Selectone

Operating Instructions
MODELS ST-807, ST-807L
SUB-MINATURE DTMF DECODER

GENERAL

The ST-807 is a sub-miniature DTMF decoder designed for installation in hand-held and mobile radios. The ST-807 uses surface mount and uP technologies to produce a small sized product aimed at the limited available space in modern two-way radios. Product with an L suffix (ST-807L) is identical to the ST-807, with the exception that the interface connector is eliminated and interface is accomplished with 18 inch long flying leads soldered directly to the ST-807 printed circuit board. Elimination of the connector on the ST-807L further reduces the height profile for exceptionally critical applications. The ST-807 will respond to an address of 1 to 7 digits in length using any of the 16 DTMF characters. There are no restrictions on the use of repeated digits in the address. This provides greater than 250,000,000 unique addresses. Digit position and address length recognition virtually eliminate the possibility of response to incorrect addresses. Group/all call, deadbeat disable, alert tone, transpond acknowledgement and remote reset are additional features.

Because of our comprehensive warranty policy, and surface mount construction, field repair is usually not cost effective.

Application notes are available or can be developed for most radio models. If you would like applications details for a specific radio, please call us. Together we may be able to save you some time and money.

OPERATING SPECIFICATIONS

Parameter	Min	Typ	Max	Unit
Power supply voltage	5.5		25	V DC
Power supply current			7	mA DC
Open collector output sink currents			>60	mA DC
Call Lamp output current			>100	mA DC
Temperature range	−30		+60	°C
DTMF input (HI range)	30		850	mV RMS
DTMF input (LO range)	10		280	mV RMS
Signal to noise ratio	12			dB SINAD
DTMF twist			±10	dB
Interdigit time	50		1000	mS
Digit time		50		mS
Decode time	1000			mS[1]
DECODE MOMENTARY time			2000	mS[2]
Transpond tone level		5		V p-p, no load
Interconnect type	13 18" flying leads terminated on board (ST-807L) or at a miniature low profile connector (ST-807).			
Size	1.7"L x 0.825"W x 0.25"H (0.150"H no connector) (43mm x 21mm x 6mm)			

[1] Measured from the end of the last DTMF character in the sequence.

[2] During this period both DECODE MOMENTARY and TRANSPOND TONE are both active.

OPERATION

While awaiting a call, the decoder will mute the radio to block out unwanted channel traffic. When the correct DTMF address is received, the decoder latches its DECODE LATCHED output to the unmute condition, provides a DECODE MOMENTARY to activate a buzzer, alerting device or operate PTT for transpond applications. Outputs to drive a call indicator are also provided as well as tones for transpond or local alert functions. When the radio operator responds to the call, all outputs are reset on the "ON-HOOK" to "OFF-HOOK" transition.

INSTALLATION

MOUNTING

Use of a double-sided adhesive pad or an insulating piece of Mylar® eliminates hardware requirements. When using the adhesive pad, mount the ST-807 on a clean, dry surface, oriented to allow easy routing of the wiring to the radio. Press firmly after mounting to ensure good adhesive contact. Do not touch the adhesive or attempt to re-position the unit after mounting.

WIRE INTERFACE

Wire color assignments for the ST-807 and ST-807L are identical. Numbers shown in brackets [#] represent the ST-807 connector pin number.

[9] NEGATIVE (−) SUPPLY (BLACK): Connect to system (−) Supply (GND).

[3] POSITIVE (+) SUPPLY (RED): Connect to system (+) Supply (5.5 to 25Vdc).

[12] DTMF SIGNAL INPUT (GREEN): Connect to signalling audio source, e.g., discriminator output, volume high, etc. This input will accept levels between 30 and 850 mVrms. Place a solder jumper at JU1 for lower levels 10 to 280 mVrms. Connection to the speaker output is not recommended due to the wide dynamic range at this point.

NOTE: *This point must not mute while awaiting signalling tones.*

[6] CALL LAMP #1 (YELLOW): Open collector of a darlington transistor, providing a flashing CALL LAMP. This output is latched on until an ON-HOOK to OFF-HOOK transition or receipt of a remote reset command.
NOTE: *CALL LAMP #2 must be tied to NEGATIVE (-) SUPPLY when using CALL LAMP #1 as an output.*

[11] CALL LAMP #2 (BLUE): Open emitter of a darlington transistor, providing a flashing CALL LAMP. This output is latched on until an ON-HOOK to OFF-HOOK transition or receipt of a remote reset command.

