOOPBACK	0 dBm
DURATION	4.0 min
JOKER	P
CONTRAST	227

Table 1

### 3.0 FUNCTIONS:

#### 3.1 RECEIVER TEST FUNCTIONS:

The following description summarizes the functions of a Model 5212A. To cause operation, you must dial the address, followed by the one or two-digit function code. The “repeat address” requirement may be done with a manual DTMF keyboard, but it is more easily accomplished using a Signalcrafter Model 5106 Base Master or Model 5493A.

Function		Description
1	01	Loopback mode for measuring round-trip impairments.
2	02	DTMF indication of the remote’s address and selected function.
3	03	Generate a tone sequence from 404 to 2804 Hz (every 200 Hz except 2604) for inbound frequency response measurements.
4	04	Generate 1004 Hz for mid-band loss.
5	05	Generate 1004 Hz at -13 dB.
6	06	“Amputate” provides a way to silence an offending remote.
7	07	“Quiet Termination” mode facilitates noise measurements.
8	08	Generate a tone sequence from 404 to 2804 Hz (every 200 Hz except 2604) at -13 dB from output setting to detect level compression versus frequency.
9	09	Generate 2804 Hz for high frequency loss.
A	0A	Un-timed Loopback mode for long term round-trip measurement.
B	0B	Causes 5212M to measure outbound loss versus frequency.
C	0C	Simultaneous 857 and 863 Hz for intermodulation measurement.
*/#	*9/#9:	Auxiliary Relay Control (pin #’ on edge connector, NO: 33, NC: 31, A: 29).
N/A	*n/#n:	Optional relay expander boards provide 8 DTMF controlled relays and up to 64 DTMF controlled relays.
0	00	Reset command, ends any function in progress.

Table 2

└ Two digit function

└ One digit function

### 3.2 TRANSMITTER TEST FUNCTIONS:

#### **Function 3 and 8 Step Tones (Function Duration set 0.1 sec. or greater):**

Function 3 tone output is set to level set in Section 5.5.

Function 8 tone output is set to level set in Section 5.5 -13dB.

<b>Tone Number</b>	<b>Frequency</b>
1	404 Hz
2	604 Hz
3	804 Hz
4	1004 Hz
5	1204 Hz
6	1404 Hz
7	1604 Hz
8	1804 Hz
9	2004 Hz
10	2204 Hz
11	2404 Hz
12	2804 Hz

#### **Function 3 and 8 Step Tones (Function Duration set 0.0 sec.):**

Output frequency: 404 Hz

Function 3 tone output is set to level set in Section 5.5.

Function 8 tone output is set to level set in Section 5.5 -13dB.

#### **Function 4 and 5:**

Output frequency: 1004 Hz

Function 4 tone output is set to level set in Section 5.5.

Function 5 tone output is set to level set in Section 5.5 -13dB.

#### **Function 9:**

Output Frequency: 2804 Hz

Function 9 tone output is set to level set in Section 5.5.



### 3.3 RELAY FUNCITONS:

#### Function Relays:

There are 3 Functions Relays. REC Relay, TX Relay and TX LOAD IN Relay.

REC Relay (K2): Switch's remote receiver phone line and loads phone line and remote equipment.

TX Relay (K3): Switch's remote transmitter phone line.

TX LOAD IN Relay (K1): Loads remote transmitter equipment.

**Auxiliary Relay (K4, NO: pin-33, NC: pin-31, A: pin-29):** The Auxiliary Relay is a SPDT relay.

#### One Digit Function Mode (Mode Position 4 set to "L"):

Auxiliary Relay is controlled by address + \* or #. From the keyboard press \* or #

#### Two Digit Function Mode (Mode Position 4 set to "R"):

Auxiliary Relay follows Function Relays. By sending the "address" + \*9 or #9 (1590\*9) you tell the Model 5212A to SET the Auxiliary Relay and make it independent of the Function Relays. To make the Auxiliary Relay follow the functions relays again send "address" + \*D or #D (1590\*D).

