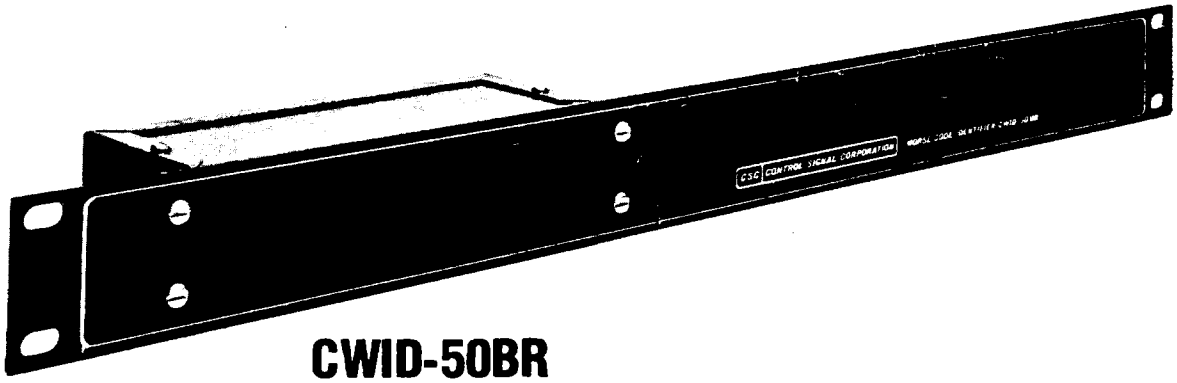
INSTRUCTION MANUAL

Automatic Station Identifier

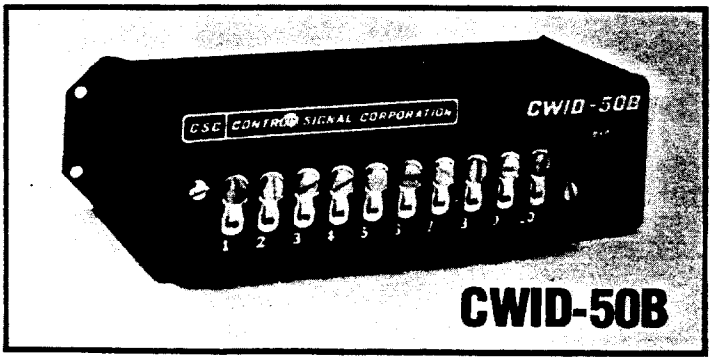
MODELS CWID-50B, -50BR, -51B

Revision C

CWID-51B



CWID-50BR



CWID-50B

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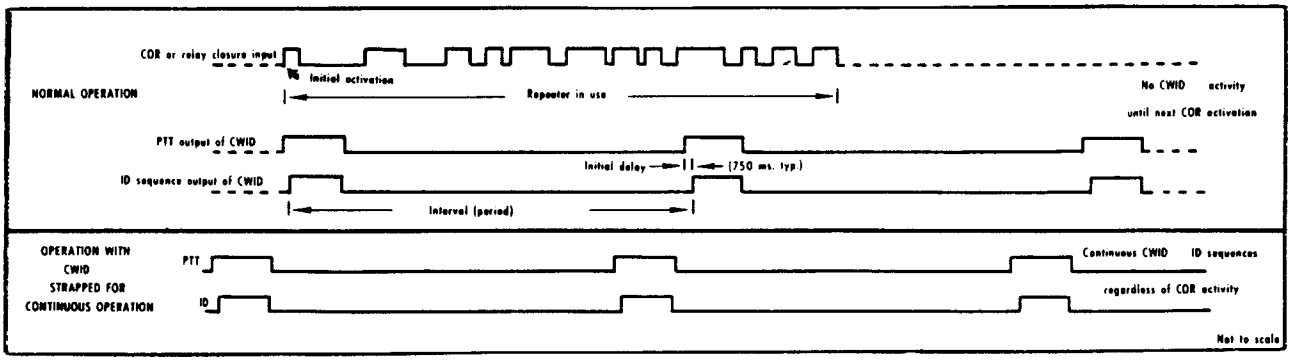
INTRODUCTION

Models CWID-50B, CWID-50BR* and CWID-51B automatic station identifiers possess the versatility to perform in virtually all applications requiring a precisely timed transmitter identification (ID) in international Morse code. Three control inputs -- COR, inhibit, and test -- when used singly and in combination yield a wide variety of operating modes, many of which are covered in the CONFIGURATION SELECTION section of this manual. The heart of all CWID units is a read-only memory (ROM) integrated circuit which has been factory programmed to deliver the station call letters in standard CW. The audio output level is continuously adjustable from 0 to 1.5 volts peak-to-peak (600 ohm reference) for proper modulation level. A high-level output (4 V peak-to-peak) is also available for use with a monitor speaker (provided in the CWID-51B). All timing is provided by a precision integrated circuit (IC) timer, thus making the CWID units independent of commercial 60 Hz mains. The push-to-talk (PTT) output can be configured to handle either positive or negative PTT lines over a wide range of voltage and current.

Several timing parameters may be set to suit the individual user by simply installing the proper 1/4-watt resistors in the appropriate terminals on the circuit board. These parameters are initially set by the factory. The use of resistor replacement rather than variable trimmer resistors, aside from being more economical, is a deterrant to tampering with the adjustments. The CWID-50B contains an internal voltage regulator allowing a wide range of DC power to be applied to the power input terminals. The CWID-51B can be similarly powered but also is provided with a 117 VAC supply. When an external DC supply (such as a backup 12 VDC battery) is employed, the CWID-51B automatically switches to the external supply in event of loss of the 117 VAC source. The CWID-51B is also supplied with a monitor speaker and volume control, a push-to-test switch and a switch to select remotely-activated ID triggering or continuous operation.

Typical Timing Diagram



*CWID-50BR is a CWID-50B mounted on a 1-3/4 inch rack panel.

DEFINITION OF TERMS

Continous Mode - ID sequence provided each interval period, regardless of station activity.

COR (Carrier Operated Relay) - A relay which is energized when the receiver is in the unsquelched state (channel in use).

COR Mode - ID sequence delivered each interval period only during periods of station activity. Normally triggered by COR and/or PTT activity.

COS (Carrier Operated Switch) - Solid state device which is on when the receiver is in unsquelched state (channel in use).

CWID - Station identification in Morse code. Also trade name of Control Signal Corporation's CWID (pronounced QUID) line of automatic station identifiers.

Dual Inhibit - Multiple inputs for triggering the inhibit action of the station identifier. Diode CR9 is included in CWIDs with this option.

Final ID - Identification sequence after expiration of interval period beyond last transmission.

Guard Receiver - Receiver monitoring output RF channel of station transmitter.

Half Duplex - Communications system utilizing separate RF channels for transmit and receive. (Repeater station is an example.)

ID - Station identification

ID Sequence - Series of Morse code characters providing station identification.

Inhibit - Delaying the automatic ID sequence so as to not be simultaneous with voice traffic on the channel. Normally triggered by COR or PTT activity.

Inhibit-Release Delay - Quiet-channel time interval which must elapse after inhibit function has been invoked before ID is given. Standard is 5 seconds, but is adjustable by resistor R1. (See Table 5.)

Initial Delay - Time period between the actuation of the station PTT line and the beginning of the ID sequence. Standard is 750 msec., but is adjustable by resister R15. (See Table 2.)

Interval Period - Time between ID sequences. Typically 15 or 30 minutes, depending on radio service. Adjustable by resister R8. (See Table 1.)

N.C. - Normally closed contacts on relay or switch.

N.O. - Normally open contacts on relay or switch.

PTT - Transmitter push-to-talk circuit.

Shared Channel - Same RF channel used by more than one group or more than one licensee with contiguous or overlapping areal coverage.

BEFORE TRYING ANYTHING ELSE - TRY THIS

Step 1. Applying Power

a. If the unit is one without internal power supply (CWID-50B or CWID-50BR), it will be necessary to utilize a well-filtered source of voltage between 8 and 30 V, capable of up to 250 ma. current. If it is desirable to monitor the Morse code identification sequence, it will be necessary to connect a high-impedance (100 ohm) speaker or earphone between Terminal 7 and ground (Terminal 9) on the rear of the unit. Connect the positive supply voltage to Terminal 10, and the negative (common) of the supply to Terminal 9. Upon application of power the Morse code should be heard once in the monitor speaker, if used.

b. If the identifier unit is a CWID-51B, it is only necessary to plug the line cord into a source of 110 VAC, and put the "DC-AC/AUTO" switch in the "AC/AUTO" position. If the monitor volume control has been advanced sufficently, the Morse code identification sequence should be heard once in the monitor speaker. Place the remaining bat-handled switch in the "COR" position.

If no ID is heard, the most likely cause, aside from external connection errors, is that the ROM, U1 has become loose in its socket during shipping. Remove the four cover screws in the CWID-50B or two cover screws in the CWID-51B and carefully ensure that U1 is seated in its socket on the circuit board. U1 is the only socket-mounted component in the CWID and it has a label with the call sign on top. Try Step 1 again. If Morse code identification cannot be obtained please write Control Signal Corporation describing your problem or return the unit for diagnosis and repair, if necessary.

