# RACOM MODEL 1402 AND 1402D
# AUTOMATIC MORSE CODE STATION IDENTIFIERS

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## FCC WARNING

Because the 1402 uses digital electronics and a 3.59 MHz oscillator, the FCC requires that this warning be printed. Please notify RACOM if you detect any RF problems with the 1402.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

## INSPECTION

After the instrument is unpacked, it should be carefully checked for damages received in transit. If any shipping damage is found, file a claim with the carrier and refer to the Warranty Section of this manual.

Perform an electrical inspection as soon as possible after the equipment is received.

## RETURN FOR WARRANTY OR REPAIR

If the equipment is to be returned to RACOM for service or repair, please follow the procedures listed below:

1 Contact RACOM for a "RETURN MATERIAL AUTHORIZATION NUMBER" (RMA #)

By writing to: RACOM, INC.
RMA Division
5504 State Road
Cleveland, Ohio 44134

Or Telephone: (216) 351-1755

2 Attach a tag to the equipment. This tag should identify the owner of the unit and give the serial number and the RMA number. *

3 Carefully repack the unit and mark the box with the RMA number. *

4 Then ship the unit to: RACOM, INC.
Repair Department
5504 State Road, Cleveland, Ohio 44134

* NOTE: No merchandise will be accepted by RACOM, INC without an RMA number.

## SPECIFICATIONS for Model 1402

**Call Letters:** Up to 12 letters, digits, "-" or "/" (for repeaters). Optionally proceeded by DE (from).

**Call Programming:** Programmed with switches or by a cable to a PC (personal computer).

**Front Panel Features:** TEST SWITCH for manual ID and testing.
SPEAKER SWITCH turns on internal speaker.
ACTIVE LED indicates when unit is identifying.

**Output Impedance:** 600 Ohm +/- 20 %

**Output Level:** Variable from -25 to -3 DBM

**Solid State Transmitter Keying Switch:** Maximum 200 mA to ground with maximum .6 VDC drop from maximum 200 VDC (or less) source.

**Monitor Inputs:** Receiver (Rx) COR monitor and transmitter (Tx) keying monitor.

**Receiver COR Monitor:** Switch set to Active low or active high.

**Transmitter Monitor:** Active low. Usually controlled by push-to-talk closure to ground. Also starts time period.

**Rx and Tx Monitor Loading:**
1 mA maximum at 0 VDC, 0 mA for voltages above +5 VDC.

**Rx and Tx Monitor Levels:**
Digital low is defined as 0 to +1.2 VDC
Digital hi is defined as +3.5 to +75 VDC

**Operating Modes:**

1. Identifies after each time period.
2. Identifies after each transmission.
3. Identifies one time period after beginning of a transmission.
4. Identifies at the beginning of a transmission and again one time period after start of the transmission.

Note: "Time Period" is the time the INTERVAL TIMER is set to. Typically 15 Minutes.

The following items are programmed into the 1402 with its switches or with the optional PC programming cable. The call sign and all variables are stored in a removable EEPROM.

| | Default Value | Programmable range | | | |
|---|---|---|---|---|---|
| Call Letters: | | Up to 12 | | | |
| Output Frequency: | 1080 Hz | 690 | to | 2020 | Hz |
| Period Interval Timer: | 15 Min | 0 | to | 98 | Minutes |
| Monitor Release Delay: | 3 Sec | 0 | to | 19 | Seconds |

| | |
|---|---|
| Code speed: | Switch set from 10 to 40 Words/Minute<br>We recommend setting it to 24 W/Min. |
| Connections: | Screw terminal strip. |
| Humidity: | Up to 95% RH |
| Monitor Inhibit After Identification: | .4 seconds |
| Output Signwave Distortion: | 20% maximum |
| Output Noise: | 50 db below rated output |
| Power Requirements: | 8-20V AC-DC  200 mA |
| Size: | Desk top - 8.5" wide x 1.75" high x 5.5" deep |
| Temperature Range: | -20 degrees C to +80 degrees C |
| Weight: | 2 lbs. |