#### Auxiliary Relay Control Examples:

Address: 1590, Mode: XXXR (Two Digit Function), Digit: 5 (Four Address plus function)

Set Relay: 1590\*9

Reset Relay: 1590#9

Address: 1590, Mode: XXXL (One Digit Function), Digit: 5 (Four Address plus function)

Set Relay: 1590\*

Reset Relay: 1590#

### CONTROLLING 64 RELAYS FROM ONE MODEL 5212A

To control more than one relay card, program Digit to 5 and program address xxx\* (fourth digit of address to \*) and Mode 4 to R.

The multi-relay DTMF control sequence is 6 digits. Four address digits, DTMF \* in the fifth digit causes the corresponding relay to latch ON. DTMF # in the same digit causes the corresponding relay to pulse ON, then latch OFF.

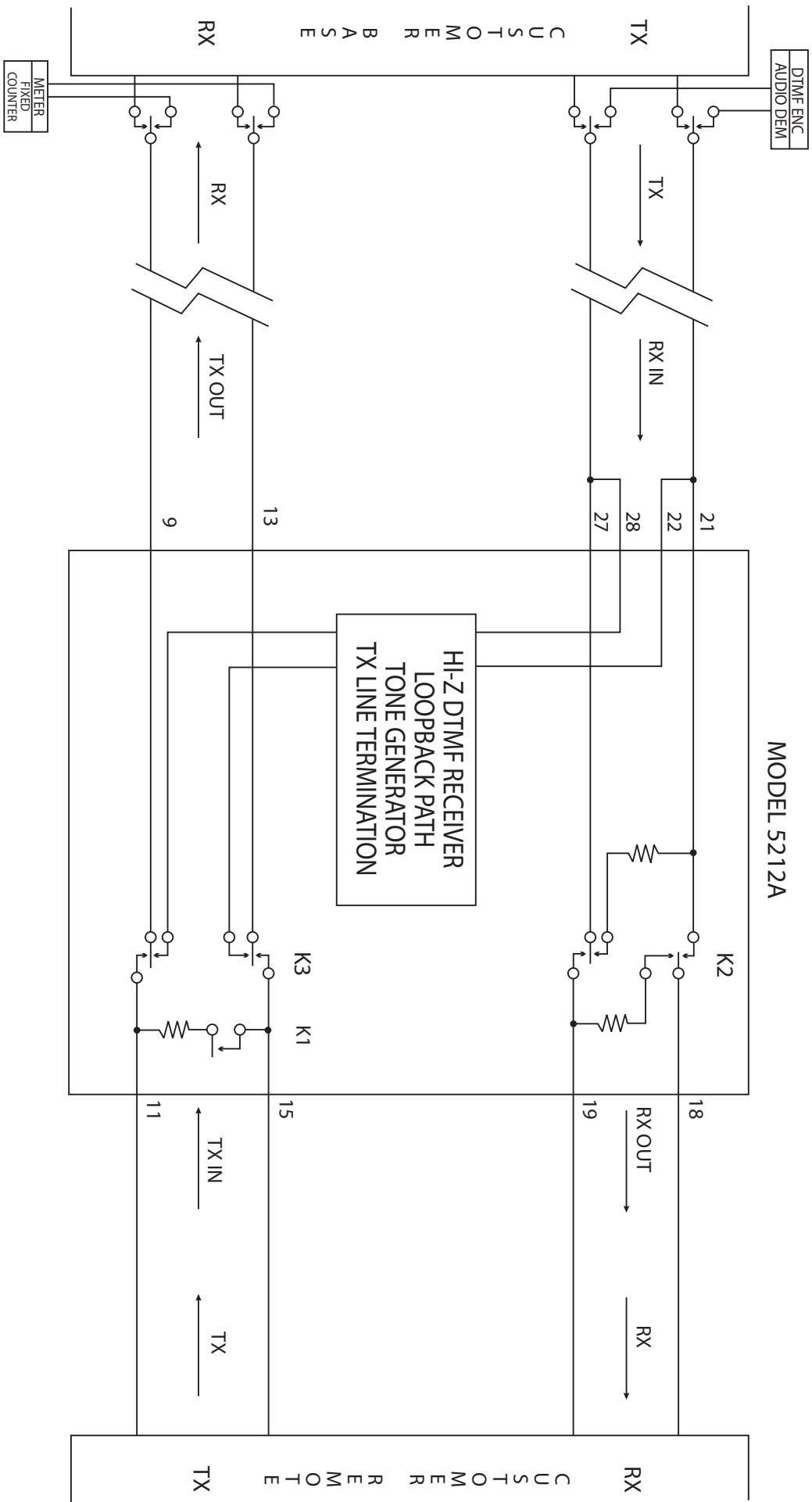
ADDRESS			RELAY CARD (1-8)	SET or RESET	RELAY (1-8)
1	5	9	1	*	1