Step 2. Push-to-Test Button (or Test Terminal)

Each time Terminal 3 is temporarily grounded and released the identification sequence should be heard in the monitor speaker, and a logic low should be observed on a DC voltmeter connected between Terminal 5 and ground (Terminal 9). The interval timing is re-initalized each time this is done. This same action will occur when the red test button on the front panel of the CWID-51B unit is depressed and released.

Step 3. Triggering the Identifier

When Terminal 1 is temporarily grounded and released, the ID sequence will be heard only if the appropriate interval time has elapsed since the last automatic ID. (Typically 30 or 15 minutes.) Once an ID sequence has been obtained using Terminal 1, no other ID sequence

will occur until after the interval period, regardless of the number of times Terminal 1 is grounded and released. A final ID sequence will occur at the end of the interval period, providing Terminal 1 is not grounded (unit in inhibit state).*

If the "COR-CONT" switch on the CWID-51B is placed in the "CONT" position, no action on Terminal 1 will initiate the ID sequence. The ID sequence will take place on a "continuous" basis, each ID interval period, regardless of station activity. CWID-50B OR CWID-50BR units may be operated in the continuous mode by permanently strapping Terminal 1 to ground.

Step 4. Inhibit

If the interval period (typically, 30 or 15 minutes) expires while Terminal 1 is grounded, the ID sequence will not occur until the ground is released from Terminal 1.* This is the INHIBIT action of the unit, which prevents the ID sequence from interfering with voice traffic on the circuit. This is also the function of Terminal 2 on dual inhibit models.

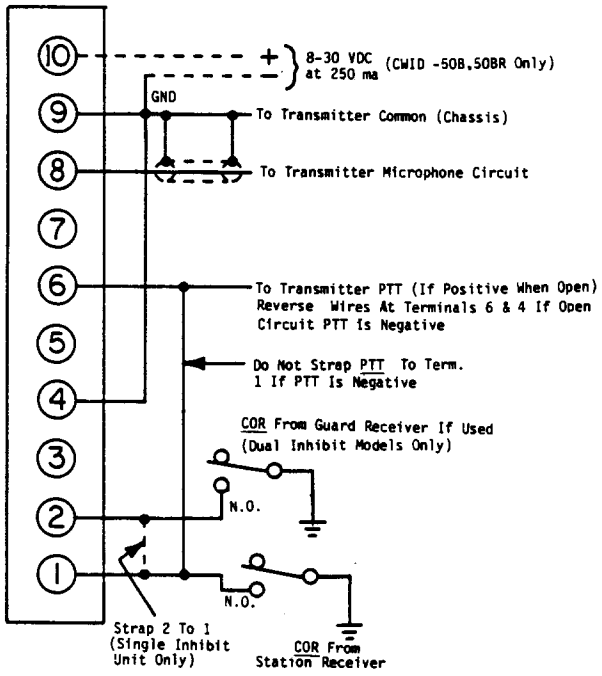


Figure 1.
Identifier hookup for COR mode with inhibit for repeater, mobile relay, or remote base systems. This will allow for all mobiles and the dispatcher to both activate and inhibit the identifier.

*This applies to dual inhibit models only. Single inhibit models are inhibited while Terminals 2 and 1 are strapped together, and grounded.

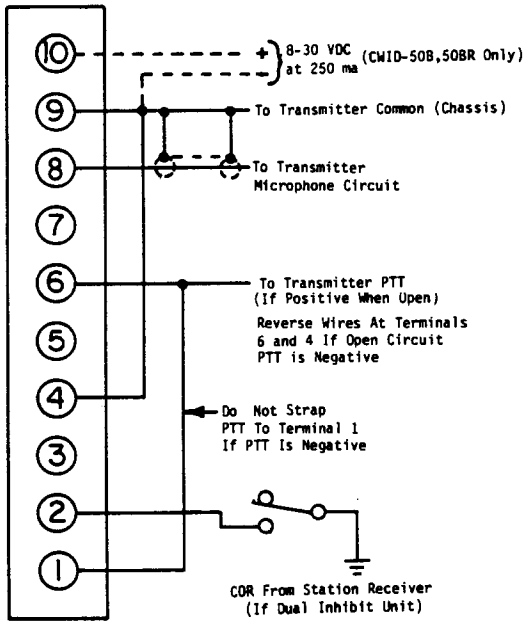


Figure 2.
Identifier hookup for COR mode with inhibit for base station. This will allow for dispatcher to activate the identifier. ID will be inhibited when local PTT is used and when station receiver is unsquelched if dual inhibit model is used.

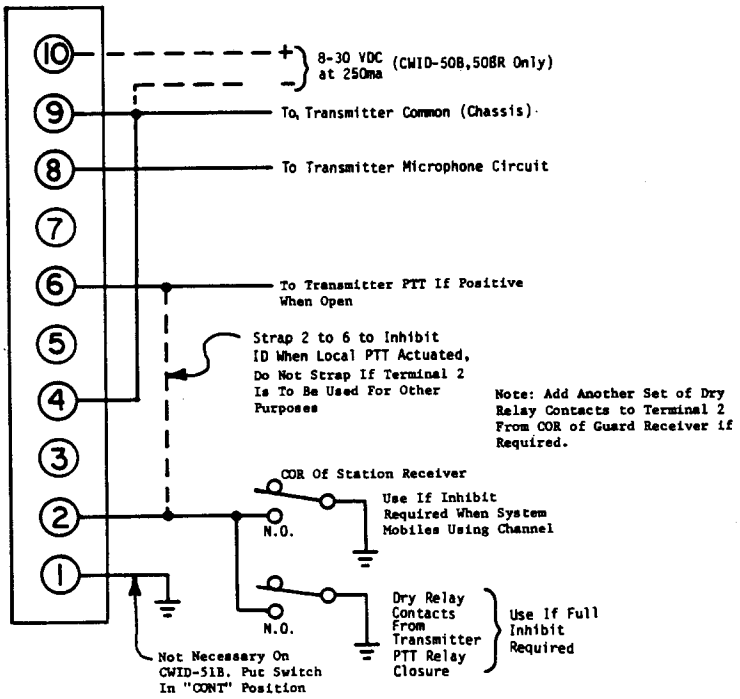


Figure 3.
Identifier hookup for continuous mode.

INSTALLATION

CAUTION: CONNECT THE TRANSMITTER TO A SUITABLE ANTENNA OR DUMMY LOAD BEFORE CONTINUING. Refer to Figure 1, 2 or 3 for the following.

Steps 1-4. (See above)

Step 5. Ground

Connect a chassis common (ground) line from the transmitter to Terminal 9 of the station identifier.

Step 6. PTT Line Output

a. For positive PTT lines, connect Terminal 6 to the PTT line.

b. For negative PTT lines, connect Terminal 4 to the PTT line.

Step 7. PTT Return

Connect either Terminal 6 or 4 (whichever was not used in Step 6) to ground (Terminal 9).

Step 8. Test Terminal and ID Trigger Input

Repeat Steps 2 and 3 above, and the transmitter should be keyed during the ID sequence. Note that as long as the red test button is held down the transmitter will be keyed (This action may be duplicated on CWID-50B and CWID-50BR units by grounding Terminal 3.)

Step 9. Audio Output

Using an appropriate length of shielded audio cable, connect the center conductor to Terminal 8 of the ID unit and directly to the microphone input (600 ohm) of the transmitter. Connect the shield or braid to common (ground) at the transmitter and at the ID unit (Terminal 9).

Step 10. ID on Monitor Receiver

The ID sequence should be heard on a monitor receiver when Steps 2 or 3 above are repeated, though the deviation level may not be correct or adequate for operation.

Step 11. Deviation Level

To adjust the deviation level, use a small screw driver or alignment tool through the hole on the back of the ID unit marked "level". This is a PC-board-mounted, ten-turn potentiometer which adjusts the audio output level between 0 and 1.5 V peak to peak. This adjustment does not affect the monitor speaker volume. To produce a continuous tone for use in setting the deviation level, temporarily remove the ROM (U1).

If the nominal 600-ohm output impedance loads the transmitter microphone circuit, R20 may be replaced with a higher value to raise the output impedance at the expense of output amplitude.

NOTE: In the United States the FCC requires that the deviation level of the ID sequence be adjusted for 40% (± 10%) of the nominal maximum deviation of the voice transmissions. This would be 2.0 KHz (±.5 KHz) for a 5 KHz (NBFM) system.

Step 12. Trigger and Inhibit

a. If the COR mode of operation or the inhibit feature is desired it is necessary to activate Terminals 1 and/or 2 to provide logic for triggering or inhibit as may be required. If the continuous mode is desired (see Figure 3) without inhibit it is not necessary to activiate Terminals 1 or 2. (In the continuous mode the identifier is internally triggered every interval period.

   Terminal 1 or 2 may be activated by a dry contact closure to ground or a logic low (less than 0.5 VDC) via a carrier operated relay (COR) or switch (COS) which is driven by the squelch operation of the station or guard receiver.