NOTE: *CALL LAMP #1 must be tied to POSITIVE (+) SUPPLY when using CALL LAMP #2 as an output.*

NOTE: *MOST CALL LAMPS ARE LED'S WHICH REQUIRE A SERIES CURRENT LIMITING RESISTOR.*

[10] TRANSPOND PTT/SET (BLK/YEL): Open collector output, momentarily saturates to (-) Supply (GND) following each Primary code sequence or Secondary code if Deadbeat Disable mode is selected. Additionally this line SET's the DECODE LATCHED output to the UNMUTE condition when taken low (PTT switch is operated). This is intended to force monitor and prevent multiple blind transmissions.

[5] DECODE MOMENTARY/DEADBEAT DISABLE (ORG/BLK): When JU8 and JU10 are both OPEN, an open collector output saturates to (-) Supply (GND) for approximately 2 sec. following each Primary or Secondary code sequence (Factory shipping condition). When JU8 and JU10 are both SHORTED, an open collector output saturates to (-) Supply on reception of the Secondary code (Deadbeat Disable), and is Reset ONLY by the Deadbeat Disable RESET CODE (Deadbeat disable output state is stored in EEPROM and will remain as set even following a loss of power).

[7] MONITOR/RESET (BROWN): Connect to the microphone hookswitch, hang-up button or box. This lead places the DECODE LATCH output in UNMUTE condition when off-hook and resets all other outputs on the transition from "ON-HOOK" to "OFF-HOOK". See the JUMPER SETUP CHARTS to customize the MONITOR/RESET line for your application using JU2.

[1] ALERT TONE (WHT/BLU): 525Hz tone pulsed 250mS "ON" then 250mS "OFF" for local user alerting applications. This tone remains active until reset.

[13] TRANSPOND TONE (WHT/GRN): 525Hz tone active only while TRANSPOND PTT is active, (for transpond applications).

[4] DECODE LATCH (WHT/ORG): Connect to the muting point in the radio. This output goes to the UNMUTE condition upon decode, if the MONITOR/RESET Line is "ON-HOOK". It may be reset to the MUTE condition by a "OFF-HOOK" then back "ON-HOOK" transition of the MONITOR/RESET line. If the MONITOR/RESET line is "ON-HOOK" this output may be reset remotely. Jumpers JU3 and JU4 set the MUTE/UNMUTE conditioning for this lead. See the JUMPER SETUP CHARTS to customize the output for your application.
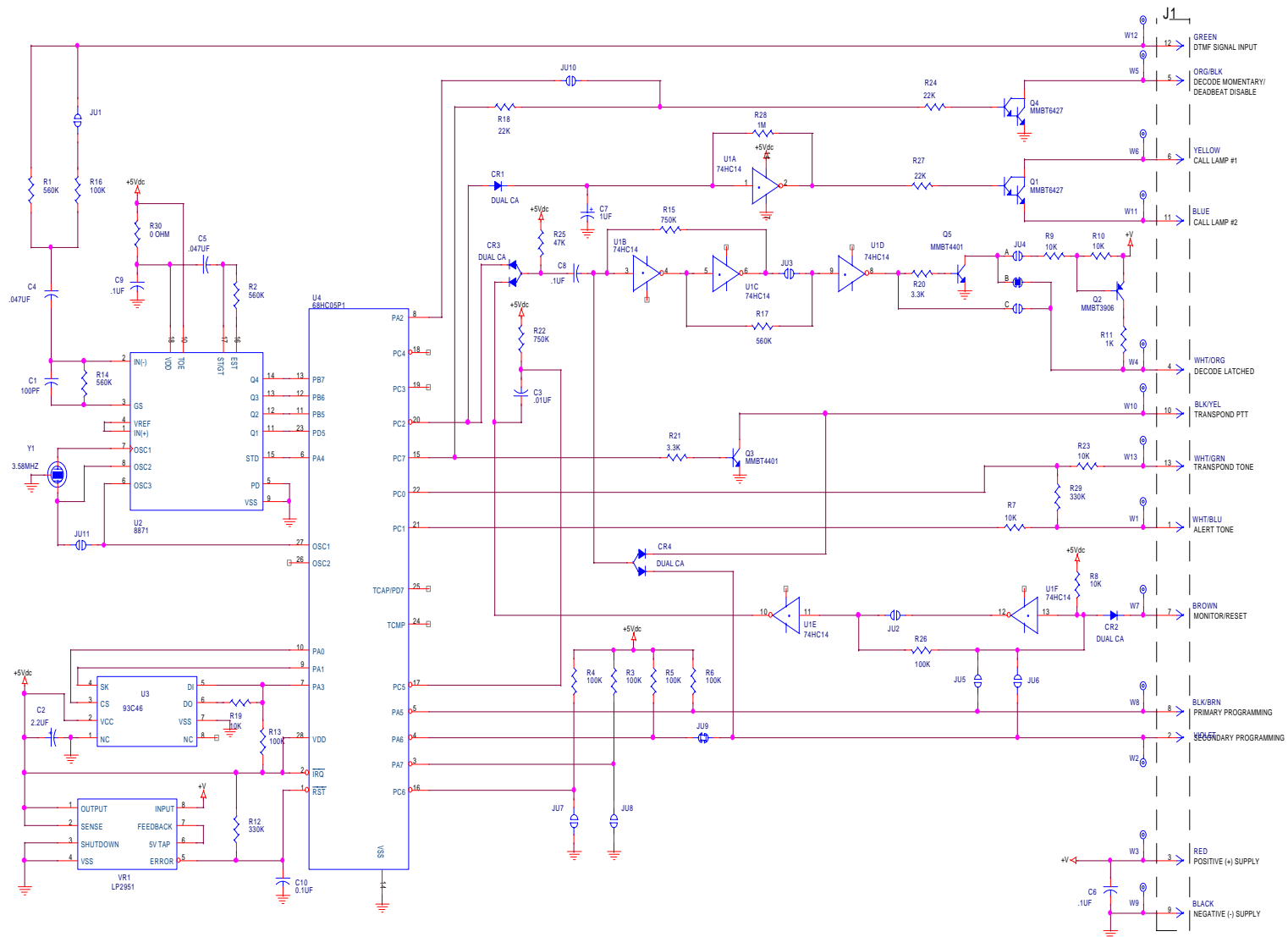
[8] PRIMARY PROGRAMMING (BLK/BRN): Normally unterminated. When connected to (-) SUPPLY at power-up, the ST-807 is placed into the programming mode.