**ADDITIONAL SPECIFICATIONS for Model 1402D**

| | |
|---|---|
| Audio Output: | 600 ohm, balanced, DC blocked and isolated from ground.  Variable up to +3 DBM. |
| Relay Contacts: | Two form "C" (DPDT) contacts rated at 2 Amps. |
| Audio Monitor: | Input is 10K ohm impedance (min.) balanced, DC blocked and isolated from ground. Sensitivity is adjustable down to 40 mVAC. |

**OPTIONS for Models 1402 and 1402D**

| Part number | Description |
|---|---|
| 1402-PC | Programming cable and software for a PC |
| 1402-R | EIA Rackmount 19" x 1.75" |
| 1402-T | 120 Vac Wall plug power transformer |
| 1402-L | 50 Character microprocessor for 1402 or 1402D<br>This must be programmed with option 1402-PCL |
| 1402-PCL | 50 character PC software and programming cable |

## INTRODUCTION AND GENERAL FEATURES

The Racom Model 1402 is a sophisticated state of the art Morse Code Station Identifier which is designed with the professional communications specialist in mind. The 1402, 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 and microprocessor are used throughout for dependable operation in areas where RF radiation can cause havoc with lesser equipment. Usage of a microprocessor approximated signwave 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 1402 IDENTIFIER

The 1402 identifier is capable of producing any Morse Code call sign that has between one and twelve alphabetical or numerical characters. The 1402 may be programmed with the Morse Code characters A through Z, 0 through 9, the symbols / and - and a "space" (no audio). 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 twelve call letters may be optionally proceeded by "DE" (meaning from).

The standard Model 1402 is capable of several distinct operating modes which comply with FCC part 81 and 90 regulations. With a wide variety of external hookup schemes, the 1402 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.

**Operating Modes:**

**The standard 1402 will operate in four distinct modes. The 1402 has two built-in timers. The interval timer controls the time interval or time period at which identifications take place (usually about 15 minutes). The other timer is the monitor delay timer. This timer will delay an identification until it reaches it's set point (usually 2 to 5 seconds). It is reset to 0 whenever there is activity on any of the monitor inputs. This timer keeps the 1402 from identifying on top of other traffic.**

**Mode 1:** **The unit will identify every time interval as set by interval timer.**

**Mode 2:** **The unit will identify from 0 to 19 seconds after transmission has ended.* This 0 to 19 second delay time is called "Monitor Delay Time".**

**Mode 3:** **The unit will identify one time interval after the transmitter has been keyed.* This time interval is set by the interval timer. Grounding the transmitter monitor terminal starts the timer.**

**Mode 4:** **The 1402 will identify over any audio at the beginning of the transmission and again identify one time interval after the transmitter was first keyed.* This time interval is set by the interval timer. Grounding the transmitter monitor terminal starts the timer.**

*** Provided the "transmitter monitor" is connected to the transmitter.**

**NOTE:** **The "COR monitor" terminal and the "XMTR monitor" terminal are active in all of the above modes and if either or both terminals is given a "digital low" (less than 1.2 VDC), no identification will take place until the "digital low" resumes to a "digital high" (above 3.5 VDC).**

## EXTERNAL CONTROLS AND POWER HOOKUP

**Power Requirements:**

The Model 1402 may be powered by 8-25 volts AC/DC which makes it ideal for 12 volt battery operation. Power is applied between terminals 1 and 2 of TB1 or to the power connector. These terminals connect to a full wave bridge rectifier so the power connections are not sensitive to polarity.

The option "T" 120 VAC wall plug transformer should be plugged into the power jack or connected between terminals TB1-1 and TB1-2.

**Fuse:**

The power fuse is located on the circuit board. This fuse should be replaced with one of the same type and value.

**Front Panel Controls and Indicators:**

The following two switches and LED are mounted on the front panel.

**SPEAKER:** When this locking toggle switch is "up", an internal monitor speaker is connected to the identifier's audio circuit.

