

Series 1401 Morse Code Station Identifier

Instruction Manual



[216] 351-1755

5504 State Road • Cleveland, Ohio 44134

INTRODUCTION AND GENERAL FEATURES

The Racom Model 1401 is a sophisticated state of the art Morse Code Station Identifier which is designed with the professional communication's specialist in mind. The 1401, when optioned correctly, will interface easily to any communications system, and will provide years of maintenance-free service. Low-power consumption, high noise immunity CMOS logic circuits are used throughout for dependable operation in areas where RF radiation can cause havoc with lesser equipment. There are no high-frequency oscillators in the 1401 that can interfere with nearby receiving equipment. Usage of a CMOS bilateral switch as an audio gate completely eliminates key clicks that are common to most identifiers. All CMOS circuits have protected circuitry against static damage.

Racom products are built on 1/16" thick glass-epoxy printed circuit boards, with all ICs mounted in sockets for ease of service. The strict usage of name brand top quality components and high degree of craftsmanship make RACOM the name to know in the communications field. As a further assurance, RACOM station identifiers are subjected to a pre-inspection, electronic calibration, performance tests, a 48 hour cycling test (burn-in), and a functional operation test prior to shipment.

USAGE OF THE RACOM 1401 IDENTIFIER

The 1401 identifier, properly optioned, is capable of producing any Morse Code call sign that has between one and six (eight with the "X" option) alphabetical or numerical characters. The read-only-memory in the 1401 is programmed with the Morse Code characters A through Z, 0 through 9, plus a "space" (no audio), and "tone" (continuous audio) in six character models with "/RPT" available on eight character models ("X" option). Any of these Morse characters in any desired order can be accessed by proper setting of a series of subminiature switches located on the printed circuit board.

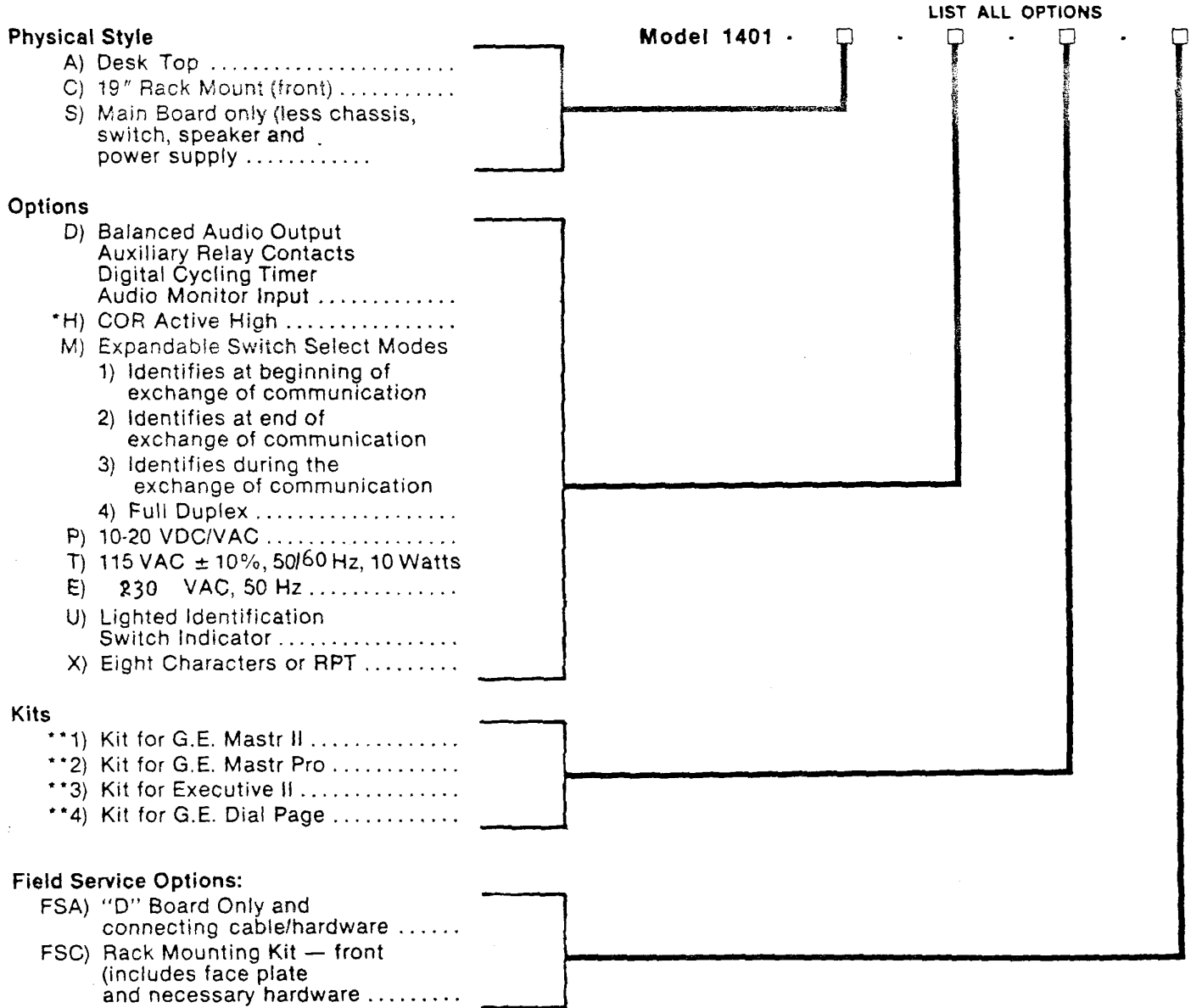
The standard Model 1401 is capable of three distinct operating modes which comply with FCC part 90 regulations. By adding Option "M", three new operating modes are added which then allow compliance with FCC part 81 regulations. With a wide variety of external hookup schemes, the 1401 can easily function in these situations:*

- 1) Paging operations
- 2) Business Radios (mobile or base stations)
- 3) Local and remote control stations (repeaters)
- 4) Amateur radio stations
- 5) Marine applications
- 6) Unmanned test stations or warning systems
- 7) Public Safety or emergency radio systems

* Always check specific FCC qualifications for your particular station before using an automatic identifier.

SERIES 1401 (LAND/MARINE)

MORSE CODE STATION IDENTIFIER



*Option "H" not available with Option "M"
 **Kits can only be used with Option "D"

EXTERNAL CONTROLS AND POWER HOOKUP

Power Requirements:

The standard Model 1401 may be powered by 10-20 volts AC/DC which makes it ideal for 12 volt battery operation. All low voltage (10-20 volt) 1401s are wired at the factory for DC operation. If a unit must be operated on 10-20 VAC, refer to Figure One for the proper wiring procedure. The two conductor power cords supplied with a low voltage 1401 are color coded RED for positive and BLACK for negative. The black wire is internally connected to chassis ground.

Optional 115 VAC ("T" option) and 230 VAC ("E" option) 1401s are equipped with an appropriate built-in power transformer and are wired at the factory with a standard 6 foot - 3 conductor AC power cord and grounded plug.

Fuse:

The power fuse is located on the rear panel using a standard $\frac{1}{4}$ turn quick release fuse socket. See parts list for proper fuse application.

Front Panel Controls:

There are two externally accessible switches mounted on the front panel:

- 1) SPEAKER: This is a "push-lock" switch that connects an internal monitor speaker to the identifier's audio circuit when depressed. Generally, this switch should be left "off" except for testing purposes.
- 2) TEST: This is a momentary contact switch that will cause the identifier to identify just once, regardless of other conditions, when momentarily depressed. Manually holding down the switch will cause the unit to identify continuously until it is released.

NOTE: On units equipped with "U" option, there is a lamp inside of the "test" button which will light during the identification period. If lamp replacement is ever required, use only the type specified on the parts list.

INITIAL OPERATION

Initial Check & Set-up:

Initial set-up of the Model 1401 will involve removing the top cover, which is secured by four phillips head screws. Inspect the unit at this time for any obvious damage. If everything looks proper, the identifier may be connected to an appropriate power source (check for proper fuse); depress the "speaker" switch. The identifier should send out the Morse Code characters "DE", meaning "from". Refer to Figure Three for a pictorial view of internal switches and controls. The call sign programming switches (SW1 through 12 "standard") or (SW1 through 12, plus SW15 through 18, "X" option) are factory set for all "spaces", so a newly purchased unit will not emit any call sign audio other than the "DE" code.

Call Sign Programming:

Call sign programming requires setting one pair of switches per Morse Code character. The standard 1401 comes equipped with 6 pairs of switches for up to 6 character call signs, and the "X" option 1401 comes with 8 pairs of switches for up to 8 character call signs. Referring to the programming chart, Figure Two, simply adjust each pair of switches to suit your particular call sign. If there are extra switches left over at the end, program a "space" into the switches so there will be no extra audio after the call sign is completed.