   To inhibit the ID sequence during normal voice operation Terminal 1 must be grounded while the PTT is activated. This may be done by (A) a set of dry contacts of a relay driven by the PTT (see figure 16) or (B) Terminal 1 and Terminal 6 may be tied together in systems where the open PTT voltage is positive (see Figure 3).

b. IF REPEATER, REMOTE BASE, OR MOBILE RELAY connect the COR or COS to Terminal 1 so that Terminal 1 is grounded when the receiver is unsquelched (channel active). In addition, on single inhibit models, tie Terminal 1 to Terminal 2 (see Figure 1).

c. IF BASE STATION and dual inhibit model in use connect the COR or COS to Terminal 2 so that Terminal 2 is grounded when the station receiver is unsquelched (channel active) (see Figure 2).

d. If the RF channel is shared, it may be necessary to utilize a "guard" receiver to insure the station identifier does not "step on" another station using the channel.

Use the dual inhibit model, and connect the COR or COS of the guard receiver to Terminal 2 so that Terminal 2 is grounded when the guard receiver is unsequelched.

Converting to a Dual Inhibit Model

If your unit is a single inhibit (standard) model you can convert it by installing a 1N4148 diode in location CR9 which is located on the upper left-hand corner of the CWID-50 board. (See Figure 19, page 27).

ADDITIONAL INSTALLATION INFORMATION

After determining the desired hookup configuration, select a suitable location for mounting the unit. The ideal location is near the transmitter to minimize cable length, near the external power source (if used), and oriented so that the barrier strip terminals and the LEVEL adjust potentiometer (adjacent to the barrier strip) are accessible. The CWID-50B may often be mounted directly to the transmitter cabinet by its mounting ears. Where there is room and adequate ventilation it is permissible to mount the identifier inside the transmitter cabinet. The rack-mounted models CWID-50BR and CWID-51B are commonly located above or below the transmitter in the same rack.

The wiring harness should be installed as follows:

1. Wire Preparation and Termination. At the end of the harness to be connected to the CWID identifier barrier strip, the wire ends should be stripped and prepared using Cinch series 160 fanning strips or Waldom N-5510 solderless crimp terminals or equivalent (not supplied). Placing bare wire ends directly under the screw heads is not recommended due to a potential short-circuit hazard. Short jumpers may be soldered directly to the fanning strip terminals if used or may be made up with a crimp terminal on each end.

2. Control Inputs. A separate pair of wires should be routed from each set of controlling contacts as applicable. The neutral wire of each pair should be grounded at Terminal 9 and the hot wire should be connected to the appropriate Terminal (1, 2, or 3). Shielded wire is recommended to minimize potential RF interference problems. If the COR or PTT microphone contacts are not isolated and the transmitter PTT line is positive the trigger input on Terminal 1 may be connected to the PTT line as shown in Figure 2. Negative PTT lines must have an isolated set of contacts to activate the CWID Terminal 1 to avoid application of out-of-specification voltages to the CWID inputs (see Figures 16 and 17).

3. PTT Lines. Strap the PTT output for either positive or negative operation as shown in Figures 4 and 5. If the open PTT line is a positive voltage, connect the PTT line to Terminal 6 and jumper Terminals 4 and 9 as in Figure 4.

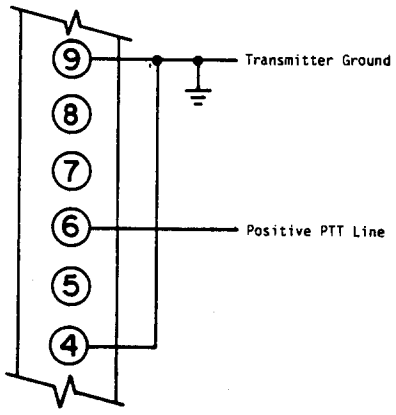


Figure 4.
Output Connections for Positive PTT Line

If the open PTT line is a negative voltage, connect the PTT line to Terminal 4 and jumper Terminals 9 and 6 as in Figure 5. Terminal 9 should be connected to transmitter ground. See Figure 16 for triggering the identifier when using negative push-to-talk line.

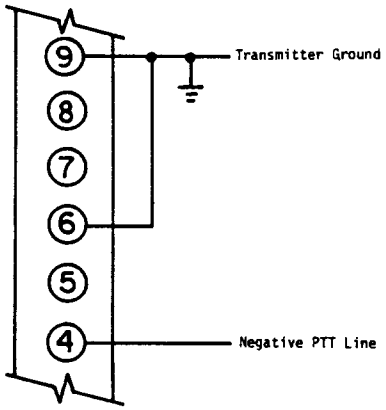


Figure 5
Output Connections for Negative PTT Line

CAUTION: PTT relay switching voltage cannot exceed 250 VDC (open circuit) and the closed circuit current cannot exceed 400 ma. If a relay coil is to be keyed directly, place a 400 volt silicon diode (1N4004) across the relay coil to protect the CWID switching transistor from inductive spikes which could cause permanent damage.

4. Audio Outputs. Connect the transmitter microphone or modulator input line to Terminal 8 using shielded wire as shown in Figure 6. If it is desired to directly monitor the audio output of the CWID-50B a high impedance speaker such as the Calectro S-206 with 100 ohm voice coil may be connected between Terminal 7 and ground (Terminal 9). The CWID-51B is equipped with such a speaker internally but a second remote speaker can also be connected as above. Alternatively, the audio on Terminal 7 can be used as a high level (4 volts peak-to-peak) modulation signal.

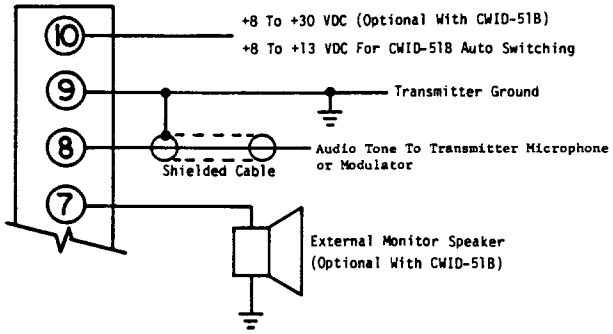


Figure 6 Power and Audio Connections

5. Activity Output. Terminal 5 provides a signal indicating that the transmitter PTT line is being activated by the CWID unit. This output is an open-collector transistor which can be used externally to enable and disable tone squelch circuits, turn on a visual indicator (LED) or for any other purpose.

Terminal 5 is low (transistor turned on) when the CWID PTT output is active; otherwise it is an open circuit (transistor turned off). This output will sink up to 50 ma when low.

6. DC Power Supply. Two wires (unshielded) should be used to connect the CWID-50B to a source of +8 to +30 VDC. See Figure 6. These connections optionally may be used to power the CWID-51B, although the maximum voltage should be limited to +13 VDC if the automatic power switchover feature is desired. The power supply voltage must remain on continuously and be capable of supplying 250 ma.

CONFIGURATION SELECTION

CWID identifiers are extremely versatile instruments and can be connected in a number of ways to fit specific applications. Figures 7 through 15 show how the control inputs may be connected to meet most identification requirements. Most commercial applications are satisfied by Figure 8 for inhibited identification and Figure 7 for non-inhibit ID activated by a COR or PTT input. If an ID is required at the specified interval period independent of transmitter use, the continuous modes of Figure 9 for non-inhibit or Figure 10 for inhibited identification are suggested. For assistance with applications other than those shown in Figures 7 through 15, please consult Control Signal Corporation. (See Figures 1, 2 and 3 for complete hook-up).

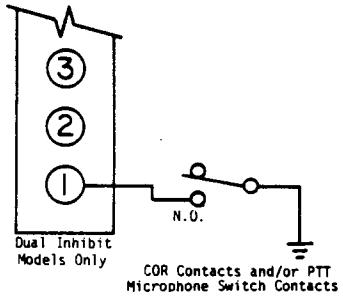


Figure 7
Non-Inhibit COR/PTT Operation With Final ID

Figure 8
Inhibit COR/PTT Operation With Final ID (Inhibit Slaved to COR or PTT).

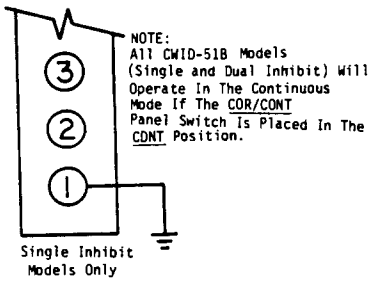


Figure 9
Non-Inhibit Continuous Mode (ID Each Interval Regardless of COR/PTT State)

Figure 10
Inhibit Continuous Mode
(ID Each Interval Unless Inhibited by COR/PTT Input)

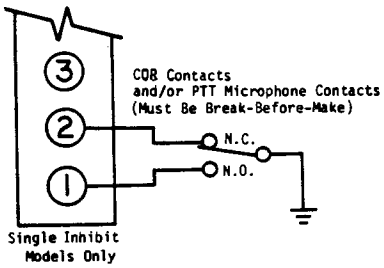


Figure 11
Non-Inhibit Cor/PTT Operation With No Final ID. For Repeaters only.*

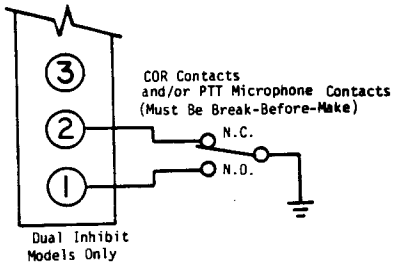


Figure 12
Inhibit COR/PTT Operation With No Final ID. For Repeaters only.*

* In addition C20 must be removed (See Figures 19 and 21) which deletes delay-after-inhibit feature.