**TEST:** This is a momentary contact switch that will cause identifier to identify, regardless of other conditions, when momentarily toggled. This switch is also used to program the 1402.

**ACTIVE LED:** During normal operation, this LED will flash during the monitor delay period and light solid during the identification period. When the 1402 is being programmed, it will flash when data needs to be saved.

## INITIAL OPERATION

**Initial Check & Set-up:**

Initial set-up of the Model 1402 will involve removing the top cover, which is secured by four 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; depress the "speaker" switch. The identifier should send out the Morse Code characters "DE", meaning "from". A newly purchased unit will only emit the "DE" code because the call sign needs to be programmed.

**Call Sign Programming:**

Call sign programming requires setting of switches for each Morse Code character or the 1402 may be programmed from a PC (Personal Computer) with its optional program cable and software.

## INTERNAL ADJUSTMENTS

Inside the 1402 there are two rotary dip switches (SW1 and SW2) and one two section dip switch (SW3). These are dual purpose switches.

For normal operation as an identifier, switch SW1 must be in position "0" and the other switches function as indicated on this page. When SW1 in a position other than "0" the 1402 is in the programming mode and SW1 determines the address to be programmed. The other switches determine the data to be programmed at the address of SW1. Program is discussed on the following pages.

### Audio Output Level - R28:

R28 controls the amplitude of audio output seen between TB1-7 and TB1-8, for purposes of setting modulation or deviation levels.

### Audio Monitor Sensitivity - R2 (Model 1402D only):

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.

### Code Speed - SW2:

When the unit is in normal operation, switch SW2 controls the code speed as follows: Code speed is in words per minute.

| SW2 Position | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Code Speed | 40 | 30 | 24 | 20 | 17 | 14 | 13 | 12 | 11 | 10 |

### Interval Timer Mode - SW3-1:

When the unit is in normal operation, switch SW3-1 controls if the interval timer will cycle continuously or only be started by transmitter monitor terminal activity.

On - Started by transmitter monitor activity (Mode 3)
Open - Runs continuously (Mode 1)

This switch must be closed or on for operation in modes 2, 3 or 4.

### Receiver COR Monitor State - SW3-2:

When the unit is in normal operation, switch SW3-2 controls the state of the receiver COR monitor terminal as follows:
If the COR is not connected this switch should be set "open"
On - COR is active high
Open - COR is active low

## PROGRAMMING

The station's call letters must be programmed into the 1402. The 1402 also allows output frequency, interval timer, monitor release delay and its mode to be customized programmed for the system or to stay at our recommend values.

The 1402 may be programmed with its internal switches or it may be programmed by a cable connected to a PC (personal computer).

For normal operation of the 1402 switch, SW1 must be in position 0. When the 1402 is being programmed, SW1 selects the address to be programmed. Switches SW2 and SW3 determine the data to be programmed at the address of specified by SW1.

Programming from a PC:

To program with a PC plug, the DB25 end of the programming cable into one of the parallel printer ports (LPT1, LPT2 or LPT3) on the PC and start the PC program marked "1402.BAT" on the 1402 disk. The program will instruct you as to when the other end of the cable should be plugged into J2 on the 1402 and when to apply power to the 1402.

Programming With Switches:

To program the 1402 with switches, it is necessary to set SW1 to the address or position to be programmed. SW2 and SW3 are set to the character or value to be programmed. The test switch is pushed to do the actual programming. This needs to be done for each position of SW1 that needs to be programmed. The active LED will flash if the data selected with SW2 and SW3 does not match the data at the address selected with SW1.

| SW1 ADDRESS | DESCRIPTION |
|---|---|
| 0 | Normal Operation |
| 1 | Call Letter Character position 1 |
| 2 - A | Call Letter Character positions 2 to 10 |
| B | Call Letter Character position 11 |
| C | Call Letter Character position 12 |
| D | Monitor Delay in seconds |
| E | Interval Time in Tens of Minutes |
| F | Tone Frequency, "DE" and mode 4 selection |