INTERNAL CONTROLS FOR FIELD ADJUSTMENT - STANDARD MODELS

- Code Speed (R27) Code speed is factory set and sealed at 22.5 words per minute, which falls into the FCC specification of 20-25 words/minute for automatic identifiers. Code speed can be varied with R27 from approximately 10 to 80 words/minutes, if desired.
- Should the code speed need to be calibrated, use a frequency counter at Pin 1 of U4 (4024). The frequency seen at that point is approximately 1.2 times the code speed; thus 22.5 words/minute is equal to 27 Hertz. An average 3 letter 3 number call sign will be about 4.6 seconds in length at that rate.
- Interval Timer (R20) Interval time, defined as the amount of time between identification cycles, is factory set and sealed at 13 minutes. Interval time may be varied from approximately 3 minutes to 35 minutes with R20.
- To calibrate or reset the interval time length, use a frequency counter on Pin 3 of U6 (4011). The formula $F = 546/T$ will dictate what frequency corresponds with a given time interval, where F = frequency in Hz and T = time in minutes. The frequency for a 13 minute interval is $546/13 = 42$ Hz.
- NOTE: On "D" option equipped 1401s, R20 does not control the interval timer. See "Operating Modes with "D" Option" on page 8.
- Tone (R29) Audio output tone is factory set and sealed to 1000 Hz \pm 20 Hz. The tone frequency may be varied from approximately 750 to 1000 Hz. Tone modulated morse code in this frequency range can be run simultaneously with voice with minimal interference.
- Monitor Delay (R10) Monitor delay is factory set and sealed at 2.5 seconds, and may be varied from 0.2 seconds to 5.0 seconds with R10. Monitor delay is defined as the amount of time that the XMTR or COR monitors have to become active to prevent an identification from taking place during periods of channel activity.
- To check monitor delay time, place unit in Mode 2 and ground TB1-1 or TB1-4. Remove the ground from TB1-1 or TB1-4. The time measured from removal of the ground to the beginning of the identification is the "monitor delay time".
- Audio Output Level (R41) R41 controls the amplitude of audio output seen at TB1-6, for purposes of setting modulation or deviation levels. On "D" option equipped units, this same control varies the audio output level seen at TB2-7 and 8. See specifications for exact information.

INTERNAL CONTROLS FOR FIELD ADJUSTMENT - "D" OPTION BOARD

Audio Monitor Sensitivity (R101) - This control adjusts how much receiver audio voltage is required to trigger the audio monitor circuitry. Each individual installation may require touching up of this control to match it to the receiver's audio output level. The important consideration is to see that hum and noise does not falsely trigger the circuit.

50/60 Hz Oscillator (R110) - This control is present only on 10-20 VDC (Std.) and 230 VAC 50 Hz ("E" option) units equipped with "D" option. It is factory set and sealed for 60 Hz measured at Pin 1 of U103 (4566), on 10-20 VDC units, and factory set and sealed for 50 Hz on 230 VAC 50 Hz ("E" option) units.

C107 may be omitted on 10-20 VDC units as it is no longer required for synchronization of the oscillator.

R110 may be replaced by a fixed composition resistor in 115 VAC 60 Hz ("T" option) units for usage on the North American continent.

NOTE: For usage of SW101, SW102 and SW103, see "D" option digital timer on page 13.

Operating Modes with "D" Option:

The "D" option includes two features which will materially affect operating modes. First and foremost, a 60 Hz referenced digital interval timer, mounted on the "D" option printed circuit board, replaces the standard potentiometer controlled interval timer on the main printed circuit board. "D" option equipped units are intended to be operated as such:

- (1) IC U9 (4040) mounted on main printed circuit board is not installed. Do not attempt to use this IC on a "D" option model or the digital timer will not operate.
- (2) SW13-2 must be left in the "open" position.
- (3) R20 (interval timer adjustment) is inoperative.
- (4) SW13-1 will remain operative and its usage in conjunction with "D" option will follow.

The second feature of the "D" option is the "audio monitor detector" which, when connected to receiver audio, will function similar to the COR monitor and may be used to initiate an identification cycle via SW101-2.

Selection of Operating Modes with "D" Option:

NOTE: It is advisable to read "D" Option Interval Timer operating instructions on page 13 and "D" Option Internal Controls on page 6 before proceeding.

Mode 1: Identify after each time interval as set by digital timer switches.

Main Board: SW13-1 - Closed
SW13-2 - Open
"D" Board: SW102 }
SW103 } - Set for desired time interval (see page 13)
SW101-1 }
SW101-2 - Open

Mode 2: Identify after transmission has ended.

Main Board: SW13-1 - Open
SW13-2 - Open
"D" Board: SW102 - Set dial to "0"
SW103 - Set dial to "1"
SW101-1 - Closed
SW101-2 - Open - Only the transmitter monitor will cause identification
Closed - Audio monitor detector activity or transmitter monitor will cause identification

Mode 3: Identify one time interval after the beginning of a transmission.

Main Board: SW13-1 - Open
SW13-2 - Open
"D" Board: SW102 }
SW103 } - Set for desired time interval (see page 13)
SW101-1 }
SW101-2 - Open - Only the transmitter monitor will activate interval timer
SW101-2 - Closed - Audio monitor detector or transmitter monitor will activate interval timer

NOTE: The "COR monitor", "Transmitter monitor" and "Audio monitor detector" input terminals are all active in the above modes. Activity at any of these three monitor terminals will delay identification until they are cleared. At this point, identification will take place, providing the interval timer has timed out.

OPERATING MODES WITH 'M' OPTION

'M' option gives the 1401 expanded operating modes so that FCC identification requirements can be satisfied under the more stringent Part 81 regulations. 'M' option does not actually create new operating modes, but offers more flexibility within the present Modes 2 and 3 of the Model 1401. Three switches are provided on the main board for 'M' option, which are SW19, SW20-1 and SW20-2, shown on Figure 3. When the three above switches are in the 'off' position, the 'M' option is rendered inoperative and the identifier will operate in the operating modes as outlined on page 7 or 8.

The following operating modes can be realized with 'M' option:

A: To identify at the beginning of a communications exchange:

Place SW20-1 in 'on' (closed) position. SW19 and SW20-2 remain 'off'. This will cause an identification to take place at the beginning of the first transmission of a communications exchange. The identifier will identify over any microphone audio, if present. This feature may be used in Mode 2 or Mode 3 only. Note that all operating characteristics of Mode 2 or Mode 3 are retained; there is just one identification added to the beginning of the first transmission.

B: To identify at the end of a communications exchange (when channel is clear):

Place SW19 in 'on' position. SW20-1 and SW20-2 remain 'off' (open). Diode CR4 (see Figure 11) must be removed from the main printed circuit board. Receiver audio must be monitored by the 1401, whether it be through the 'COR monitor' terminal (standard) or through the 'audio monitor' terminals ('D' option). This feature is intended for use in Mode 3 only.

Set up as such, the identifier will operate the same as it would in Mode 3 with the following exceptions:

- 1) If the transmitter is keyed for a period of time exceeding that of the interval timer, identification will take place on top of microphone audio at the interval time limit.
- 2) When the communications exchange has ended (transmitter and receiver are both quiet), one last identification will occur 0.2 to 5.0 seconds (as set by monitor delay adjustment R10) after the last channel activity.

C: To identify on full duplex systems:

Due to the fact that each system can be wired differently for transmitting operations, it is necessary to contact factory for specific technical data related to each type transmitter.

Note: It is acceptable to use Feature A and B of 'M' option at the same time if desired. In this case, there would be an identification at the beginning and end of a communications exchange, as well as inbetween if the transmitter was keyed long enough to exceed the interval timer limit.

TERMINAL HOOKUP GUIDE

NOTE: All identifier terminals are referenced to ground potential and all voltage measurements are made with respect to ground (TBI-2 or TBI-5).

COR Monitor Terminal (TBI-1): "Carrier operated relay" terminal

This terminal has the purpose of inhibiting or delaying the identifier from keying the transmitter until such a time that there is no other traffic on the channel. Generally, this terminal is connected to the receiver squelch circuit* in such a fashion that a "digital low" (less than 1.2 VDC) applied to the COR terminal indicates that there is traffic on the received frequency, and the identifier will remain quiet until the voltage resumes to a "digital high" (more than 3.5 VDC), indicating that the channel is cleared of traffic. Some GE and RCA receivers have an "active high" squelch voltage, where a "digital high" means the channel is busy and a "digital low" means the channel is clear. In this situation, the "H" option package for the identifier must be used, which automatically inverts all COR voltages for proper interfacing. See "Audio Monitor" ("D" option) and "Inverted COR" ("H" option) for further information regarding COR hookups.

* May go to a "channel busy" light circuit if this is available and electrically compatible.

TX Monitor or XMTR Monitor (TBI-4): Transmitter monitor" terminal

This terminal has the function of letting the identifier know when the transmitter is on the air. In almost all cases, the TX monitor terminal is connected to the push-to-talk (PTT) line of the transmitter.* The TX monitor terminal performs two functions: (1) It inhibits identification until the transmitter is free, and (2) It starts the interval timer when used in Mode 2 or 3. The TX monitor is an "active low" circuit; i.e., the transmitter is considered on or "keyed" when a "digital low" (less than 1.2 VDC) is applied to the terminal, and off when a "digital high" (more than 3.5 VDC) is applied.