#### Auxiliary Relay Control Examples:

Address: 159\*, Mode: XXXR, Digit: 5

Set Relay Card 1 Relay 1: 1591\*1

Reset Relay Card 1 Relay 1:1591#1



**4.0 PIN CONNECTIONS: Pin connections on rear of Model 5212A circuit board.** All even numbers on one side, all odd numbers on the other. External connections to be made as required.

TERMINAL NUMBER	CONNECTION	TERMINAL NUMBER	CONNECTION
1	Tone out, un-switched	2	
3		4	
5		6	
7	Tone out, un-switched	8	
9	TX OUT RING	10	
11	TX IN RING	12	
13	TX OUT TIP	14	
15	TX IN TIP	16	
17	+DC Input (+12 , +24, +48 VDC)	18	REC OUT TIP
19	REC OUT RING	20	
21	REC IN TIP	22	Receive In Tip (Loopback)
23		24	
25		26	
27	REC IN RING	28	Receive In Ring (Loopback)
29	AUX-1 Common	30	
31	AUX-1 Normally Closed	32	
33	AUX-1 Normally Open	34	
35	- 24 VDC or 48 VDC Input	36	+DC Input (+12 , +24, +48 VDC)
37	AUX-2 Normally Closed Power Out	38	
39	AUX-2 Normally Open Power Out	40	
41	+DC Input (+12 , +24, +48 VDC)	42	+DC Input (+12 , +24, +48 VDC)
43	- 12 VDC Input	44	- 12 VDC Input
45	-5 VDC output; To Model 2452	46	-5 VDC output; To Model 2452
47		48	
49		50	
51		52	
53	Relay Count Out; To Model 2452	54	
55	Relay Reset Out; To Model 2452	56	

Table 3

## 5.0 PROGRAMMING:

### 5.1 HARDWARE JUMPER SETTINGS:

Jumper Number	12VDC & 24 VDC	48 VDC
J14 (Power Input)	1 & 2	2 & 3

	Software Controlled	Hardware Controlled
J1 (CPU Watchdog)	1 & 2	3 & 4

	600Ω	900Ω
J8 (Rec In Load)	1 & 2	2 & 3
J10 (Rec Out Load)	1 & 2	2 & 3
J11 (TX In Load)	1 & 2	2 & 3
J12 (Loopback TX)	1 & 2	2 & 3

	600Ω	900Ω	HI-Z
J9 (Rec In Loopback)	1 & 2	2 & 3	1

Note: If pins 28 and 22 are connected to pins 27 and 21 set J9 to HI-Z (pin 1).