**Step By Step Programming:**

| | |
|---|---|
| 1 | Set SW1 to 1 for call letter position 1 |
| 2 | Set SW2 and SW3 to code for Call Letter Character 1<br>See table 1 for settings |
| 3 | Push the test switch to save the settings |
| 4 | Repeat steps 1, 2 and 3 for each call letter character |
| 5 | If the call letters have 12 characters, skip to step 9 |
| 6 | Set SW1 to the first not used call letter position |
| 7 | Set SW2 and SW3 to the END code (See table 1) |
| 8 | Push the test switch |
| 9 | Set SW1 to D |
| 10 | Set SW2 and SW3-1 to the monitor delay in seconds. |
| 11 | Push the test switch |
| 12 | Set SW1 to E |
| 13 | Set SW2 and SW3 to the desired interval time in minutes |
| 14 | Push the test switch |
| 15 | Set SW1 to F |
| 16 | Set SW2 to the desired tone frequency, use SW3-1 to select mode 4 and SW3-2 to add "DE" (from) if desired. |
| 17 | Push the test switch |
| 18 | Set SW1 to 0 |
| 19 | 1402 is now back in normal operation. Push the test to hear the call letters. |
| 20 | Set SW2 to the desired code speed |
| 21 | Set SW3-1 to the Interval Timer start mode<br>If mode 1 identification is desired set this switch "open" |
| 22 | Set SW3-2 to the desired COR monitor state<br>If the COR is not connected this switch should be set "open" |

**Call character selection at addresses 1 to C:**

| SW3 -1 | SW3 -2 | Position of SW2 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Open | Open | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| On | Open | A | B | C | D | E | F | G | H | I | J |
| Open | On | K | L | M | N | O | P | Q | R | S | T |
| On | On | U | V | W | X | Y | Z | / | - | space | END |

**Programming in the "END" selection will tell the 1402 that this is the end of the call and the identification will end at its address.**

**Markings on SW3:**

**The switch SW3 is general made with a marking of either OPEN or ON. Please remember that for this type of switch closed is the same as on and open is the same as off.**

Monitor Delay Time Setting (Seconds) at address D:

| SW3 -1 | Position of SW2 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Open | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| On | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

SW3-2 Keep this switch in the open position.

Interval Time Setting (Minutes) at address E:

| SW3 -1 | SW3 -2 | Position of SW2 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| On | On | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| Open | On | 3 | 13 | 23 | 33 | 43 | 53 | 63 | 73 | 83 | 93 |
| On | Open | 5 | 15 | 25 | 35 | 45 | 55 | 65 | 75 | 85 | 95 |
| Open | Open | 8 | 18 | 28 | 38 | 48 | 58 | 68 | 78 | 88 | 98 |

For mode 2 operation set the interval time to 0.

Tone Frequency Setting (Hz) and options at address F:

| SW3 -1 | SW3 -2 | Position of SW2 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| See below | | 2020 | 1660 | 1410 | 1220 | 1080 | 970 | 870 | 800 | 740 | 690 |

SW3-1 Open Modes 1, 2 or 3. Also see the section on the Interval Timer Mode on page 8. Set the interval time (see above) to 0 form mode 2 operation.

SW3-1 On Mode 4. An identification takes place immediately when the transmitter monitor terminal goes to the low state. Then the interval timer will start and another identification will follow. If the unit is operated in mode 4 the Interval Timer Mode switch on page 8 must be in the on position.

SW3-2 Open DE (from) is sent before the call letters.

SW3-2 On DE is not sent

## TERMINAL HOOKUP GUIDE

**NOTE:** All identifier terminals are referenced to ground potential and all voltage measurements are made with respect to ground (TB1-4).

### POWER (TB1-1 and TB1-2)

Power of 8-25 volts AC/DC should be applied between terminals TB1-1 and TB1-2 or to the power connector. These terminals connect to a full wave bridge rectifier so the power connections are not sensitive to polarity.