* May go to a "TX key" light circuit if available and electrically compatible.

TX Keying (TBI-3): "Transmitter keying" terminal

This is the terminal that is used to automatically key the transmitter while identification is taking place. This is done with an NPN transistor in open collector configuration. The transistor is capable of switching a 200 MA load (up to +200 VDC open circuit) to ground. It cannot switch AC and it cannot switch anything that is not "ground seeking". For these applications, the "D" option must be used, which has a pair of isolated relay contacts for transmitter or auxiliary switching purposes.

Whether the transistor or relay is used, the connection is made at the push-to-talk (PTT) line of the transmitter.

Audio Output (TB1-6):

This terminal is a ground-referenced medium level audio output with a 600 Ohm output impedance. It is designed to hook directly to the microphone input lead of the transmitter.* The identifier audio circuitry produces a sine wave with electronic circuitry to prevent key clicks. Audio output amplitude is varied by adjusting R41. Generally, the output level should be adjusted for 40% deviation, or ± 2 KHz on a ± 5 KHz system.

In the event that an isolated DC blocked audio output is needed (for Motorola transistor microphones or carbon microphones), use "D" option audio output which is compatible with these systems (see page 9).

* In some cases, a resistor of 10K or greater Ohms must be placed in series with the audio lead to ease adjustment of deviation and to reduce loading.

INVERTED COR - Option "H"

"H" option is a switch-selectable COR mode package. SW19 (see Fig. Three) is used to select "active low COR" in the "off" position or "active high COR" in the "on" position. In either case, the voltages required to operate the COR terminal (TB1-1) are the same as used in standard 1401 models, whether operated in the "active low" or "active high" position.

TERMINAL HOOKUP GUIDE - "D" OPTION

Model 1401 "D" Option Terminals:

Relay Contacts (TB2-3, 5, 6); (TB2-1, 2, 4):

These six terminals comprise two sets of SPDT relay contacts which are completely isolated from the chassis electrically. In most cases, one set of contacts could be used to key the transmitter and the other set could be used to insert audio into the transmitter microphone circuit.

The relay contacts close and remain closed for the entire duration of the identification period, which is usually four to seven seconds.

Audio Output (TB2-7 & 8):

This is similar to the audio output terminal TB1-6, but it is transformer-coupled, DC blocked and electrically isolated from the chassis. Approximately 100 volts may be placed across these terminals without damage. The output is a sine-wave 600 OHM impedance, and its output is variable with R41.

Audio Monitor (TB2-9 & 10):

The audio monitor is designed to connect directly across the receiver's volume control terminals (high side and ground) or to a standard 600 OHM audio transmission line.* Its 10K OHM input impedance allows for relatively minimal audio power losses. The function of the audio monitor is to keep watch of receiver activity and to prevent the identifier from keying the transmitter until the channel is clear. Its function is much like that of the COR monitor terminal except that it is audio-controlled instead of DC-controlled.

The audio monitor needs about 40mVAC to trigger, which is considerably less than what is normally found on audio lines. The sensitivity of this circuit can be adjusted by R101, which is mounted on the "D" option board. (See Figure Four. Some care must be taken in making this adjustment so that hum and noise will not falsely trigger the circuit. The audio monitor terminals are transformer-coupled, DC blocked and electrically isolated from the chassis. Approximately 200 VDC may be placed across the terminals without damage.

* NOTE: Some installations may dictate hooking the audio monitor to the receiver speaker terminals for an audio source. This is generally not recommended because adjusting station volume control too low will defeat the purpose of the monitor and risk FCC citation.

DIGITAL INTERVAL TIMER - "D" OPTION

On 1401s equipped with "D" option, the interval timer control, R20, is rendered inoperative.

Interval timer functions are now handled by a 60 Hertz referenced digital timer mounted on the "D" option printed circuit board. The number of minutes of interval time is selected by two 10-position miniature rotary switches, (SW102 and SW103). See Figure Four. SW102 selects tens of minutes, while SW103 selects units of minutes. Thus, if SW102 is set at 2, and SW103 is set at 4, the interval time would be 24 minutes.

A third timer switch, SW101-1, is provided for selection of minutes ("open" position) or seconds ("closed" position). This function is useful for rapid field testing of the interval timer.

The "D" option timer is capable of operating through the entire range of one second to 99 minutes.

NOTE: "D" option equipped units do not require U9 (4040) to be on the main printed circuit board. Do not attempt to use U9 in these models. (Timer will not operate.)

- * 1401s with "D" option and 10-20 VDC power do not have the ability to reference 60 Hz from the power line. These models are equipped with a trimpot control (R110) to allow factory calibration at 60 Hz.

RACOM MODEL 1401 MORSE CODE STATION IDENTIFIER

SPECIFICATIONS - ALL MODELS

Case Dimensions: Standard Desktop - 12" wide x 1.75" high x 6.50" deep
Option "C" Rackmount - 19" wide x 1.75" high x 6.50" deep

Mounting: Standard - Desktop style
Option "C" - EIA 19" x 1.75" rackmount

Weight: Four (4) lbs. max.

Color: Mushroom brown with brushed aluminum front panel

Power Requirements: Standard - 10 to 20 Volts AC/DC @130 MA max. standby
@200 MA max. active
With Option "D" and "U" - @240 MA standby (max.)
@350 MA active (max.)
Option "T": 115 VAC $\pm 10\%$ 50/60 Hz - 10 watts max.
Option "E": 230 VAC $\pm 10\%$ 50/60 Hz - 10 watts max.

Temperature Range: -30 degrees C to +80 degrees C

Humidity: Up to 95% relative humidity

Operating Modes: Standard - (1) Identify every time interval
(2) Identify 0.2 to 5.0 seconds after transmission has ended.
(3) Identify one time interval after beginning of transmission.
Option "D"-Same operating modes as standard, but will respond to audio monitor activity as well.
Option "M"-Same operating modes as standard, but the following features are added:
(A) Identify at beginning of communications exchange.
(B) Identify at end of communications exchange.
(C) Identify with full duplex, multiple frequency systems.

Audio Output Level: Standard - Variable to .44 VAC RMS or -5DBM max. referenced to ground.
Option "D"-Variable to 1.5 VAC RMS or +5DBM max. balanced, DC blocked, isolated from ground.
Sine wave, 1000 Hz, into 600 ohms load.

Output Impedance: All models - 600 ohms $\pm 20\%$

Output Frequency: 750 to 1000 Hz

Output Distortion: 10% max. @ max. output

Noise: 50 db. below rated output

Inhibit Features: Standard - Two DC controlled monitor terminals available on rear chassis terminal strip.
(1) COR Monitor (active "low")
(2) Transmitter monitor (active "low")
Option "H"-Same as standard, but COR monitor is selectable between active "low" and active "high".
Option "D"-Includes all standard features, plus an Audio Monitor Detector.

Audio Monitor Detector: Option "D" only:
Sensitivity - 40mVAC minimum required (adjustable)
Input Impedance - 10K ohm minimum, balanced, DC blocked, isolated from ground.

Transmitter Keying: Standard - Solid State Switch. Will switch 200 VDC or less @ 200 MA max. to ground, max. loss - 0.6 VDC.

Relay Contacts: Option "D"-Includes standard solid state switch plus 2 form "C" relay contacts (DPDT), contacts rated @ 2 amps.

Receiver COR Monitor Loading: Loading - 1 MA max. at 0 volts

Transmitter Keying Monitor: Loading - 2 MA max. at 0 volts

Receiver COR Monitor and Transmitter Keying Monitor Levels: Digital "Low" = 0 to 1.2 VDC
Digital "High" = +3.5 to +75 VDC
The region between low and high (+1.2 to +3.5 VDC) is in the threshold area.

Interval Timer Range: Standard - 3 to 35 minutes (adjusted with potentiometer).
Option "D" - 1 second to 99 minutes (selected with switches).

Code Speed: 10-80 words/minute, factory set @22.5 words/minute.

Monitor Inhibit After Identification: .2 sec. to .3 sec.

Monitor Release Delay: Adjustable 0.2 to 5.0 seconds

Programming: Call letters are selected with internal switches. Memory is non-volatile. The call letters may be changed an unlimited number of times in the field with the internal switches.

Call Length: Standard - Six (6) characters
Option "X" - Eight (8) characters or "/RPT"

CIRCUIT DESCRIPTION:

The key to the circuit operation of the Model 1401 identifier is the PROM (U12) and the manner in which the 40 Morse characters shown in the chart are programmed into it. Each Morse character is broken into bits of time. A dot is one bit long, a dash three bits long and the space between a dot and a dash is one bit. The space between characters is three bits in length. Each character is allotted 32 bits of space and is arranged in eight sets of four bits each. The binary coding of the A0, A1 and A2 leads select which set is being used.

The rotary switches used for character selection have a binary coded output to select the 10 characters. Each set of 10 characters then is selected by the two spst switches beside each rotary switch into address leads A7 and A8.