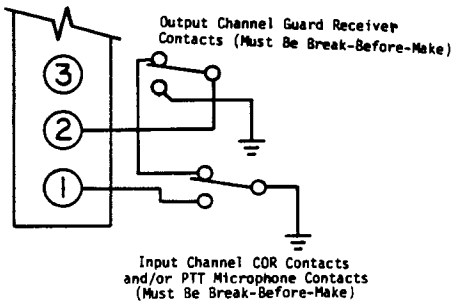


Figure 13
Full Dual Inhibit COR/PTT Operation With No Final ID (First Inhibit Signal Internally Slaved to COR Input) For Repeaters Only.*

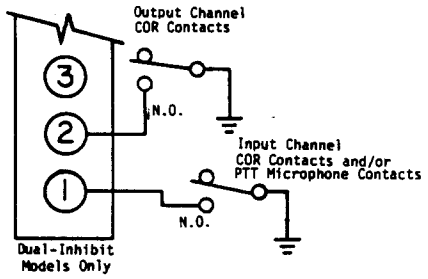


Figure 14
Full Dual Inhibit COR/PTT Operation With Final ID (First Inhibit Signal Internally Slaved to COR Input) For Repeaters Only.*

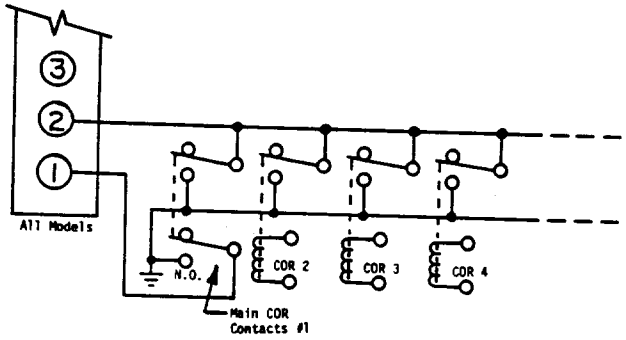


Figure 15
Multiple Inhibit COR/PTT Operation

ISOLATING PTT LINE AND IDENTIFIER UNIT

Figure 16 may be used as a guide when it is necessary to isolate the transmitter PTT line from the output driver of the identifer unit. The 12 VDC relay should not have a coil current greater than 250 ma. The normally open contacts of the relay may be run to the transmitter PTT line, or may be used to actuate any other device.

Figure 17 enables the CWID-50B/51B to be used in installations where the closed PTT line is a positive voltage rather than ground (0 volts). Some RCA equipment falls into this category. It is necessary to add an external relay with protective diode and a simple transistor inverter circuit to obtain proper operation of the identifier. The positive voltage on the PTT line when active is converted to a 0 volt signal on Terminal 1 to properly trigger the COR input. The external relay is turned on by the CWID-50B/51B PTT output during identification. The relay contacts apply +12 volts to the transmitter PTT line to hold the transmitter on until the ID is complete.

* In addition, C20 must be removed (See Figures 19 and 21) which deletes delay-after-inhibit feature.

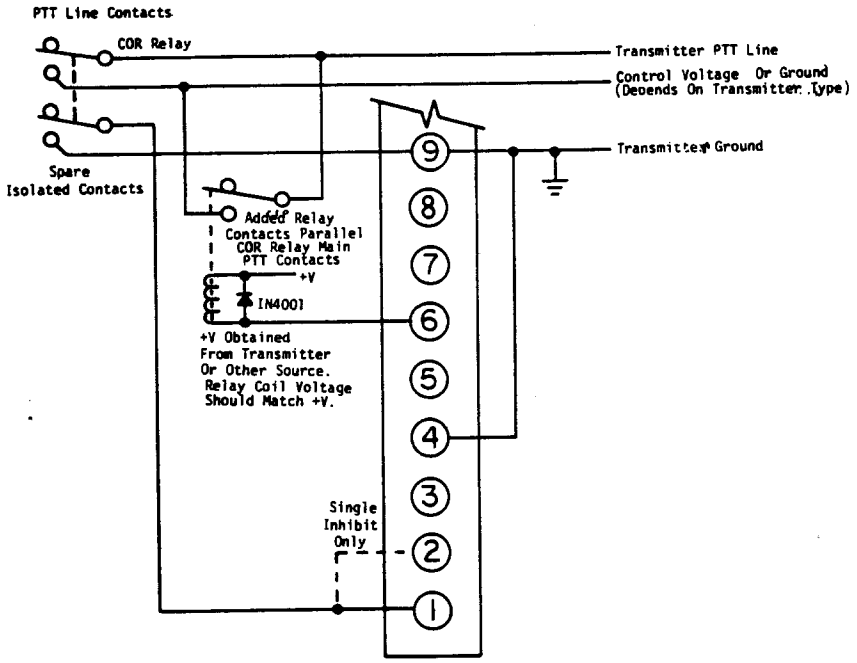


Figure 16
Circuit to Drive Relay for Isolating CWID Unit Output

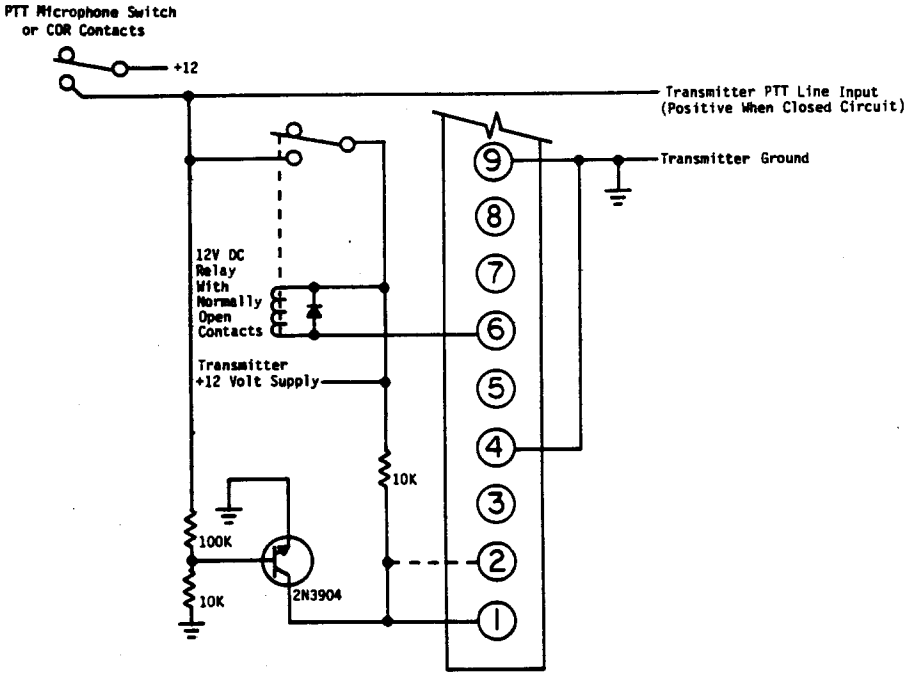


Figure 17
Actuating Positive-When-Closed PTT Line
(For Some RCA Transmitters)

SPECIFICATIONS

CWID-50B, CWID-50BR* and CWID-51B

Control inputs:

Absolute maximum applied voltages: -0.5 to +30 VDC.
TTL or transistor activation: 0.5 active, +2 volts inactive.
Relay or switch activation: closed-active, open-inactive.

Terminal 1: Triggers a pending ID which occurs when inter-ID interval expires. Dual inhibit only--in addition performs inhibit function until Terminal 1 goes inactive (high).

Terminal 2: Inhibits an ID if the ID interval period expires while Terminal 2 is active (low). Allows ID to proceed when the inhibit-release delay timing expires after Terminal 2 goes inactive (high). If Terminal 2 again goes active (low) before the timing expires the ID will continue to be inhibited for another inhibit-release delay period.

Terminal 3: Test input. Interrupts current sequence at any point and returns to beginning of sequence. Holds output PTT line on while active. Upon de-activation of Terminal 3, the initial delay and audio ID proceed immediately.

Push-to-talk line outputs:

Terminal 6 (with Terminals 4 and 9 jumpered together):

Maximum open-circuit voltage: +250 VDC.
Maximum closed-circuit current: +400 ma.

Terminal 4 (with Terminals 6 and 9 jumpered together):

Maximum open-circuit voltage: -250 VDC.
Maximum closed-circuit current: -400 ma.

Activity output:

Terminal 5: CWID status indicator for disabling tone squelch and other uses. The activity output is an open collector transistor which is turned on (closed circuit to ground) when the CWID is activating the PTT line and is off (open circuit) at all other times.

Maximum open-circuit voltage: + 20 VDC.
Maximum closed-circuit current: + 50 ma.

Audio outputs:

Terminal 7: 4 V peak-to-peak square wave into 100 ohm load, capacitively coupled.

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* The CWID-50BR is electronically identical to the CWID-50B and all technical data for the CWID-50B applies to the CWID-50BR.

Terminal 8:

Amplitude: 0 to 1.5 volts peak-to-peak square wave (continuously variable) into 600 ohm load, capacitively coupled.
DC level: External DC voltages of up to ± 15 volts such as for microphone bias may be applied to this terminal.

Power requirements:

Terminal 9: Ground (isolated from CWID chassis)

Terminal 10: +8 to +30 VDC, 150 ma maximum.