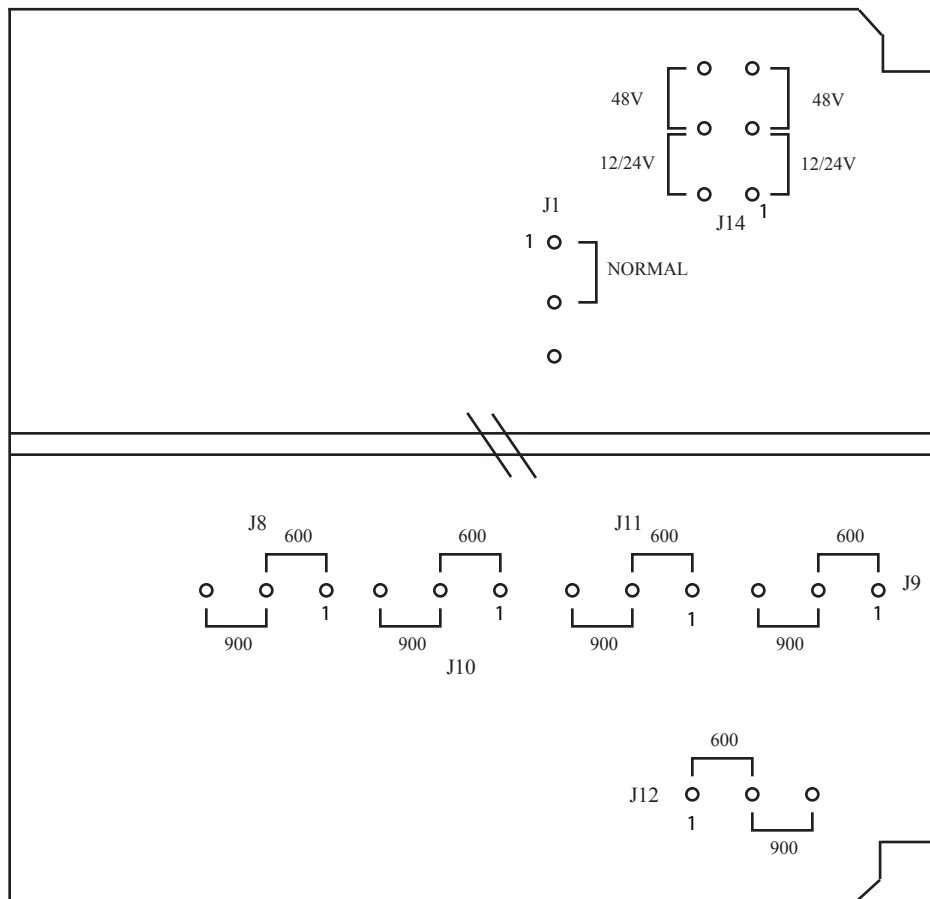


Figure 1

## 5.2 Front Panel Programming:

Once in program mode, **PRGM**, you can perform multiple set-ups without pushing **PRGM** each time. The LCD Display background color will change to amber to indicate the Model 5212A is in program mode.

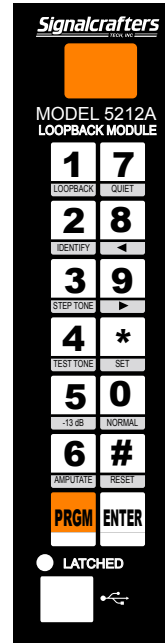
To end programming push the **PRGM** key again.

Both the scrolling keys, ◀ (the 8 key) and ▶ (the 9 key) are only active when adjusting **Contrast**.

Except for **Contrast** the scroll key ◀ (the 8 key) is never active. You cannot backspace to make changes.

When programming, the curser will automatically move to the next location when you perform character changes. The exception to this is the last character in the program, where the curser will remain until the screen is closed.

Note: If you have selected the wrong program key and have not press the ENTER key you can press another program key and ENTER to get to the desired program screen.



Programming Screens	Description	
1	Address	0000 to DDDD
2	Mode	LLLL to RRRR
3	Output Level	+7dBm to -20dBm
4	Output Impedance	600Ω or 900Ω
5	Last Digit	1 to 5
6	Loopback Gain or Attenuation	+24dB to -31dB
7	Function Duration	0.1 min to 9.9 min
8	Joker Setup	0,1,2,3,4,5,6,7,8,9,A,B,C,D,*,#,P
9	Contrast Adjust	200 to 255
*	NOT USED	
0	Software Verison Number	Lists Version of Firmware
#	Default	Set Model 5212A back to default
PRGM	Enter Program Mode	
ENTER	Entering in Data	

Table 4

### 5.3 Card Address:

Press **PRGM** (if not already in PRGM mode)

Press **1**

Press **ENTER**

Enter Address

Note: To enter “alpha mode,” for entering an A, B, C or D, momentarily press the **ENTER** key.

Once in this mode:

push **0** for A

push **1** for B

push **2** for C

push **3** for D

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### 5.4 Modes:

Press **PRGM** (if not already in PRGM mode)

Press **2**

Press **ENTER**

To change the Left to a Right or Right to a Left press \* otherwise scroll ahead by pressing **▶** (the 9 key)

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### 5.5 Output Level:

Press **PRGM** (if not already in PRGM mode)

Press **3**

Press **ENTER**

To change the sign press \* otherwise scroll ahead by pressing **▶** (the 9 key)

Either enter a number or continue to scroll

**Note:** the Model 5212A can only be set from +7dB to -20dB, if you enter a number outside this range the unit will default to an allowable value.