The counter (U4) drives the PROM, the multiplex decoder (U5) and the address select (U2) to provide the proper circuit timing. U5, the decoder, is a 1 of 8 gate and its output drives a switch (U8A) which permits audio to pass to the amplifiers. Also, the output is fed to OR gate U11D to Reset Counter U10B. This counter is a divide by 3 counter; an output from U5 before this counter reaches 3 bits will reset the counter and not affect the identifiers operation. However, if this counter reaches a count of 3 bits without a "1" or high logic, it will reset U4 and clock U2 to the next character.

The clock circuit is driven by an oscillator formed by U11C and U6D; the frequency is set by the RC time constant and adjusted by pot R27. The frequency of this oscillator is equal to roughly 1.2 times the code speed in words per minute, i.e. $1.2 \times 22.5 = 27\text{hz}$.

The audio oscillator is a phase shift oscillator formed by Q3 and Q4, its frequency being determined by the RC network and adjusted by R29. During periods the 1Der is quiet, the oscillator is inhibited through CR7 and R34, which overcomes its bias to shut it off.

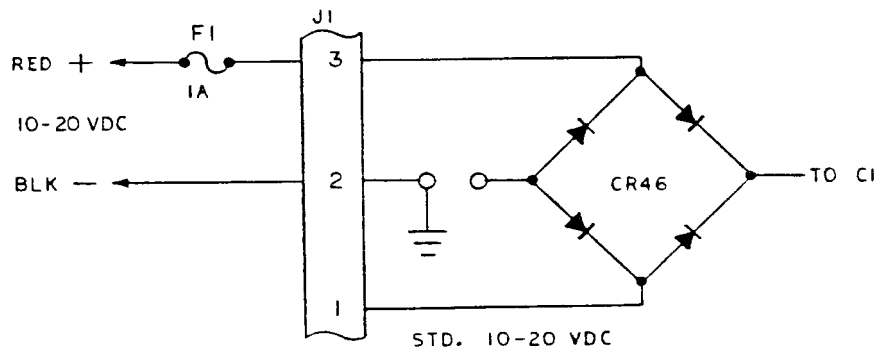
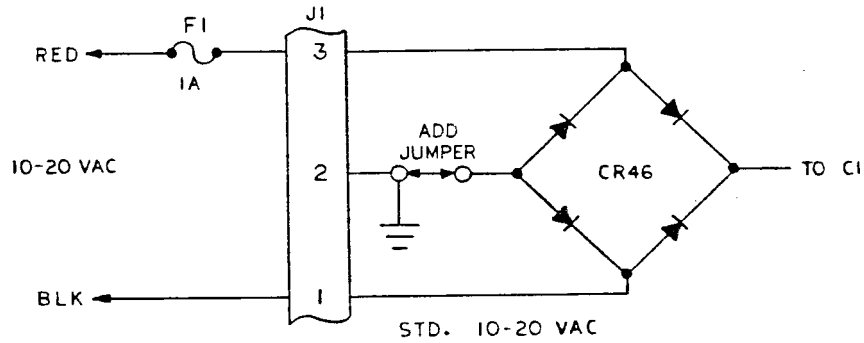
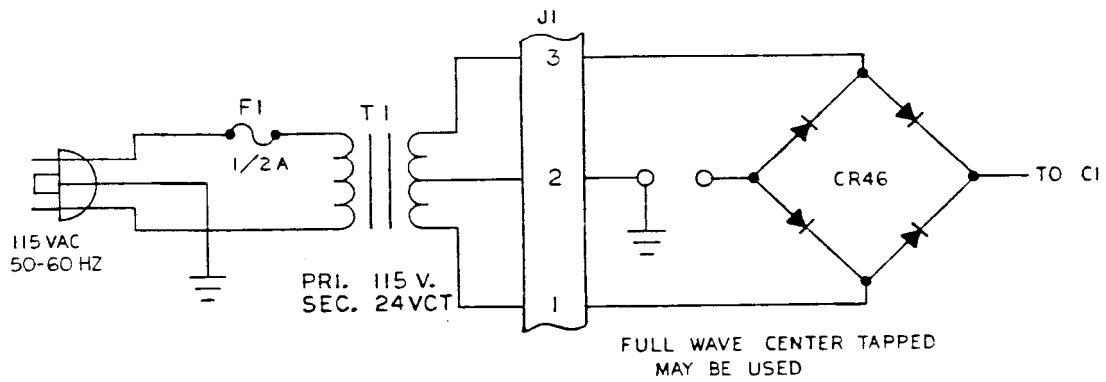
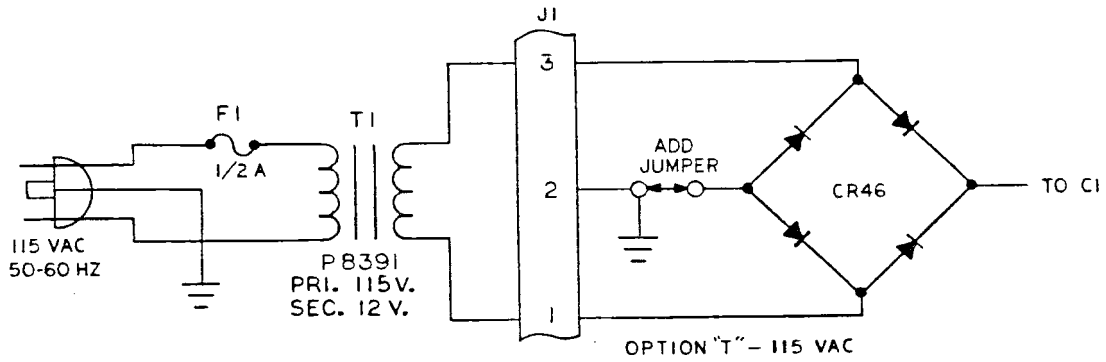
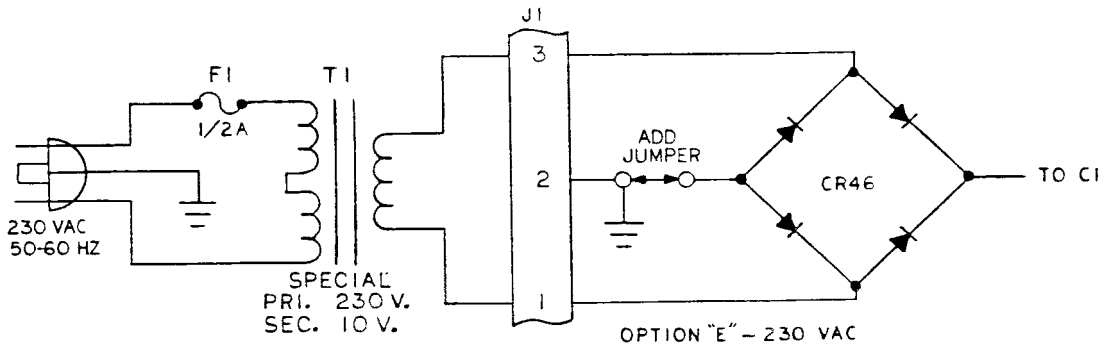
Audio output for the speaker is obtained from Q6. Q5 supplies audio to output terminals with level set by R41. Both of these stages operate as emitter followers.

The interval timer consists of a counter, U10A, and an oscillator, U7C and U6B, with its frequency set by R20. This oscillator is initiated by the logic from flip-flop U6A and B. When the count of U10A is complete, it delivers a signal to AND gate U7C, thus starting an identification. The frequency at the oscillator is $F = 546/T$. "T" is equal to time in minutes.

Both the transmit and COR monitors controlled by the monitor delay circuit inhibit identification when ground is placed at terminals 1 or 4 of TB1. These are isolated by diodes CR3, CR4, CR5 and AND gate U7B. A ground on the transmit line will also set the flip-flop if SW13 Section 1 is open to start the timer. When the ground is removed from the monitor lines, the unit will continue to be inhibited by the time constant R10, R11 and C8. Triggering the test switch (SW14) will start the unit by setting AND gate U7A, which drives the reset line.

The three sections, U8B, C and D form an inverter used to trigger Q1 and Q2, the transmitter keying circuit. The circuit also resets the interval time counter.

The power supply furnished +5 VDC to the unit. Models equipped to use an AC power supply furnish a 60 Hz pulse for synchronization of the "D" option digital interval timer.