[2] SECONDARY PROGRAMMING (VIOLET): Normally unterminated. When connected to (-) SUPPLY at power-up, the ST-807 is placed into the programming mode.

FUNCTIONAL DESCRIPTION

The microprocessor circuit of the ST-807 utilizes an advanced decoding algorithm which allows all possible combinations of the sixteen standard DTMF tone pairs in codes of one to seven digits in length. The decoder ignores codes of incorrect length, even though they may contain the correct code within them. It is allowable, for example, to install decoders programmed with codes "1," "12," "123," "1234" and "12345" in the same system without improper activation of any of the units. During setup the ST-807 offers user programming of two CODES (Primary and Secondary), INTERDIGIT TIME and DECODE MOMENTARY timing. Additionally, all ST-807's respond to a common ALL CALL and ALL RESET code.

1. The **PRIMARY** code consists of a one to seven digit sequence and is user-definable. Reception of this code activates all outputs including the TRANSPOND outputs, which generate a two second tone burst, and a simultaneous "one-shot" logic output for externally gating the tone or for transmitter keying. In two-way radio applications, this code can correspond to the user's "call" number. The PRIMARY code may be recalled any number of times, setting off all momentary outputs each time, without resetting the decoder. The decoder may be reset locally on the "ON-HOOK" to "OFF-HOOK" transition or remotely by sending the PRIMARY code plus a "#". **CAUTION: See SECONDARY CODE sequence length restrictions.**

2. The **SECONDARY** code consists of a one to seven digit sequence and is user- **Secondary code sequence length is restricted** definable. The to a digit sequence shorter than, equal to, or more than 1 digit longer than the PRIMARY code sequence. Two modes of operation, selected by on-board jumper, are possible for this code:

   a. In the **GROUP** mode (JU8 & JU10 open as shipped from the Factory), the DECODE LATCHED output goes to the UNMUTE condition upon reception of the SECONDARY code. In two-way radio applications, this allows subgroup calling to be implemented. The entire sub-group of decoders may be remotely reset by sending the SECONDARY code, plus a "#". This modified code will reset all decoders programmed with the same SECONDARY code. No transpond occurs.