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### 5.6 Output Impedance:

Press **PRGM** (if not already in PRGM mode)

Press **4**

Press **ENTER**

To toggle between the 600 and 900 ohm impedance press \*

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

**Set the four impedance jumpers, J8, J10-J12, to match entered impedance.**

### 5.7 Last Digit:

Press **PRGM** (if not already in PRGM mode)

Press **5**

Press **ENTER**

Enter the “last digit” (only a 1, 2, 3, 4, or 5 are permitted entries)

NOTE: If less than 5, the last digit must be sustained 100 msec and have a dead time of 13.3 ms.

Caution: If you enter an incorrect number it may truncate the address and alter the address previously entered.

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### **5.8 Loopback Gain / Attenuation Level:**

Press **PRGM** (if not already in PRGM mode)

Press **6**

Press **ENTER**

To change the sign press \* otherwise scroll ahead by pressing ► (the 9 key)

Either enter a number or continue to scroll

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### **5.9 Function Duration:**

Press **PRGM** (if not already in PRGM mode)

Press **7**

Press **ENTER**

Enter **0.0** if no end to function is desired. Numbers between 0.1 min to 9.9 min for Function Duration.

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### **5.10 Joker:**

Press **PRGM** (if not already in PRGM mode)

Press **8**

Press **ENTER**

Enter Joker character. To change Joker back to its parking post press **ENTER 4**.

► (the 9 key)

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### **5.11 Software Version:**

Press **PRGM** (if not already in PRGM mode)

Press **0**

Version will display on LCD screen.

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### **5.12 Contrast Adjust:**

Press **PRGM** (if not already in PRGM mode)

Press **9**

Press ► (the 9 key) to increase Contrast

Press ◀ (the 8 key) to decrease Contrast

When finished press **ENTER** until the **LATCHED** LED comes on (after 3 seconds) or **PRGM**.

### **5.13 Default:**

Press **PRGM** (if not already in PRGM mode)

Press **#**

Press **ENTER**

Returns Model 5212A to it's default settings (see table 1).

Tip **ENTER**

Press **ENTER** until the **LATCHED** LED comes on (after 3 seconds).

## 6.0 SPECIFICATIONS:

**CONTROLS & INDICATORS:** 12 button keypad for local mode select with LCD display to indicate selected function and a LED to indicate function is running or Auxiliary state.

POWER SUPPLY: 12, 24 or 48 VDC

Current Drain:

DC Voltage	Idle	Activated
12 VDC (9.6 VDC to 14.4VDC)	160mA	230mA
24 VDC (19.2 VDC to 28.8 VDC)	90mA	126mA
48 VDC (38.4 VDC to 56 VDC)	100mA	135mA

Additional current due to each Relay expansion card:

	12VDC	24VDC	48VDC
LED annunciator power Switch ON	24mA	13mA	13mA
LED annunciator power Switch Off	1mA	1mA	1mA
Relay card without LED's	1mA	1mA	1mA

**TEMPERATURE RANGE:** -30°C to +70°C operating; -55°C to +85°C storage

**DIMENSIONS:** Height 5.58" (14.17 cm); Width 1.42" (3.61 cm); depth 5.53" (14 cm)

**DTMF:** 50 ms ON, 50 ms Hiatus period (OFF).

DTMF Character	Low Tone (Hz)	High Tone (Hz)	Decoder Hex Code
1	697	1209	1
2	697	1336	2
3	697	1477	3
4	770	1209	4
5	770	1336	5
6	770	1477	6
7	852	1209	7
8	852	1336	8
9	852	1477	9
0	941	1336	A
*	941	1209	B
#	941	1477	C
A	697	1633	D
B	770	1633	E
C	852	1633	F
D	941	1633	0

Table 5



**ADDRESS CODING:**

Up to 4 digits, field programmable

**SIGNALING SPEED:**

Each character must be minimum 40 ms in duration; maximum 2 seconds between characters.