RACOM, INC.	
SCALE: _____ DATE: 8-17-82 APPROVED BY: _____ DRAWN BY: STJ	POWER SUPPLY WIRING GUIDE MODEL 1401 DRAWING NUMBER 1400-60

FIGURE 1- POWER SUPPLY WIRING

CALL SIGN PROGRAMMING CHART

TRUTH TABLE FOR THE BCD SWITCHES

DIAL	L			
	1	2	3	4
0				
1	●			
2		●		
3	●	●		
4			●	
5	●		●	
6		●	●	
7	●	●	●	
8				●
9	●			●

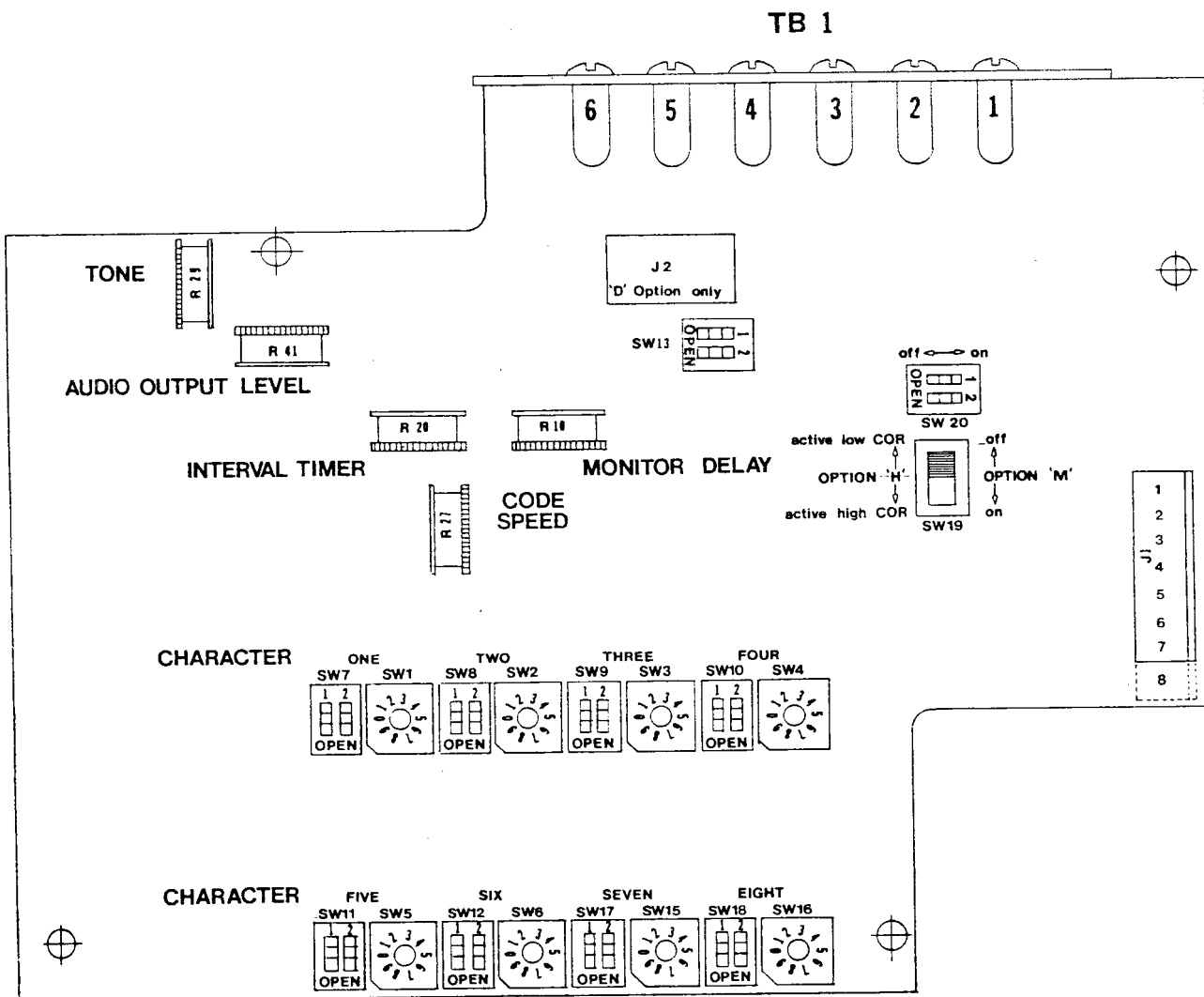
	0	-----		K	---●
	1	●-----		L	●...●
	2	●●-----		M	---●
	3	●●●-----		N	---●
	4	●●●●-----		O	-----
	5	●●●●●		P	●---●
	6	---●●●●		Q	---●●
	7	---●●●●		R	●---●
	8	-----●		S	●...●
	9	-----●		T	---
	A	●--		U	●...-
	B	---●●		V	●...-
	C	---●●		W	●---●
	D	---●●		X	---●●
	E	●		Y	---●---
	F	●...●		Z	---●●●
	G	---●●		SPACE	
	H	●...●		TONE	
	I	●●		/	---●●●
	J	●---●		RPT	[Used only in the EIGHT CHARACTER model]

FIG. 2

RACOM, INC.	
SCALE: FULL DATE: 8-26-82 MODEL 1401	APPROVED BY: GJS REVISION: NEW DRAWING NUMBER: 1400-7
CALL SIGN PROGRAMMING CHART	

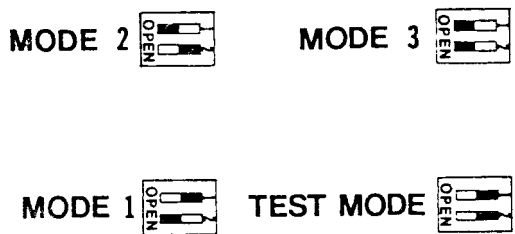
FIGURE 3
 INTERNAL CONTROLS - MAIN BOARD

RACOM INC
 DRAWN BY G.J.S.
 REVISED
 MAIN BOARD
 DRAWING NUMBER 1400-9
 SCALE: FULL
 DATE: 8-30-82
 INTERNAL CONTROLS -
 MODEL 1401

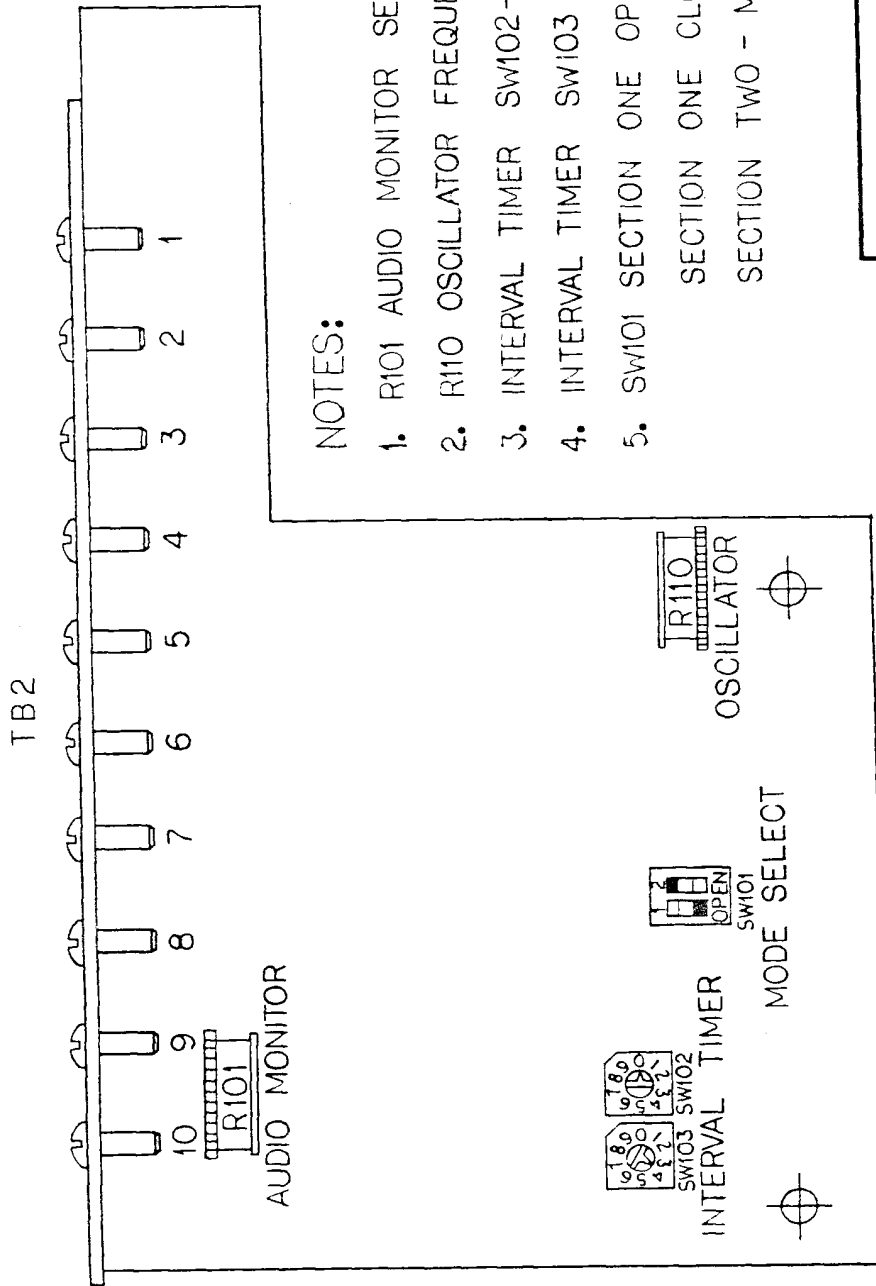


NOTES:

1. SW19 APPEARS ONLY WITH OPTIONS 'H' OR 'M'.
2. SW15-SW18 APPEAR ONLY WITH OPTION 'X'.
3. SW20 APPEARS ONLY WITH OPTION 'M'.
4. J2 IS USED WITH OPTION 'D' ONLY.