J1

Wire	Pin	Signal
W12	12	GREEN DTMF SIGNAL INPUT
W5	5	ORG/BLK DECODE MOMENTARY/DEADBEAT DISABLE
W6	6	YELLOW CALL LAMP #1
W11	11	BLUE CALL LAMP #2
W4	4	WHT/ORG DECODE LATCHED
W10	10	BLK/YEL TRANSPOND PTT
W13	13	WHT/GRN TRANSPOND TONE
W1	1	WHT/BLU ALERT TONE
W7	7	BROWN MONITOR/RESET
W8	8	BLK/BRN PRIMARY PROGRAMMING
W2	2	SECONDARY PROGRAMMING
W3	3	RED POSITIVE (+) SUPPLY
W9	9	BLACK NEGATIVE (-) SUPPLY

U4 68HC05P1
U2 8871
U3 93C46
VR1 LP2951
Y1 3.58MHZ

NOTES:
1. ST-807L has 13 28ga wires (W1-W13) in place of J1 (ST-807)

JUMPER CHART

JUMPER		FUNCTION
JU1	IN	INCREASED SENSITIVITY
JU2	IN	GND = MON/RESET
JU3	IN	OUTPUT "ON" TO MUTE
JU4-A	IN	source DECODE LATCHED
JU4-B	IN	sink DECODE LATCHED
JU4-C	IN	CMOS LOGIC OUT
JU5	IN	PRIMARY PROGRAMMING
JU6	IN	SECONDARY PROGRAMMING
JU7	IN	ALL CALL
JU8 & 10	IN	DEADBEAT DISABLE
JU9	OUT	SECONDARY SET

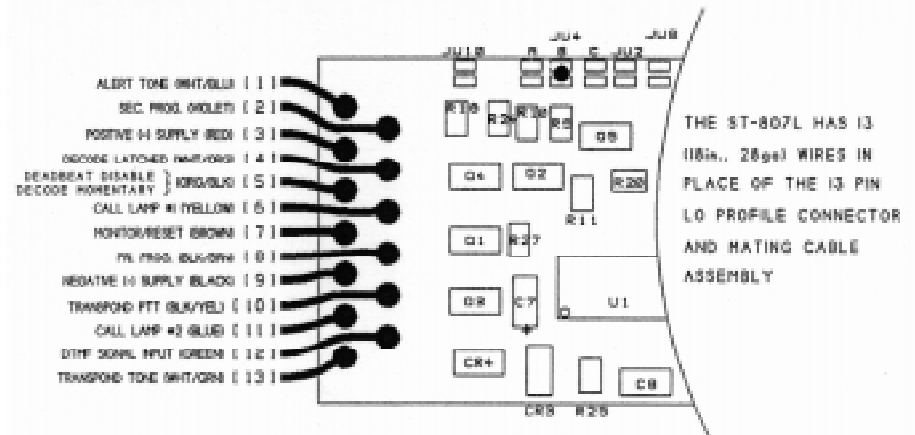| LAST USED	
C10	R30
CR4	U4
J1	VR1
JU11	W13
Q5	Y1
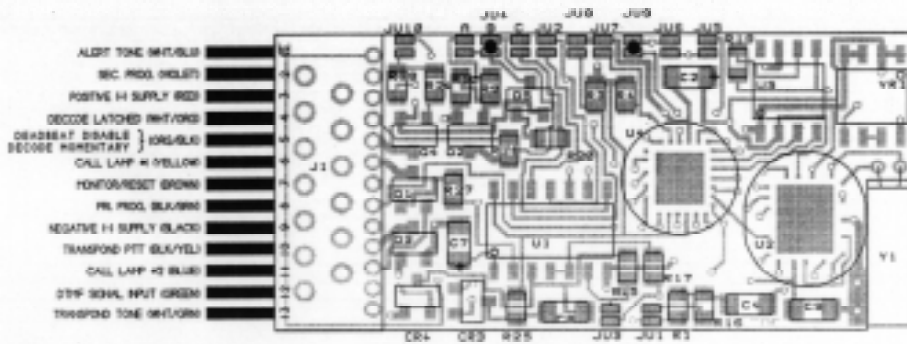
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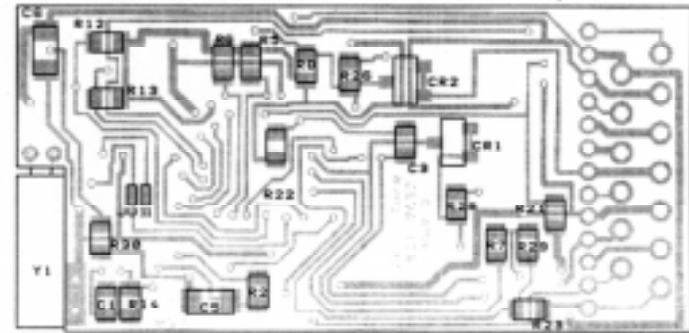
BOTTOM SIDE