**LOOPBACK MODE:** Timed (function 01) and Un-timed (function 0A):

Loopback Gain: Programmable in 1 dB increments from +24 dB to -31 dB

Loopback frequency response:  $\pm 0.3$  dB from 0.3 to 4 kHz

Loopback distortion: 0.25% maximum THD (total harmonic distortion)

**ENCODER SPECIFICATIONS:**

**OUTPUT IMPEDANCE:** In normal mode, the customer's equipment connected between pins 11 and 15 and terminates the line at pins 9 and 13. During test modes, the Model 5212A is 600 $\Omega$  or 900 $\Omega$ , balanced and transformer isolated.

**FREQUENCY ACCURACY:**

1004 Hz test tone:  $\pm 200$ ppm

Step tones:  $\pm 200$ ppm

DTMF:  $\pm 200$ ppm

**ENCODER DISTORTION:**

Distortion (function 04): 0.5% maximum THD.

Distortion other modes: 1% maximum THD.

**TONE OUTPUT LEVEL:** Tone output level from +7 dBm to -20dBm into 600 $\Omega$  or 900 $\Omega$ .

**DTMF ID OUTPUT LEVEL:**

DTMF Tone Twist:  $\pm 0.1$  dB maximum difference between low and high tone.

**SWEEP (functions 03 and 08):**

Sweep rate: Sequence takes about 90 seconds. Sweep rate tone present for 1.5 seconds with a 1 second pause between tones. Sequence takes about 30 seconds.

**LEVEL ACCURACY:**

$\pm 0.1$  dB at 25°C.

$\pm 0.3$  dB from +70°C to -30°C.

**QUIET MODE (function 07):**

Noise level  $\geq 55$  dB below 0 dB reference.

**AMPUTATE MODE (function 06):**

Un-timed quiet mode. Disconnects Remote equipment

## **DECODER SPECIFICATIONS:**

### **INPUT TONE LEVEL RANGE:**

3.0 Vrms to 3.0 mVrms, each DTMF component tone (NOT composite level).

### **INPUT IMPEDANCE:**

When in normal mode, the DTMF receiver provides  $>20\text{ k}\Omega$ , in parallel with the customer's equipment – connected between pins 18 and 19 – to terminate the line at pins 21 and 27. During test modes:  $600\Omega$  or  $900\Omega$  balanced and transformer isolated.

### **CTCSS REJECTION:**

The decoding process will not be inhibited by any tone from 67 to 440 Hz and no more than 6 dB above the weaker DTMF component tone.

### **SINAD:**

16 dB or better signal.

### **INTERDIGIT TIMING:**

2.4 seconds.

### **CONTROL MODE (\*9 Set/#9 Reset) RELAY OUTPUT:**

K2: 2 form-C contacts, rated 2 amps 30 VDC, or 0.6 amps at 120 VAC.

## 7.0 OPTIONAL MEASUREMENT FUNCTION:

This appendix provides technical data for the Model 5212A Measurement Function.

### 7.1 GENERAL

7.1 MEASUREMENT TEST FUNCTION: Model 5212A can measure the level and frequency of a 300-3000 Hz tone, and send that measurement in a DTMF string to be decoded by the Model 5493A and Signalcrafters Path Monitor Software.

7.2 The remote Model 5212A must have Mode Position 4 to “R” and Mode Position 2 to “R” when using Path Monitor Software. To start the measurement process, send the address of the remote Model 5212A, followed by “0B” (for address 1590, send DTMF string 15900B). With Mode Position 2 set to “R”, the command string is echoed back from the Model 5212A.

7.3 The remote Model 5212A sends DTMF ABCA03 to the Model 5493A, which will start sending its step tone sequence. The remote Model 5212A wait for the tone to disappear and then transmit the reading back in a DTMF burst. If the Model 5212A didn’t receive the tone sequence it will send DTMF ADCA00 to the Model 5493A which will reset the Model 5493A

7.4 Levels higher than 0 dBm are indicated in ten’s complement notation:

95DB means +5 dBm  
96DB means +4 dBm  
97DB means +3 dBm  
98DB means +2 dBm  
99DB means +1 dBm

7.5 The measurement function remains enabled until the Model 5212A does not see a tone for 2.5 seconds or the Model 5212A received a return to normal command (for example, 159000).

7.6 **Note: Model 5212A’s Relay Count Out pin-53 is different then Model 5212-M’s Relay Count Out pin-50.**