SW13 POSITIONS
 (STANDARD MODELS ONLY)



NOTES:

1. R101 AUDIO MONITOR SENSITIVITY ADJ.
2. R110 OSCILLATOR FREQUENCY 50/60HZ.
3. INTERVAL TIMER SW102-TENS OF TIME UNITS
4. INTERVAL TIMER SW103 TIME UNITS
5. SW101 SECTION ONE OPEN - MINUTES
SECTION ONE CLOSED - SECONDS
SECTION TWO - MODE SELECTION

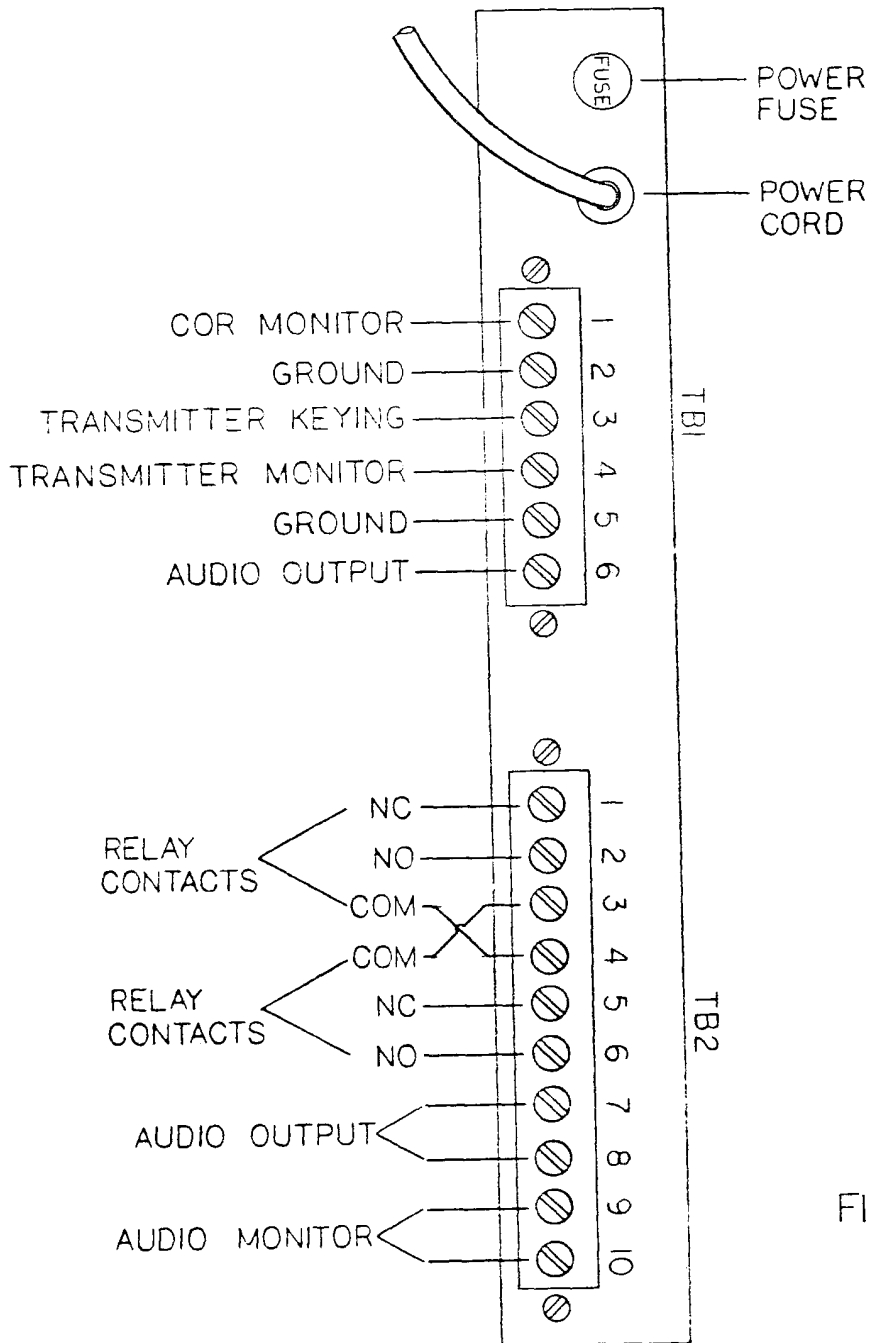
RACOM INC

SCALE: 2/1 APPROVED BY: DRAWN BY: G. J. S.
DATE: 8-30-82 8-30-82

INTERNAL CONTROLS - 'D' BOARD

DRAWING NUMBER: MODEL 1401 1400-10

FIGURE 4
INTERNAL CONTROLS - 'D' BOARD



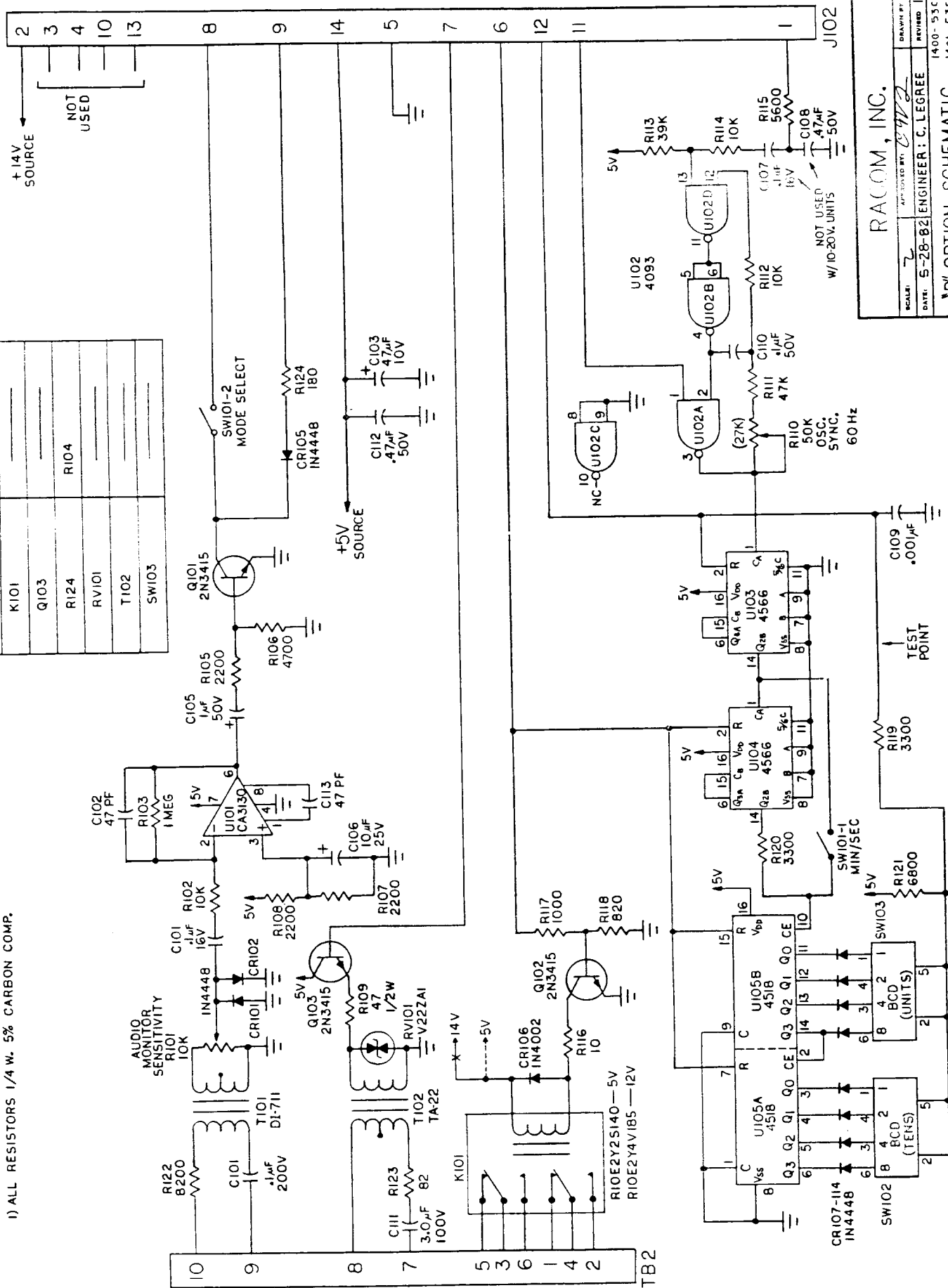
REAR PANEL TERMINAL GUIDE	
SCALE: FULL	APPROVED BY
DATE: 9-27-82	
RACOM INC	
MODEL 1401	DRAWING NUMBER 1400-8

FIGURE 5

NOTE: TB2 CONNECTIONS ARE FOR USE WITH "D" OPTION ONLY.