CAUTION!
This product is built using surface mount construction techniques. The solder jumpers used to configure this product should be changed using equipment and techniques suitable for surface mount device repairs. Abuse due to the use of inappropriate tools and techniques will VOID the warranty.

JUMPER SETUP CHARTS

MON/RESET		ON-HOOK	OFF-HOOK
JU2	Open	(–) Supply	Open Circuit
JU2	Shorted	Open Circuit	(–) Supply

JU3	JU4	MUTE	UNMUTE
Open	B	Sinks to (–) Supply	Open Circuit
Shorted	B	Open Circuit	Sinks to (–) Supply
Open	A	Sources (+) Supply	Open Circuit
Shorted	A	Open Circuit	Sources (+) Supply
Open	C	HCMOS HI (5Vdc)	HCMOS LO (0Vdc)
Shorted	C	HCMOS LO (0Vdc)	HCMOS HI (5Vdc)

JU7	Open	All Call Disabled
JU7	Shorted	All Call Enabled
JU8 & 10	Open	[5] (BLK/ORG) is Decode Momentary
JU8 & 10	Shorted	[5] (BLK/ORG) is Deadbeat Disable
JU9	Shorted	J1 pin 2 Secondary Programming
JU9	Open	J1 pin 2 Secondary Set input

Highlighted lines indicate factory shipping condition.

THE ST-807L HAS 13 (18in., 28ga) WIRES IN PLACE OF THE 13 PIN LO PROFILE CONNECTOR AND MATING CABLE ASSEMBLY

ST-807L

b. In the **DEADBEAT DISABLE** mode (JU8 & JU10 shorted), the DEADBEAT DISABLE line is set to "ON" by reception of the SECONDARY code. Status of this line is stored in nonvolatile memory and will be maintained even if power is interrupted and then restored. Reception of the SECONDARY code followed by a "#" will reset this output. This feature is useful wherever reset due to loss of power is undesirable as in energy management applications. In leased two-way radio systems, the DEADBEAT DISABLE mode allows the system operator to readily enforce air time and billing policies. Upon reception of the DEADBEAT DISABLE code, a TRANSPOND will occur, beeping once when DEADBEAT DISABLE is set to "ON", and twice when "RESET". Reception of the DEADBEAT DISABLE or ENABLE code will cause a reset of any individual call (PRIMARY CODE) or ALL CALL.

3. The **INTERDIGIT TIME** is the time permitted between incoming DTMF characters. Incoming DTMF sequences that exceed this time between digits are considered invalid. This parameter may be field programmed for fast signalling (automatic encoder) or slow signalling (manual encoder). Factory Setting is for 1 Second.

4. The **DECODE MOMENTARY TIME** is the time the DECODE MOMENTARY output will remain active following reception of a valid sequence. This parameter may be field programmed to accommodate specific applications. Factory setting is 2 sec.

5. The **ALL CALL** code consists of a single fixed digit which is common to all ST-807 modules. Reception of the DTMF code "*" for six seconds is required to activate this mode, which turns on all outputs except the TRANSPOND outputs. This feature is used in any application in which simultaneous activation of all modules in a system is required. This function is enabled by installation of JU7. No DECODE MOMENTARY or TRANSPOND occurs following an ALL CALL.

6. The **ALL RESET** code consists of a single fixed digit which is common to all ST-807 modules. Reception of the DTMF code "#" for six seconds is required to activate this mode, which resets all outputs. This feature is used in any application in which simultaneous resetting of all modules in a system is required regardless of the call type used to activate them. No DECODE MOMENTARY or TRANSPOND occurs following an ALL RESET.

NOTE:
The ST-807 utilizes an E²PROM (Electrically Erasable programmable Read-Only Memory) for non-volatile storage of the signalling codes and DEADBEAT DISABLE status. This information will remain intact for up to ten years with out power being applied.