CWID-51B only (in addition to above):

Power requirements:

117 VAC 6 watts maximum, standard 3 conductor plug.

Terminal 10: +8 to +13 VDC if automatic switchover to DC with loss of AC power is desired.

Indicator:

A light-emitting diode is provided on the front panel to indicate when the unit is powered by external DC supply.

Front panel switches:

DC-AC/AUTO: In the DC position the unit is powered by the external DC supply connected to Terminal 10. In the AC/AUTO position the unit is powered by the 117 VAC internal power supply and will automatically switch to an external DC supply if AC power is lost.

PUSH-TO-TEST: Each time this switch is depressed the normal timing sequence is interrupted and resets to the beginning of the cycle. The sequence holds at this point until the switch is released, at which time the audio ID and following inter-ID interval proceed normally.

COR/CONT: In the COR position the ID sequence must be initiated by a contact closure on Terminal 1. In the CONT position the ID sequence is always activated and an ID occurs at equally spaced intervals (except when inhibited by other control signals).

MONITOR CONTROL: A volume control for the internal 100-ohm speaker is included for monitoring the audio tone.

AUTO SWITCHOVER TO DC

NOTE: This paragraph is applicable only to the Model CWID-51B. When an external DC supply is provided and the line cord is unplugged or the AC-AUTO/DC switch is in the DC position the LED indicator should be lighted, indicating the unit is powered by the external DC. If the DC source is between +8 and +13 VDC, the line cord is plugged in and the left switch is in the AC-AUTO

position the LED indicator should extinguish. If AC power is lost or if the switch is put in the DC position the LED will show that the unit is supplied by DC.

CHANGING TIMING PARAMETERS

Tables 1 through 5 are provided to enable the user to change any of the five adjustable timing parameters as needed. To use the tables, find the desired value of the parameter value in the leftmost column and find the corresponding resistor value. Refer to Figure 19, Identifier Circuit Board Layout, and replace the proper resistor with the new value. All the changeable resistors are mounted on standoff terminals.

CHECKING THE CODE SPEED

Write down the identification message in dit-dah or dot-dash form, and determine the total number of unit pulses in the message. Count one unit pulse for dits, one for spaces between dits and dahs, three for dahs, three for letter spaces, and seven for word spaces. Determine the length of time required for the CWID-51B to send the message. (Take several readings and average.) Divide the number of unit pulses in the message by the number of seconds required to send the message. This will give the length of a unit pulse for the speed of the message. Using Table 3, determine the code speed.

TABLE 1. INTERVAL TIMING RESISTOR (R8) VALUE

MINUTES	R8 VALUE COLOR OF ROM LABEL WHITE	BLUE	RED	GREEN
3	150K	300K	470K	910K
5	240K	510K	750K	1.5 MEG
9	470K	910K	1.3 MEG	2.7 MEG
10	510K	1 MEG	1.5 MEG	3.0 MEG
13	680K	1.3 MEG	2.0 MEG	3.9 MEG
15	750K	1.5 MEG	2.2 MEG	4.7 MEG
27	1.3 MEG	2.7 MEG	4.3 MEG	8.2 MEG
30	1.5 MEG	3 MEG	4.7 MEG	9.1 MEG
45	2.2 MEG	4.7 MEG	6.8 MEG	---
60	3 MEG	6.2 MEG	9.1 MEG	---

NOTE: REMOVE CWID COVER AND OBSERVE COLOR OF LABEL WITH TYPED CALL SIGN ON ROM IC, U1. USE THE COLUMN UNDER THE SAME COLOR HEADING.

YELLOW LABEL ROMS DO NOT REQUIRE R8 AND REPRESENT AN INTERVAL OF LESS THAN 5 SECONDS

EXAMPLE:

W		R		Ø		X		Y		Z	Total No. of Unit Pulses
• – –		• – •		– – – – –		– • • –		– • – –		– – • •	
11313	3	11311	3	313131313	3	3111113	3	3111313	3	3131111	85

If the message is 5.32 seconds long, the length of a single unit pulse is 5.32/85, or 0.0625 seconds (62.5 msec.). From Table 3, the code speed is 20 wpm.

TABLE 2 INITIAL DELAY INTERVAL RESISTOR (R15) VALUE

SECONDS	R15 VALUE
0.25	910
0.5	1.8K
0.75	2.7K ✓
1.0	3.9K
1.5	5.6K
2.0	7.5K

TABLE 3 CODE SPEED RESISTER (R 16) VALUE

WORDS PER MINUTE	UNIT PULSE LENGTH, MS	R16 VALUE
18	69.4	910
20	62.5	820
22	56.8	750
24	52.1	680 ✓
26	48.1	620

TABLE 4 AUDIO TONE FREQUENCY RESISTOR (R19) VALUE

TONE FREQUENCY, HZ	R19 VALUE
400	860K
500	680K
600	560K
800	430K
1000	360K
1200	300K
1400	240K 270K
1600	220K
1800	200K
2000	180K

TABLE 5 INHIBIT RELEASE DELAY RESISTOR (R1) VALUE

SECONDS	R1 VALUE
0.25	270K
0.5	510K
0.75	750K
1	1.0 MEG
2	2.0 MEG
3	3.0 MEG
5	5.1 MEG ✓
10	10 MEG

CHANGING THE MESSAGE

Should the station call be changed, or the CWID be moved to a different station, or for some other reason it is desired to change the identification message, a new ROM with the new message may be obtained from your dealer or from Control Signal Corporation. Detailed information on programming the ROM may be obtained upon request to Control Signal Corporation.

CAUTION: When replacing the ROM be certain the orientation of the index key is the same as that shown in the pictorial of Figure 14 of this manual. The white dot on the ROM should be at the same end as the white dot on the socket. The ROM may be permanently damaged if it is plugged in the wrong way.

THEORY OF OPERATION

The CWID-50B/51B is assumed to be in the "ready" state. That is, power is applied and there has been no channel activity for a period greater than the ID interval period; Pin 1 of the ROM U1 (See Figure 21) is now high to indicate that the interval between ID's has expired. Pin 8 of U4c is also high if there was no action on the COR input (barrier Terminal 1) during the interval. With both inputs to U5a high the output on pin 3 will be low. U5d acts as an inverter because pins 13 and 12 are tied together. The output of U5d on pin 11 is then high. Pin 5 of A2 is the reset input for the master timer. The timing function is now halted, waiting for input activity to begin the ID sequence.

The automatic identification sequence begins when Terminal 1 of the barrier strip is grounded by the transmitter PTT line or COR/COS contact closure. This action pulls pin 1 of nand gate U4a low through CR4. U4a and U4b are connected to form a latch so that pin 3 of U4a will go high and remain high even if the COR contact goes high. This latch signifies that an identification sequence is pending. If the inhibit input is not active (i.e., barrier Terminal 2 not grounded) pin 9 of U4c will be high. After a short delay due to R27 and C16 pin 10 of U4c will go high and the gate output pin 8 will go low. When pin 8 goes low the output on U5a, pin 3 is forced high. This level is inverted once by U5d putting a low on A2 pin 5 (reset) and inverted again by U5c placing a high on A2 pin 6, the trigger input. This action allows A2 to begin oscillating again to produce the sequence timing.

When pin 11 of U5d goes low a negative spike is produced by the differentiator formed by C8, R3, and R4 and applied to pin 4 of U5b. If the TEST input, barrier Terminal 3 is not grounded (it is not grounded in normal operation) then a positive spike will appear at U5b pin 6 which goes to pins 2 of counters U2 and U3 resetting all their outputs to low levels or the "zero" state. As was mentioned previously, in the "ready" condition pin 1 of U1 is high. When the counters U2 and U3 are reset, U1 pin 1 goes low making pin 1 of U5a low. The output of U5a goes high and maintains timer A2 in the active (timing) state regardless of changes on barrier input Terminals 1 and 2. Barrier Terminal 3 can be grounded to interrupt the sequence at any time and reset to the beginning because a low input to pin 5 of U5b will cause U2 and U3 to remain reset until the condition is removed.

When the master timer A2 is in operation, output pulses on pin 3 are coupled to pin 14 of counter U2. The oscillation frequency of A2 is different during the initial delay, identification, and interval periods as determined by the ROM U1.

The read-only memory (ROM) U1 is the heart of the CWID-50B/51B. It contains not only the factory-preprogrammed call sign, but also performs important control functions within the unit. One output from U2 and all outputs from U3 form the input address to U1. During the first eight clock counts pin 4 of U1 is low. This "ground" applied at the junction of R16 and CR7 back biases CR7, preventing it from affecting the timing circuit of clock A2. During the same time U1 output pin 3 is "open". Because of the open output, R15 through forward-biased CR6 effectively places R15 in parallel with R8. Since R15 is much smaller than R8, R15 determines the charging time of C12 and thus the length of the timing pulses generated by master timer A2. R15 determines the initial delay during which the transmitter PTT line is activated but before the audio call sign begins. R15 can be replaced by another value resistor to vary this initial delay. During these first 8 counts the output on pin 2 of U1 goes low which causes PNP transistor Q2 to conduct. The collector of Q2 rises to nearly +5 volts supplying base current to NPN driver transistor Q1.