NOTES:
UNLESS OTHERWISE SPECIFIED:
1) ALL RESISTORS 1/4 W. 5% CARBON COMP.

HIGHEST REF. DES. USED	REF. DES. NOT USED
U105	
C113	
CR114	CR103, 104
K101	
Q103	
R124	R104
RV101	
T102	
SW103	



RACOM, INC.
SCALE: 2
DATE: 5-28-82
ENGINEER: C. LEGREE
1400-53C LATE
1401-53E ALL
DRAWING NUMBER: 1400-59
FOR USE W/ 1401-51E MAINBOARD

FIGURE 8

Cont.

MODEL 1401 MORSE CODE STATION IDENTIFIER PARTS LIST

Figure 9

<u>Qty.</u>	<u>Part #</u>	<u>Description</u>	<u>Designator</u>
4	2N3415	Transistor	Q1, Q4, Q5, Q6
1	2N5089	Transistor	Q3
1	MJE340	Transistor	Q2
12	C84-14-02	14 Pin IC Socket	N/A
5	C84-16-02	16 Pin IC Socket	N/A
1	DD470	47 PF Disc Capacitor	C7
1	CE471	470 PF Disc Capacitor	C24
2	CE102	.001 uF Disc Capacitor	C13, C23
2	UK16-103	.01 uF Disc Capacitor @ 16V	C9, C10
3	650B1A393J	.039 uF Electrocube 50V, 5%	C19, 20, 21
2	650B1A474J	.47 uF Electrocube 50V, 5%	C12, C22
5	CY20C474M	.47 uF Mylar Cap 50V, 20%	C4, 6, 25, 26, 28
2	50ELA1	1 uF 50V Electrolytic Cap	C14, C15
2	25ELA10	10 uF 25V Electrolytic Cap	C17, C18
2	10ELA47	47 uF 10V Electrolytic Cap	C3, C16
1	TARA 1.5K25	1.5 uF 25 Tantalum Cap	C11
1	150D336X9010	33 uF 10V Tantalum Cap	C8
1	35ELA1000	1000 uF 35V Electrolytic Cap	C1
1	7805CT	5V, 1A Regulator IC	U1
1	4011	IC	U6
1	4016	IC	U8
1	4017	IC	U2
1	4024	IC	U4
1	4040	IC	U9
1	4050	IC	U13
1	4071	IC	U11
1	4081	IC	U7
1	4512	IC	U5
1	4520	IC	U10
1	N82S131	IC	U12
1	09-60-1071	7 Pin male polar molex PC connecter	J1
1	Smith 876	6 Screw terminal strip	TB1
6	2300-02G	EECO miniature BCD rotary switch	SW1-6
7	76SB02	Dual SPST switch	SW7-13

MODEL 1401 MORSE CODE STATION IDENTIFIER - OPTIONS PARTS LIST

Figure 10

<u>Qty.</u>	<u>Part #</u>	<u>Description</u>	<u>Designator</u>
1	1400-4	Option "A" - Desk Top Desk Top Stick-on Face Panel	N/A
1	1400-3	Option "C" - Rackmount Rackmount Front Panel	N/A
1	C84-14-02	Option "M" - Mode Expand 14 Pin IC Socket	N/A
1	4001	IC	U14
1		10K 1/4W 5% Carbon Resistor	R53
1	UK16-104	.1 uF 16V Disc Capacitor	C27
1	1N4448	Diode	CR63
1	2N3415	Transistor	Q7
1	MSS-2200	Alco Switch DPDT	SW19
1	76SB02	Switch Dual SPST	SW20
1	C841402	Option "H" - COR Active High 14 Pin IC Socket	N/A
1	4001	IC	U14
1	UK16-103	.01 uF Disc Capacitor	C29
1		4700 ohm 1/4W 5% Carbon Resistor	R54
1		22K ohm 1/4W 5% Carbon Resistor	R55
1	1N4448	Diode	CR64
1	MSS-2200	Alco Switch DPDT	SW19
1	P8391	Option "T" - 115 VAC 50/60 Hz Transformer - Stancor 12V, 350 ma.	T1
1	17237B	Belden Line Cord - 3 cond. x 18 GA.	N/A
1	Smith 862	2 Lug Terminal Strip	N/A
1	3AG	1/2A 250V Fuse	F1
1	Special	Option "E" - 230 VAC 50 Hz Transformer	T1
1	17237B	Belden Line Cord - 3 cond. x 18 GA.	N/A
1	Smith 862	2 Lug Terminal Strip	N/A
1	3AG	1/2A 250V Fuse	F1
1		Option "U" - Lighted Switch 3.3 ohm 1/4W 5% Carbon Resistor	R51
1	CM377	Light Bulb - 6.3V @75 ma.	N/A
1	09 50 7081	8 Pin Female Molex Connector	J1
1	09 60 1081	8 Pin Male Polar PC Molex Connector	P1
2	C84-14-02	Option "X" - 8 Characters 14 Pin IC Socket	N/A
13	1N4448	Diode	CR50-62
2	76SB02	Dual SPST Switch	SW17-18
2	2300-02G	EECO Miniature BCD Switch	SW15-16