The optional 120 VAC ("T" option) wall plug transformer should be plugged into the power jack or connected between terminals TB1-1 and TB1-2.

### RECEIVER COR MONITOR (TB1-3):

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 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, switch SW3-1 may be used to invert the level of this terminal. See "Option D's Audio Monitor" for further information regarding COR hookups.

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

### GROUND (TB1-4):

Chassis ground and common for the Transmitter Monitor, Transmitter Keying and Receiver Monitor terminals is TB1-4. This terminal may also be used as power ground if the 1402 is to operate off the base station's power.

### TRANSMITTER KEYING (TB1-5):

This is the terminal that is used to automatically key the transmitter while identification is taking place. The transistorized terminal 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.

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

**TRANSMITTER, TX or XMTR MONITOR (TB1-6):**

**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 Modes 2, 3 or 4. 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 connect to a "TX key" light circuit if available and electrically compatible.**

**AUDIO OUTPUT (TB1-7): (See next page for Model 1402D)**

**This terminal is a ground-referenced medium 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 R28. Generally, the output level should be adjusted for 40% deviation, or 2 KHz on a 5 KHz system.**

**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.**

**AUDIO GROUND (TB1-8): (See next page for Model 1402D)**

**TB1-8 is the ground that should be used for audio.**

## ADDITION TERMINALS for Model 1402D

**RELAY CONTACTS (TB1-9, 10, 11); (TB1-12, 13, 14):**

These six terminals comprise two sets of SPDT relay contacts. The relay contacts close and remain closed for the entire duration of the identification period. One set of contacts may be used to key the transmitter and the other set may be used to connect audio into the transmitter microphone circuit.

These relay contacts break down as follows:

| | | | |
|---|---|---|---|
| TB1-9 | N. C. | TB1-12 | N. C. |
| TB1-10 | Common pole | TB1-13 | Common pole |
| TB1-11 | N. O. | TB1-14 | N. O. |