Q1 can drive either a positive or negative PTT line. If the line is positive Q1 is connected as a common-emitter stage. The PTT line is connected to the collector and the emitter is grounded. If the line requires handling a negative voltage Q1 is connected as an emitter follower and the collector is grounded. Also when pin 2 of U1 goes low pin 5 of U4b is pulled low through R25 and CR10, resetting the U4a-U4b latch. The latch will remain reset as long as the PTT output is active. The state of U1 pin 2 is inverted by U4d and applied to the base of transistor Q3 through R33 turning on the transistor whenever the CWID unit is controlling the PTT line. The collector of Q3 is connected to Terminal 5, the "activity" output, and will sink up to 50 ma when turned on, or block up to 24 vdc when off.

On the ninth count the international Morse code ID begins. The PTT line, latch reset, and activity output continue to be activated and the master timer continues to be enabled. But now U1 pin 3 is low or "ground" and pin 4 is "open". Now R16 is in parallel with R8 and determines the code speed. The speed is adjustable by replacing R16 with a resistor of another value.

U6 is a multiplexer which turns the "grounds" and "opens" on pins 9, 7, 6 and 5 of U1 into a properly timed and spaced CW identification. The two outputs of U2 applied to pins 14 and 2 of U6 select which of the four U1 outputs appears as the keying signal at U6 pin 7. When this keying signal applied to pin 4 of A3 is high, A3 oscillates at a frequency determined by R19 and C16, generting a "mark". When pin 4 is low A3 does not oscillate and a "space" occurs. R19 can be changed to alter the pitch. The output of A3 (pin 3) is applied to audio level trimmer R17 which is adjusted to provide the proper modulation level at the transmitter. The audio ID is available at barrier terminal pin 8 through output capacitors C13 and C14. A separate high volume output (4 v peak-to-peak) for a 75-100 ohm monitor speaker is provided at barrier Terminal 7.

When the ID is complete a long timing period commences before the ID can occur again. During this period output pin 2 of U1 "opens" and Q2 and Q1 are cut off, releasing the PTT line. The U4a-U4b latch is held in the reset mode for a short time after U1 pin 2 goes high until C15 charges enough so that pin 5 of U4b goes high. The delay keeps the CWID from triggering itself in installations where Terminals 1 and 6 are connected together. Another pending ID can be triggered anytime after U4b pin 5 goes high, allowing a Terminal 1 input to again set the latch. Also during this "interval" period U1 output pins 4 and 3 are "ground" so that both R15 and R16 are out of the A2 master timing circuit. A2 timing is now determined solely by C12 and R8. R8 can be changed to vary the timing. This mode normally continues for 48 pulses from A3 for a ROM with a white label. In cases where a call sign requires more than the standard memory space the number of interval timing pulses is reduced to accommodate the call sign. Blue label ROM's allow 24 interval timing pulses, red label 16 and green label 8. The value of R8 is increased in the same proportion that the number of timing pulses is reduced to maintain the same interval time. A yellow label is used in the special case of the "end of transmission" ROM in which R8 is omitted and R15 and R16 are placed in parallel by U1 pins 4 and 3 both going high to produce a very short timing interval.

At the end of the timing interval U1 pin 1 goes high. If no COR activity has occurred since U3 pin 11 went high the master timer will halt and the CWID unit will enter the "ready" state. If there has been COR activity the counters U2 and U3 will reset to zero count, A3 will continue to produce pulses and a new initial interval and audio ID will be produced unless inhibited by a "low" on Terminal 2.

A single or dual inhibit feature modifies the behavior of the CWID-50B/51B depending upon external conditions. If barrier Terminal 2 is grounded C20 is discharged through R31 and CR8 placing a logic low on pin 9 of U4c, forcing pin 8 of U4c high. The effect is the same as if the U4a-U4b latch were reset and the timer A2 will halt when U1 pin 1 goes high at the end of the timing interval. When the ground on Terminal 2 is released C20 will hold U4c pin 9 low until it charges to the CMOS logic threshold through inhibit-release resistor R1. If Terminal 2 is grounded again before C20 discharges, the inhibit continues, and the inhibit-release delay time is re-initialized. When the voltage on C20 rises to the threshold level, circuit operation returns to normal. That is, an ID will occur if the latch is set or the unit will remain in the "ready" state if the latch is reset. Inhibit-release delay time is controlled by resistor R1 (see Table 5). NOTE: Terminal 2 should never be permanently grounded or the CWID will enter the "ready" state indefinitely and never produce another identification. Normally, Terminals 1 and 2 are jumpered together and are both activated by the COR contact closure to ground. With this connection a pending ID will not occur if it comes due while the transmitter is in normal use but will hold the transmitter on and produce an ID as soon as the inhibit-release delay timing expires after the COR contacts have opened. With the dual input feature installed CR9 activates the inhibit gate U4b whenever the COR contacts are closed and operation is the same as in the previous example except that Terminal 2 now becomes an extra inhibit input which might, for example, be actuated by a COR on a receiver tuned to the output channel in a repeater installation. These and other examples are covered in the CONFIGURATION SELECTION section of this manual.

Note that if Terminals 1 and 2 are pulled low simultaneously while the CWID is in the "ready" state the ID will be inhibited because U4c pin 9 goes low before pin 10 can go high due to the delay of R27 and C16 being longer than that of R31 and C20. The latch does, however, become set and the ID will occur after Terminal 2 goes high.

Any CWID-50B/51B which does not contain the dual inhibit option may be strapped for continuous operation by permanently grounding barrier Terminal 1. The CWID-51B will operate in the continuous mode whenever the COR/CONT switch is in the COR position regardless of options. (NOTE: If the dual-inhibit option is present--CR9 installed--a jumper from Terminal 1 to ground will permanently inhibit the ID.) The U4a-U4b latch is then always set and master timer A2 is always enabled. A CW ID is then given at continuous equally-spaced intervals except when inhibited by a closure to ground on Terminal 2.

The CW ID can be obtained at any time regardless of the state of other control inputs by momentarily grounding Terminal 3 of the barrier strip. In the CWID-51B this can also be accomplished from the front panel by depressing the PUSH TO TEST Switch. Grounding Terminal 3 causes pin 5 of U5b to go low through CR5 and R30 and pin 6 to go high resetting counters U2 and U3. When the ground is released the sequence begins with the initial delay, CW ID and the following interval. The test input differs from the COR input in that it always resets the sequences to the beginning whereas the COR input does not.

The CWID 50B/51B IC's are operated at +5 VDC by voltage regulator A1. In the CWID-50B a voltage source of +8 to +30 VDC at 250 ma must be provided at Terminal 10. The external power is applied through input protection diode CR1 which protects the circuitry if the power leads are reversed.

NOTE: The following additional circuit description applies only to the CWID-51B.

Power may be obtained either from a source of 117 VAC or +8 to +30 VDC at 250 ma. For automatic switchover to a standby DC source the DC input should be limited to a maximum of +13 volts. The power applied to Terminal 10 goes to regulator IC A1 through CR1 when no 117 VAC input is present at the transformer T1 primary. When the unit is operating from the DC source CR102, a light emitting diode (LED) is forward biased by current through R102 and R104 and is illuminated. If the line power is present and the AC-AUTO/DC switch S104 is in the AC-AUTO position, the rectifier and filter CR103, CR104 (and CR105 and CR106 if the alternate circuit is used) and C101 will put out approximately 16 VDC. Now the unit will be supplied by the internal power supply through CR101. CR1 will be back biased and no power will be drawn from the external supply on Terminal 10. The LED CR102 will also be back biased and extinguished. CR1 also serves to protect the unit against accidental reversal of the power supply leads.

TROUBLESHOOTING

A. Power supply checks: (CWID-51B only)

Plug the power cord into a source of 117 VAC. Place the power switch S103 in the AC-AUTO position. The dc voltage measured between the + lead of C101 and ground should be approximately 15 volts. If the voltage is 0, remove the plug and check the fuse, the power switch and the line cord for continuity. Next check the AC voltage on the secondary of T101. It should be norminally about 20 volts in the bridge rectifier configuration or 10 volts if the center-tap is used. If no reading is present replace T101. If the reading is normal check CR103-CR106 and replace if necessary.

If 18 volts dc is present across C101 but not on pin 1 of A1, check CR101

TABLE 6. TROUBLESHOOTING GUIDE

PROBLEMS	SEE TROUBLESHOOTING SECTION
No ID or PTT activation	A,B,F,G,E,H
PTT activation, but no ID tone	C,G,F,H
Unit IDs only with PUSH-TO-TEST switch	E,H
ID is incomplete or short	F,G,H
Unit IDs but no PTT output	D,H
Unit IDs continuously every time interval	E,H
ID is started, PTT stays active (on state)	G,F,H
ID is normal, PTT stays active all the time	D,H
Time interval not proper length	F
Audio tone wrong frequency	C
Inhibit input does not hold off ID	E
No ID at end of time interval with COR activity	E
CWID-51B's only, unit operates on battery supply only	A

and the + voltage wire between the power supply board and the identifier board.

Application of +8 to +30 volts dc to Terminal 10 with ground to Terminal 9 should cause L.E.D. CR102 to be lighted when the power switch S103 is in the DC position. If it does not light, replace CR102.