MODEL 1401 MORSE CODE STATION IDENTIFIER - OPTIONS PARTS LIST

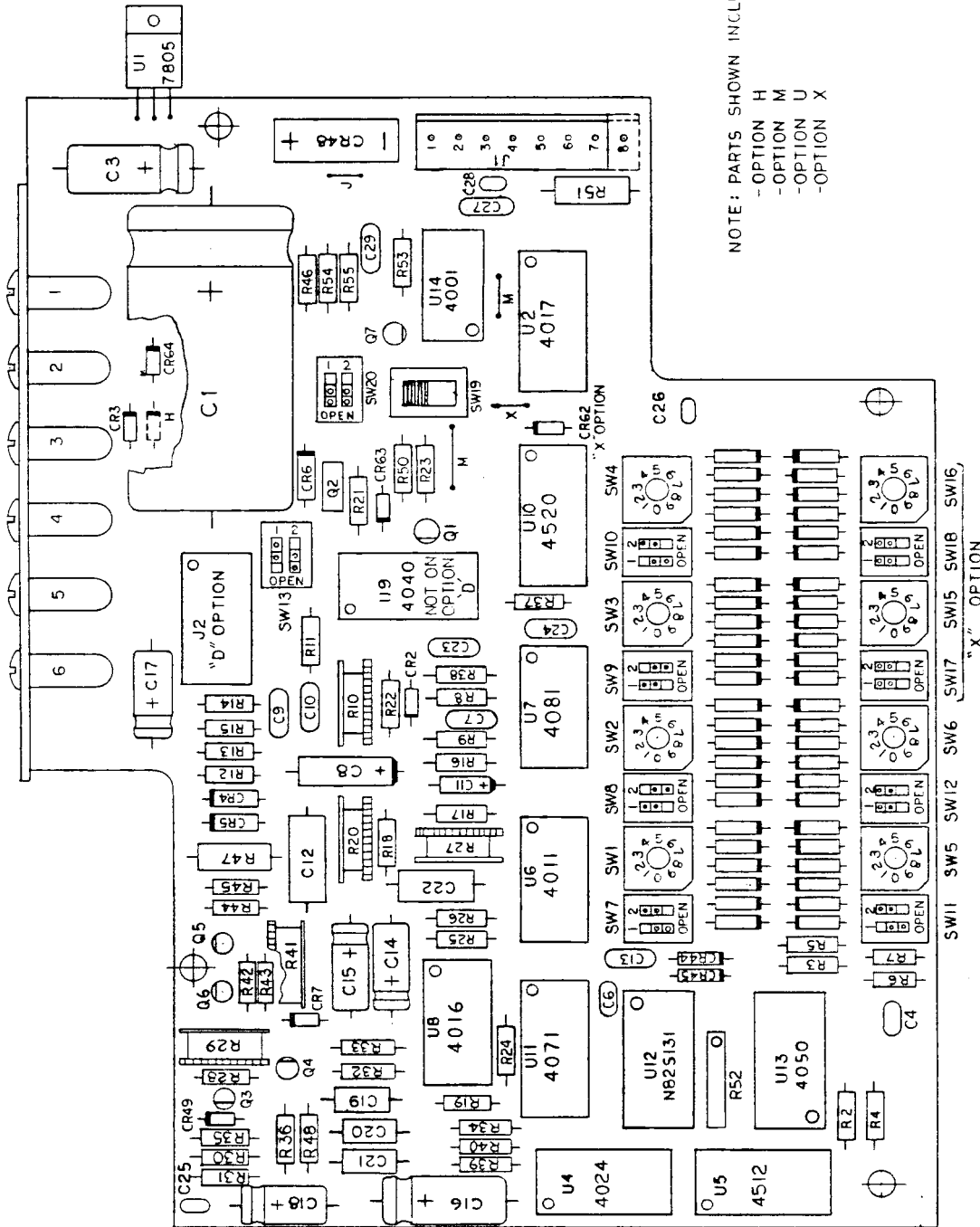
Figure 10

Qty.	Part #	Description	Designator
		Option "D" - Deluxe Board	
1	1400-53C	Printed Circuit Board	N/A
1	FFC-130-14	Ribbon Cable Connector	N/A
11	1N4448	Diode	CR101,102,105,107-114
1	1N4002	Diode	CR106
7		10 ohm 1/4W 5% Carbon Resistor	R116
1		47 ohm 1/2W 5% Carbon Resistor	R109
1		82 ohm 1/4W 5% Carbon Resistor	R123
1		180 ohm 1/4W 5% Carbon Resistor	R124
1		820 ohm 1/4W 5% Carbon Resistor	R118
1		1000 ohm 1/4W 5% Carbon Resistor	R117
3		2200 ohm 1/4W 5% Carbon Resistor	R105, R107-108
2		3300 ohm 1/4W 5% Carbon Resistor	R119-120
3		10K ohm 1/4W 5% Carbon Resistor	R102,114, R112
1		4700 ohm 1/4W 5% Carbon Resistor	R106
1		5600 ohm 1/4W 5% Carbon Resistor	R115
1		47K ohm 1/4W 5% Carbon Resistor	R111
1		1 MEG ohm 1/4W 5% Carbon Resistor	R103
1		6800 ohm 1/4W 5% Carbon Resistor	R121
1		8200 ohm 1/4W 5% Carbon Resistor	R122
1	RVA1214H103	10K Trimpot	R101
1	RVA1214H503	50K Trimpot	R110*
1	V22ZA1	GE Varistor	RV101
2	DD470	47 pf Disc Capacitor	C102,113
1	CE102	.001 uf Disc Capacitor	C109
2	UK16-104	.1 uf 16V Disc Capacitor	C104 (C107)
1	CW30C104K	.1 uf 50V Mylar Capacitor	C118
1	225P10492X	.1 uf 200V Orange Drop Capacitor	C101
2	CY20C474M	.47 uf 50V Mylar Capacitor	C112 (C108)
1	230B1B305M	3.0 uf 100V Electrocube Capacitor	C111
1	50ELA1	1 uf 50V Electrolytic Capacitor	C105
1	25ELA10	10 uf 25V Electrolytic Capacitor	C106
1	10ELA47	47 uf 10V Electrolytic Capacitor	C103
3	2N3415	Transistor	Q101, 102, 103
1	C84-08-02	8 Pin IC Socket	N/A
3	C84-14-02	14 Pin IC Socket	N/A
3	C84-16-02	16 Pin IC Socket	N/A
1	CA3130AE	IC	U101
1	4093	IC	U102
1	4518	IC	U105
2	4566	IC	U103,104
2	2300-02G	EECO Miniature BCD Switch	SW102-103
1	76SB02	Dual SPST Switch	SW101
1	D1-711	Transformer	T101
1	TA-22	Transformer, Stancor	T102
1	R10E2Y2S140	Sensitive Relay, 5 Volt	K101**
1	Smith 930	10 Screw Terminal Strip	TB2

* 27K 1/4W carbon comp resistor may be used in some units for R110.

** R10E2Y4V185 12 volt relay may be used in some units for K101.

TB 1



NOTE: PARTS SHOWN INCLUDE
 -OPTION H
 -OPTION M
 -OPTION U
 -OPTION X

FIGURE 11
 COMPONENT LAYOUT - MAIN BOARD

RACOM INC

SCALE: 2/1
 DATE: 7-9-78
 APPROVED BY: *[Signature]*
 DRAWN BY: R.A.S.
 REVISED: 2-2-83

COMPONENT LAYOUT
 (401-51F BOARD)

MODEL 1401
 DRAWING NUMBER: 1400-54

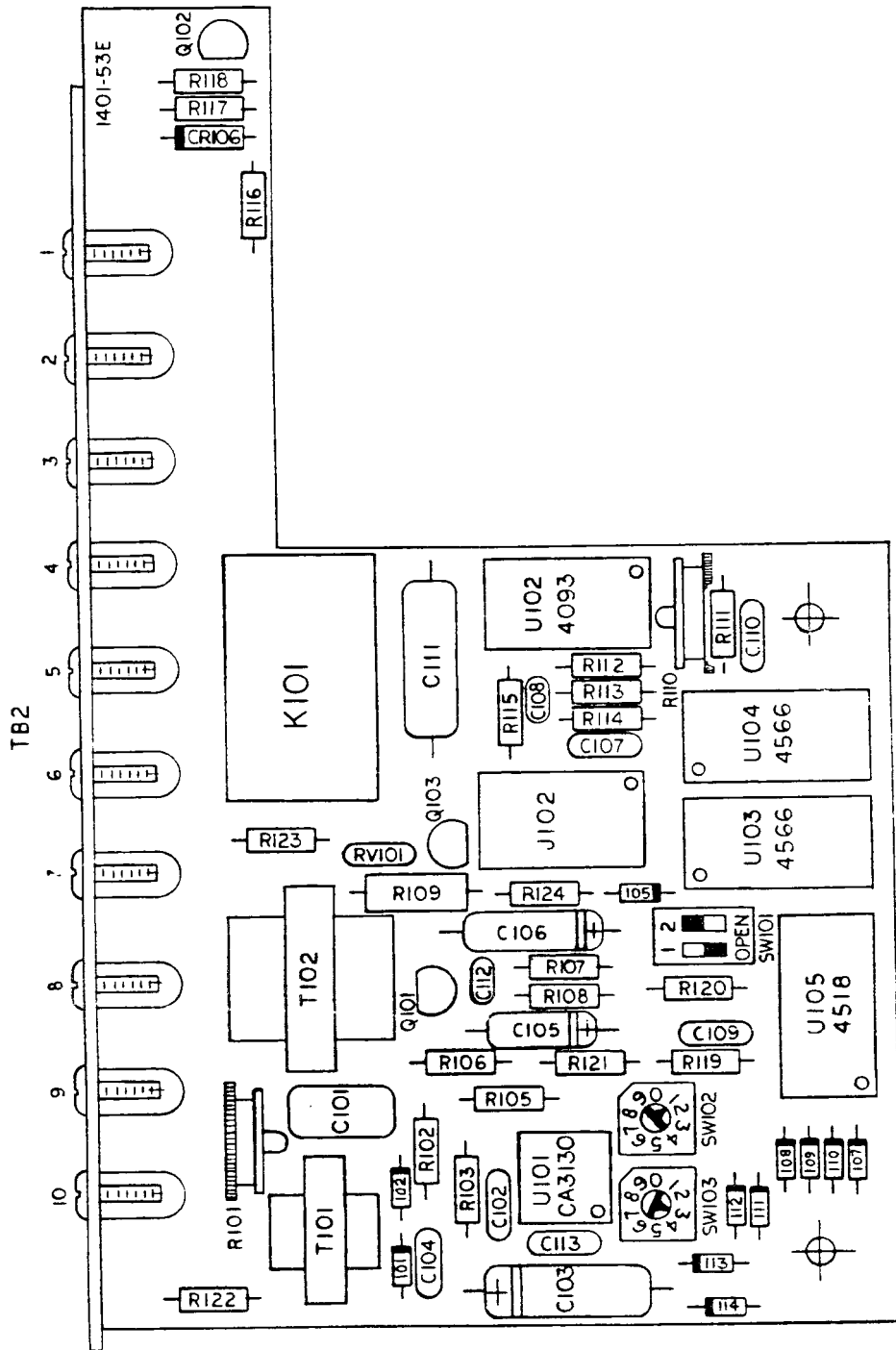


FIGURE 12
COMPONENT LAYOUT-"D" OPTION BOARD

RACOM, INC.	
SCALE: 2:1	APPROVED BY: <i>[Signature]</i>
DATE: 11-15-82	DRAWN BY: Stu
COMPONENT LAYOUT-"D" OPTION 1401-53E BOARD	
MODEL 1401	DRAWING NUMBER 1400-55

RACOM 1401 - A D P X C W I D

A UP DN 0
B UP DN 1
C UP DN 2
D UP DN 3
E UP DN 4
F UP DN 5
G UP DN 6
H UP DN 7
I UP DN 8
J UP DN 9
K DN UP 0
L DN UP 1
M DN UP 2
N DN UP 3
O DN UP 4
P DN UP 5
Q DN UP 6
R DN UP 7
S DN UP 8
T DN UP 9

U UP UP 0
V UP UP 1
W UP UP 2
X UP UP 3
Y UP UP 4
Z UP UP 5
BLANK SPACE UP UP 6
SOLID TONE UP UP 7
FOREWARD SLASH UP UP 8
ZERO 0 DN DN 0
1 DN DN 1
2 DN DN 2
3 DN DN 3
4 DN DN 4
5 DN DN 5
6 DN DN 6
7 DN DN 7
8 DN DN 8
9 DN DN 9