INTERDIGIT TIME and DECODE MOMENTARY TIME:

ADDRESS PROGRAMMING
PRIMARY CODE: ("159D" as shipped from the factory)

1. Turn power off.

2a. Connect PRIMARY PROGRAMMING (BLK/BRN) to NEGATIVE (–) SUPPLY.

— OR —

2b. Place a solder jumper at JU5 & Connect the MONITOR/RESET (BRN) to NEGATIVE () SUPPLY.

3. Turn power on.

4. Enter the desired PRIMARY code in DTMF via the DTMF SIGNAL INPUT lead.

5a. Release the PRIMARY PROGRAMMING lead from NEGATIVE (–) SUPPLY.

— OR —

5b. Release the MONITOR/RESET lead from NEGATIVE (–) SUPPLY.

6. Turn power off.

7. Remove JU5 if installed.

8. Return power, the unit has now memorized the sequence sent
in step #4 and will respond to that code.

SECONDARY CODE: ("A68*" as shipped from the factory)

1. Turn power off.

2a. Connect SECONDARY PROGRAMMING (VIOLET) to NEGATIVE (–) SUPPLY (JU9 must also be jumpered).

— OR —

2b. Place a solder jumper at JU6 & Connect the MONITOR/RESET (BRN) to NEGATIVE (–) SUPPLY.

3. Turn power on.

4. Enter the desired SECONDARY code in DTMF via the DTMF SIGNAL INPUT lead.

5a. Release the SECONDARY PROGRAMMING lead from NEGATIVE (–) SUPPLY.

5b. Release the MONITOR/RESET lead from NEGATIVE (–) SUPPLY.

6. Turn power off.

7. Remove JU6 if installed.

8. Return power, the unit has now memorized the sequence sent
in step #4 and will respond to that code.

NOTE: *If the secondary code is not required, it should be disabled by following steps 1, 2, 3, 5, 6 of the secondary code procedure.*

(ˮFactoryˮ programming INTERDIGIT TIME = 1 Sec., DECODE MOMENTARY TIME = 2 Sec.) These parameters normally **DO NOT** require change.

1. Turn power off.

2a. Connect the PRIMARY PROGRAMMING (BLK/BRN) and SECONDARY PROGRAMMING (VIOLET) leads to NEGATIVE (−) SUPPLY (JU9 must also be jumpered).

— OR —

2b. Place a solder jumper at JU5 & JU6 then connect the MONITOR/RESET (BRN) to NEGATIVE (-) SUPPLY (JU9 must also be jumpered).

3. Turn power on.

4. Enter the two digits as required in DTMF via the DTMF SIGNAL INPUT lead.

    First digit =   INTERDIGIT TIME
          0 = .5 Sec.
          1 = 1 Sec.
          2 = 2 Sec.
          3 = 3 Sec.

    Second digit = DECODE MOMENTARY TIME
          0 = 3 Sec.
          1 = 15 Sec.
          2 = 30 Sec.
          3 = 60 Sec.

5a. Release the PRIMARY & SECONDARY PROGRAMMING leads from NEGATIVE (-) SUPPLY.

— OR —

5b Release the MONITOR/RESET lead from NEGATIVE (-) SUPPLY.

6. Turn power off.

7. Open JU5 and JU6 if they were used.

8. Return power, the unit has now memorized the parameters sent in step #4.

NOTE: *The Primary, Secondary codes and the Timing parameters must be programmed in three separate operations.*

Tie back or remove the PRIMARY and SECONDARY PROGRAMMING leads to avoid connection to NEGATIVE (-) SUPPLY during power-up. If necessary, remove the solder jumper at JU5 and or JU6.

SECONDARY CODE MODE SELECTION:
To use the SECONDARY code as a group call, no action is required. To use the SECONDARY code as DEADBEAT DISABLE, place a solder jumper at JU8 & JU10.

ENABLING THE ALL CALL FUNCTION:
As shipped from the factory, the ST-807 has the ALL CALL feature disabled. To enable this feature, place a solder jumper at JU7.

SECONDARY SET function JU9:

In some applications two SET inputs are required from two separate switches. J1 pin 2 may be used for this purpose, however it may cause the ST-807 to enter the SECONDARY CODE programming mode if this lead should be low immediately following power-up. If necessary REMOVE JU9 to avoid this condition.

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