B. 5 volt regulator checks:

Apply +8 to +30 volts dc to Terminal 10 and the ground return to Terminal 9. The voltage between U5 pin 14 and U5 pin 7 should be between 4.7 and 5.2 volts. If the voltage is zero, check the solder joints on the 5 volt regulator A1. If good, check the voltage on pin 1 of A1. If this voltage is within 1 volt of the input voltage, replace A1, if not replace CR1. If the voltage is low, one of the other components in the unit has failed and is loading the regulator down.

C. Audio tone generator checks:

Remove the ROM U1 from the identifier board. Apply power to the CWID unit. A continuous tone should be heard from the internal speaker in the CWID-51B with the volume control turned clockwise or from an external 100-ohm speaker connected between Terminals 7 and 9 in the CWID-50B. Alternatively the tone waveform may be observed using an oscilloscope with the probe on Terminal 7 and return on Terminal 9. The same waveform may also be observed on Terminal 8, where its amplitude will vary between 0 and 5V peak-to-peak depending upon the setting of LEVEL control trimpot R17.

If no tone signal is present, check the logic level on pin 4 of A3. If it is low (0 volts) the problem is in U6 or its associated circuitry. If pin 4 of A3 is high (5 volts) check for the tone waveform on pin 3 of A3. If the tone is present at pin 3 but not on Terminal 8, check R20, R17, C13 and C14. If the tone signal is present on pin 3 but not on Terminal 7, check C9. If no tone signal is observed on A3 pin 3 check R19, R10, C11 and A3.

If the tone frequency is incorrect for the value of resistor installed for R19 per Table 4 check the solder joints around A3, R18, R19 and C11 and the actual value of C11. If these checks do not reveal the problem try replacing A3.

D. PTT output checks:

Remove the code ROM U1 from the unit. Connect Terminal 4 to Terminal 9, and a resistor (36 ohms, 5 watt if you use a 12 volt power supply) between Terminal 10 and Terminal 6 to simulate the 300 ma load of a PTT line. Connect a resistor (360 ohm, 1/2 watt if a 12 volt power supply is used) between Terminal 5 and Terminal 10 to form a 30 ma. current source for Q3. See Figure 18. Apply +8 to +30 volts dc to Terminal 10 and the return to Terminal 9. With a jumper lead connect U1 pins 2 and 8 together. The voltage between Terminal 6 and Terminal 9 should be less than 0.5 volts and the voltage between Terminal 5 and Terminal 9 should be less than 0.5 volts. Remove the jumper between U1 pin 2 and pin 5. The voltage between Terminal 6 and 9 should go to the supply voltage. If

not try replacing Q1 and/or Q2. The voltage between Terminals 5 and 9 should be equal to the supply voltage. If not replace Q3. If the PTT stays active all the time when the ROM (U1) is installed and the unit passes all the other tests that are done with the ROM out of the unit the ROM needs to be replaced.

E. Input control section checks:

To aid in checking the input control section, the following test setup is recommended. (See Figure 18).

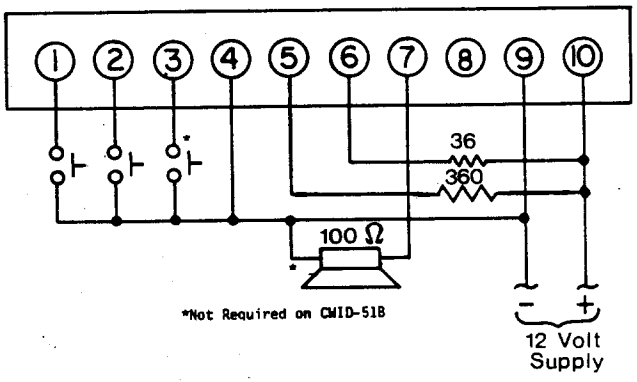

Figure 18
CWID-50B/51B Test Setup

1. Normally-open pushbutton switch between Terminals 1 and 9 to activate the COR input.

2. N.O. pushbutton switch between Terminals 2 and 9 to activate the inhibit input.

3. N.O. pushbutton switch between Terminals 3 and 9 to activate the test input. On CWID-51B units the front panel PUSH-TO-TEST button may be used.

4. Unsolder and lift one end of CR9 in dual-inhibit units.

5. Connect a speaker or earphone of 100 ohms or higher impedance between Terminals 7 and 9. On CWID-51B units simply turn up the monitor volume control.

6. With clip leads jumper a 2.2 K ohm resistor across R8 to shorten the ID interval period to about 10 seconds. (This step will also increase code speed to about 40 W.P.M.)

7. On CWID-51B units place the COR/CONT switch in the COR position. Apply power to the unit; one ID sequence should be heard. After 15 seconds push and release the switch connected to Terminal 1; one ID

sequence should be heard. This procedure checks the COR input and CR4. Push and release the switch connected to Terminal 3 or the PUSH-TO-TEST switch on CWID-51B; one ID sequence should be heard. This action checks the test input (and CR5 if the external switch is used.) Immediately after this ID sequence push and release the switch connected to Terminal 1 to trigger the COR input. Then push and hold the switch connected to the inhibit input Terminal 2. Wait at least 15 seconds; no ID sequence should be heard. An ID sequence during this period indicates trouble in the inhibit circuitry consisting of CR8, R1 and U4C. Now release the switch connected to Terminal 2; one ID should be heard after the inhibit-release delay timing expires. If this ID does not occur check CR4, U4, R27, C16, CR10, R31 and R25. If ID's occur every 10 seconds continuously check U4, U5, CR10, R31 and R25.

To check operation in the continuous mode place the COR/CONT switch to the CONT position on CWID-51B units or push and hold in the switch connected to Terminal 1; the unit should ID about every 10 seconds. Release the pushbutton or return the panel switch to COR position just after an ID has completed; one more ID sequence should be heard. This procedure checks the final ID provision. If failure occurs check U4, CR4, CR10 and U5.

If the unit is equipped with dual inhibit reinstall CR9. Push and hold the switch connected to Terminal 1; no ID should be heard until the switch is released, and the inhibit-release delay timing expires. If the ID occurs before the switch is released replace CR9.

If the ROM U1 is faulty some of the above checks will fail (See Section H).

F. Oscillator circuit checks:

To check the oscillator (1) connect a (N.O.) push button switch between Terminals 1 and 9, (2) connect a 100 ohm speaker or earphone between Terminals 7 and 9. On CWID-51B's turn up the volume to use the internal speaker. Apply power to the unit. Press and release the pushbutton switch connected to Terminal 1, A2 pin 3 should oscillate during each part of the ID sequence as follows: (1) at a frequency of about 1.3KHZ. for an initial delay of 750 ms., (2) 4.0KHZ. for a code speed of 20 W.P.M., and (3) 7.1HZ. for a timing interval of 15 minutes with a white ROM. If these tests fail, check the solder joints around A2 and check CR6 and CR7, then replace A2. A bad ROM (U1) could also cause a problem here, see Troubleshooting section H. With the ROM removed, press and release the switch on Terminal 1. A2 pin 3 should oscillate at about 5.0HKZ.

G. Counter circuit checks:

The counter circuit may be checked with the following setup (clip leads recommended as jumpers):

1. Jumper pin 10 to pin 7 of U5.

2. Jumper a 2.2 K resistor across R8

3. Remove the ROM U1 from its socket

4. On CWID-50B and BR units connect a normally-open pushbutton (PUSH-TO-TEST) switch between Terminals 3 and 9. On CWID-51B units use the PUSH-TO-TEST switch on the front panel. Apply power to the unit. Push and hold the PUSH-TO-TEST switch. Verify that all counter outputs are low (U2 and U3 pins 12, 9, 8, 11). Release the switch and verify that each stage of the counter divides by 2 using an oscilloscope in the following order: U2 pin 12, 9, 8, 11; U3 pin 12, 9, 8, 11.

   If one of these stages fails replace the affected counter. In areas where there is considerable ambient RF noise a 0.1 microfarad disc capacitor added between pins 14 and 7 of U2 may restore proper operation.

H. ROM code checks:

To check the code in the ROM the following setup is recommended:

1. Connect a PUSH-TO-TEST n.o. pushbutton switch between Terminals 3 and 9 on CWID-50B. On the CWID-51B use the panel switch.

2. Connect a 100-ohm or higher speaker or earphone between Terminals 7 and 9 on the CWID-50B or turn up the MONITOR VOLUME control on the CWID-51B.

3. Using clip leads connect a 0.1 microfarad capacitor across C12 to slow the code to 10 W.P.M.

Apply power to the unit. Press and release the PUSH-TO-TEST switch. Check the code for the correct call sign using the table below. A dash is a long tone and a dot is a short tone. A pause indicates the space between letters and numbers. The unit should also pass all tests in sections D, E, F and G where the ROM is installed in the circuit. If not, the ROM should be replaced or tried in a different unit.