**AUDIO OUTPUT (TB1-7 and TB1-8):**

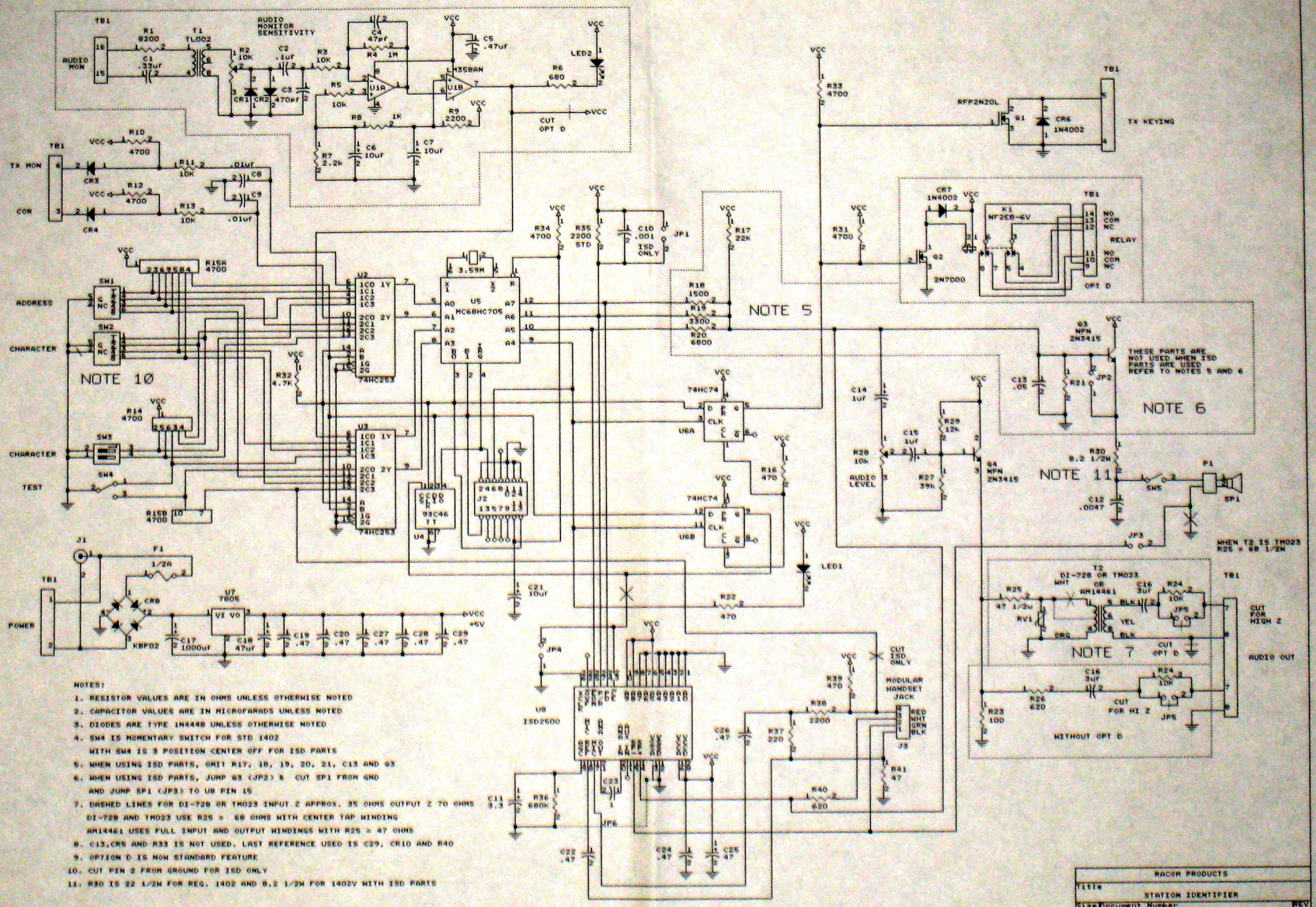
This audio output is transformer-coupled, DC blocked and electrically isolated from the chassis. Approximately 100 volts may be placed across these terminals without damage. The output is a sine-wave 600 OHM impedance and its output is variable with R28.

**AUDIO MONITOR (TB1-15 and TB1-16):**

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 a watch on 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 R2. 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.

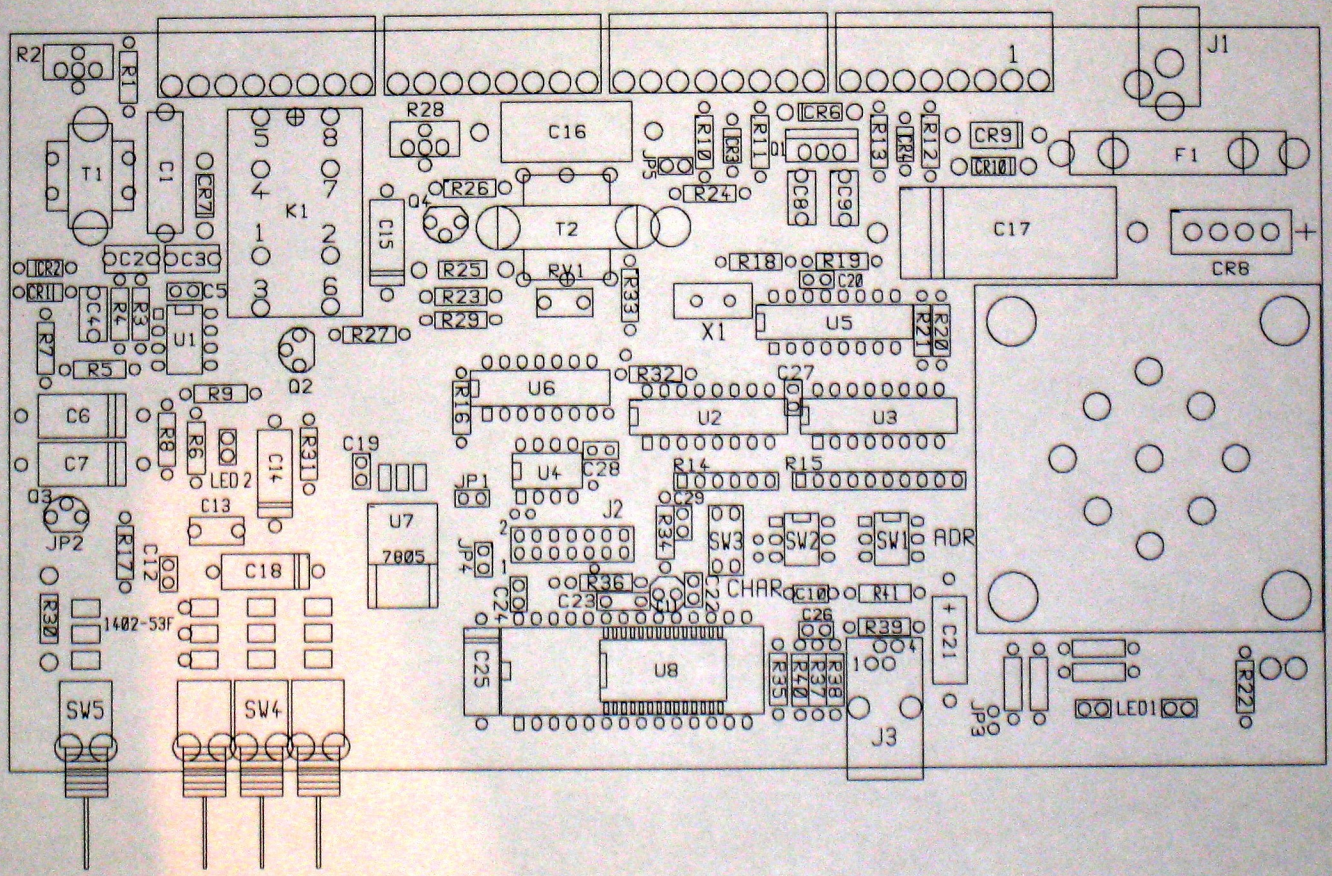
*NOTE: Some installations may dictate hooking the audio monitor to the receiver speaker terminals for an audio source. This is generally not recommended because adjusting station volume control too low will defeat the purpose of the monitor and risk FCC citation.




NOTES:

1. RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE NOTED
2. CAPACITOR VALUES ARE IN MICROFARADS UNLESS NOTED
3. DIODES ARE TYPE 1N4448 UNLESS OTHERWISE NOTED
4. SW4 IS MOMENTARY SWITCH FOR STD 1402
   WITH SW4 IS 3 POSITION CENTER OFF FOR ISD PARTS
5. WHEN USING ISD PARTS, OMIT R17, 18, 19, 20, 21, C13 AND Q3
6. WHEN USING ISD PARTS, JUMP Q3 (JP2) & CUT SP1 FROM GND
   AND JUMP SP1 (JP3) TO U8 PIN 15
7. DASHED LINES FOR DI-720 OR TN023 INPUT Z APPROX. 35 OHMS OUTPUT Z 70 OHMS
   DI-720 AND TN023 USE R25 = 68 OHMS WITH CENTER TAP WINDING
   AM14461 USES FULL INPUT AND OUTPUT WINDINGS WITH R25 = 47 OHMS
8. C13,CR5 AND R33 IS NOT USED, LAST REFERENCE USED IS C29, CR10 AND R40
9. OPTION D IS NOW STANDARD FEATURE
10. CUT PIN 2 FROM GROUND FOR ISD ONLY
11. R30 IS 22 1/2W FOR REG. 1402 AND 8.2 1/2W FOR 1402V WITH ISD PARTS

| | | |
|---|---|---|
| RACOM PRODUCTS | | |
| Title: STATION IDENTIFIER | | |
| Size: C | Document Number: 1402-52 | REV: F |
| Date: December 7, 2000 | Sheet 1 of 1 | |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U3
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JP4
R36
C23
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