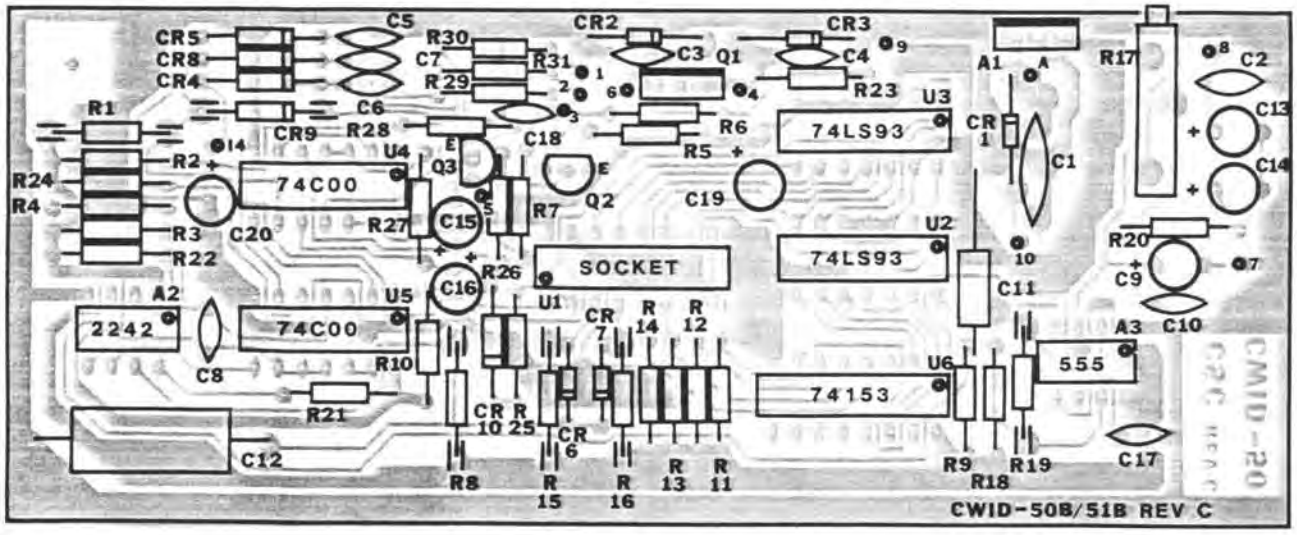

Figure 19
Identifier Circuit Board Layout

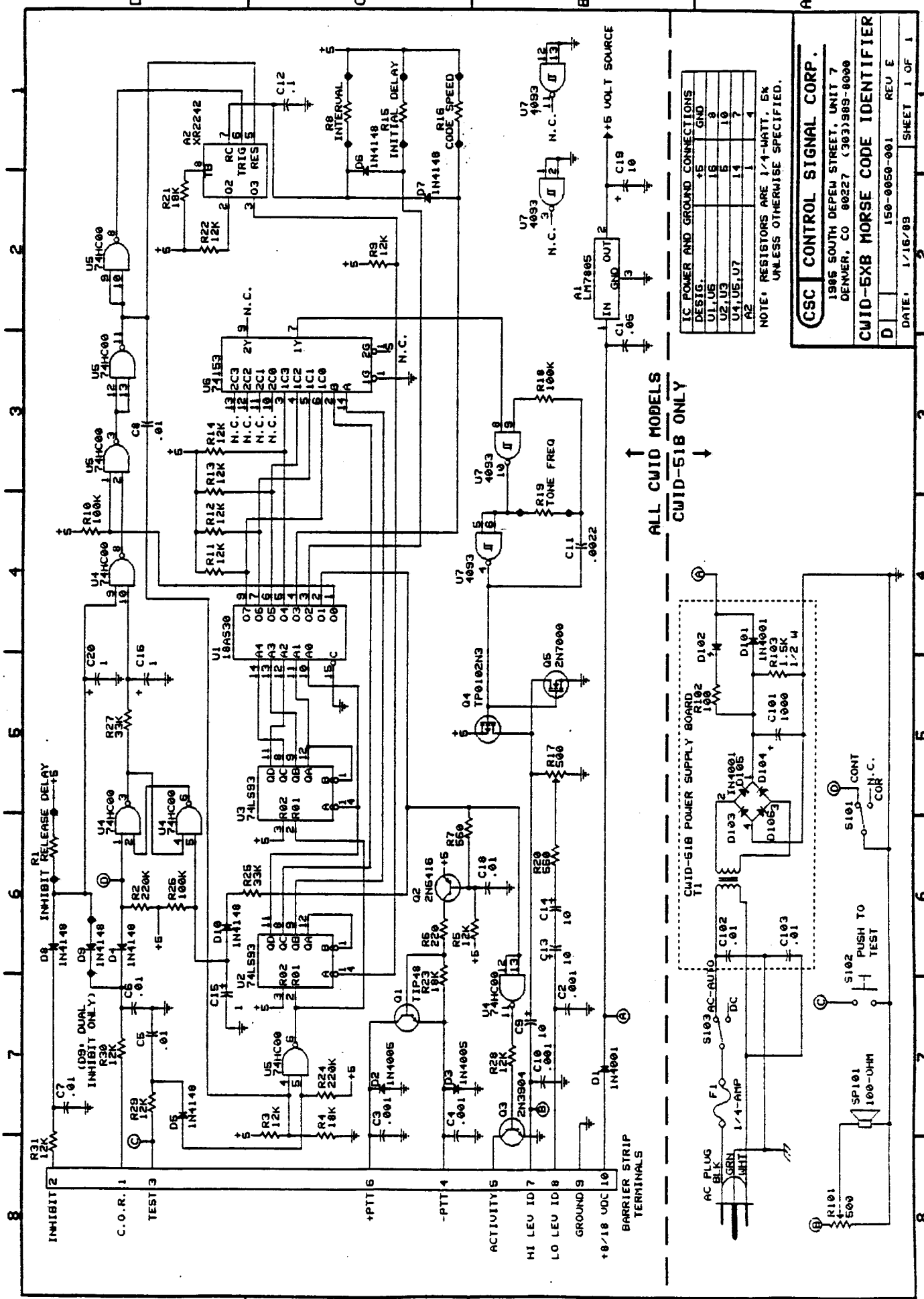

Figure 21 Schematic Diagram

PARTS LIST

Capacitors (mf)

C1	.047 Monolythic Ceramic
C2,C3,C4,C10	.001 50v Monolythic Ceramic
C5,C6,C7,C8,C17,C18	0.01 50v Monolythic Ceramic
C9,C13,C14,C19	10,16v Electrolytic
C11	0.0022 100v Mylar
C12	0.1,50v Mylar
C15,C16	1,50v Electrolytic
C20	1,35v Dipped Tantalum
C101	1000 25v Electrolytic
C102,C103	0.01,1Kv Disc, Cer.

Resitors (1/4 watt, 5% unless otherwise noted) (ohms)

R1 (Inhibit-Release Delay) (5 Sec)	5.1 Meg
R2,R24	220K
R3,R5,R9,R11,R12,R13,R14,R22,R28,R29,R30,R31	12K
R4,R21,R23	18K
R6	220
R7,R20	560
R10,R26	100K
R8 (Interval Adjust) (13 Min/27 Min)	680K/1.3 MEG
R15 (Initial Delay Adjust) (0.75 Sec)	2.7K
R16 (Speed Adjust) (24 WPM)	560 - 750
R17 (Audio Level Control)	500 (Trimpot)
R18	1K
R19 (Tone Adjust) (1200 HZ)	240K - 360K
R25,R27	33K
R101 (Monitor Volume)	500 (Potentiometer)
R102	100
R103	1.5K, 1/2 watt, 10%

Integrated Circuits

A1	LM340T5, 5v Regulator
A2	XR2242CP Timer/Counter
A3	NE555V Timer
U1	TBP185A030 Read-Only Memory
U2,U3	74LS93 Counter
U4,U5	74C00 Gate
U6	74153 Multiplexer

Transistors and Diodes

Q1	TIP48
Q2	MPSA92
Q3	2N3904
CR1,CR101,CR103,CR104,CR105,CR106	1N4001
CR2,CR3	1N4005 or 1N4004
CR4,CR5,CR6,CR7,CR8,CR9*,CR10	1N4148
CR102	LED

- - - - - -

* Dual inhibit model only.

Switches

S101,S103	SPST Toggle
S102	N.O. Push Button

Miscellaneous

T101	12v Transformer
SP101	100-ohm Voice Coil, 2-1/4" Speaker
F101	1/4 amp, Slow-Blow Fuse

Hardware

Terminal Strip
Chassis
1-3/4-inch Rack Panel
Brackets, Nuts, Screws
Fuse Holder
Line Cord and Strain Relief
Knob
Identifier Circuit Board Fiberglass Epoxy
Power Supply Circuit Board Fiberglass Epoxy

Note: Part numbers 101 and higher apply to CWID-51B only.

TABLE 7. MORSE CODE

A	.-	K	-.-	U	..-	0	----
B	-...	L	.-..	V	...-	1	.---
C	-.-.	M	--	W	.--	2	..---
D	-..	N	-.	X	-..-	3	...--
E	.	O	---	Y	-.--	4	....-
F	..-.	P	.--.	Z	--..	5	.....
G	--.	Q	--.-	/	-..-.	6	-....
H	....	R	.-.			7	--...
I	..	S	...			8	---..
J	.---	T	-			9	----.

LIMITED WARRANTY

Your automatic station identifier is guaranteed for a period of 2 years from date of shipment. If, during that time the unit fails to operate properly, return it prepaid to Control Signal Corporation and it will be repaired or replaced at no charge. This warranty is limited in time and does not apply if the unit is damaged or abused by the buyer, and this warranty excludes consequential damage. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

END OF DOCUMENT