Inst 5-28-92

INSTRUCTION MANUAL

Automatic Station Identifier

Models CWID-50, -51

Revision F

CSC | CONTROL SIGNAL CORPORATION

1985 South Depew Street, #7 • Denver, CO 80227 • (303) 989-8000

TABLE OF CONTENTS

CAUTION: On the CWID-51-E and CWID-51-ER there is exposed 117 VAC and it can cause dangerous shock. Take special care not to accidentally touch the fuse holder clips (on the power board) which are particularly exposed.

1. MODEL VARIATIONS AND BASIC MODES OF OPERATION

This instruction manual covers the complete line of Control Signal's CWID automatic station identifiers. Each CWID model provides a means of meeting the FCC regulations for identifying your transmitter in Morse code.

The CWID line of identifiers consists of two basic units, the CWID-50 and CWID-51; and each is available in model variations as shown below.

MODEL VARIATIONS

Model No.	Enclo-sure	Rack Panel	Power Input	Speaker	Push-to-Test SW.	COR/CONT Switch	Speaker Switch
CWID-50			DC				
CWID-50-E	X		DC	X	X		
CWID-50-ER	X	X	DC	X	X		
CWID-51-E	X		AC/DC	X	X	X	X
CWID-51-ER	X	X	AC/DC	X	X	X	X

The CWID-50 and its variations have a single PC board which contains all the timing and logic circuitry. The CWID-51 and its variations have two PC boards: the CWID-50 board and the CWID-51 power/control board.

The heart of all CWID units is the programmed read-only memory (PROM). It is factory programmed with the station call sign and delivers it in standard CW. Control Signal normally ships all CWID's with the call sign programmed and the Interval Period set, so that the unit is ready to install. However, a programmer (Model PRO-50) is available from Control Signal for those that wish to program the PROMs themselves.

The CWID can operate in one of two modes: **CONTINUOUS** or **COR/PTT**. In the **CONTINUOUS** mode the ID will be transmitted continually at each Interval Period. For example, if the CWID is set for a 15-minute Interval Period and is hooked up in the CONTINUOUS Mode, then the ID will be transmitted every 15 minutes, 24 hours a day, regardless of transmitter activity. In the **COR/PTT** mode the ID will be transmitted only if the unit has seen transmitter activity (via the COR or PTT closure) during the last Interval Period. If it sees no activity it will not ID. For example, if the CWID is set for a 15-minute Interval, is hooked up in the COR/PTT mode, and there has been no transmitter activity in the last several hours then the CWID will have been idle for that time. If the transmitter is then keyed, the CWID will ID. If the transmitter is keyed again a few minutes later the CWID will not ID until 15 minutes from the previous ID.

The CWID monitors the status of the COR or PTT and can be hooked up to inhibit (or hold back) the ID when the transmitter is in use. This prevents the CWID from transmitting the ID over voice traffic. When the CWID monitors the transmitter only it is called **SINGLE INHIBIT**. When the CWID monitors both the <u>transmitter</u> COR or PTT and a COR or other closure on the <u>receiver</u> it is called **DUAL INHIBIT**. Unless otherwise specified all units are set up as SINGLE INHIBIT units. See Chapter 4, page 5 for instructions for adding the a DUAL INHIBIT feature.

CWID units will operate with any brand and model radio transmitter or repeater. The CWID hooks up to the transmitter microphone line, push-to-talk (PTT) [or carrier operated relay (COR)] circuit, power and ground.

2. BRIEF HOOKUP INSTRUCTIONS FOR QUICK START -- ALL MODELS

This chapter gives the hookup for the most common mode of CWID operation: COR/PTT MODE WITH SINGLE INHIBIT. The hookup described here is shown in **Figure 2, page 5.** This hookup is for transmitters and repeaters that have a positive open-circuit PTT and which key the transmitter by closing the PTT to ground. Other modes of operation and transmitters with negative open-circuit PTT are discussed in Chapters 3 and 4. It is assumed that the CWID has the desired station call sign programmed in the PROM (U1).

Step 1 - Determine the approximate CWID mounting location relative to your transmitter and cut seven appropriately long, 24-gauge wires as follows:

1 wire, Red (Power) (Not required for CWID-51)
1 wire, Black (Ground)
1 wire, Shielded (Audio)
4 wires, Any Color (PTT/COR, Inhibit, and ID Trigger)

Step 2 - Crimp the provided female Molex terminal pins to the seven wires. Proper hand tool is Molex HTR-2262-A.

Step 3 - Insert the crimped terminal pins (with wires) into the appropriate positions (given below) in the provided, 10-position terminal housing. Before doing so note the following:

- I/O position numbers can be determined from the "1" and "10" printed on the CWID PC board,
- The terminal housing is polarized and can mate only one way with the header,
- When the wired crimped terminal pins are properly inserted into the terminal housing they will snap into position and will not be easily pulled out. (To remove a terminal pin depress the small metal ear on the terminal pin that protrudes into the "window" of the housing.)
- Insert the crimp terminal pins in the housing in the following positions:
  Red Wire (Power): 10 (Omit for CWID-51 Unit)
  Black Wire (Ground): 9
  Shielded Wire (Audio): 8
  Other 4 wires: 1, 2, 4, 6

Step 4 - Hook up the wires following **Figure 2 on page 5,** but do not plug the terminal housing into the header on the CWID yet.

Step 5 - Power Source: For all CWID-50 models and their variations a well-filtered DC source between + 8 and + 30 volts, capable of 150 ma current is required. For all CWID-51 models a 115 VAC, 60 Hz outlet is required.

Step 6 - Be sure power source is off. Then plug the terminal housing into the header on the CWID. For CWID-51 units plug the AC cord into an outlet.

Step 7 - Turn on power to the CWID. **CAUTION:** The regulator, A1 (near the I/O header and held flat to the PC board with a screw) gets **HOT** to the touch.

Step 8 - For CWID-51 units move the front panel switches to the following positions: "COR", "AC-AUTO", "SPKR ON" or "OFF"

3. I/O TERMINAL SPECIFICATIONS AND TIMING DIAGRAM -- ALL MODELS

Chapter 1 describes the alternative modes of operation available. Chapter 2 describes the hookup for one specific mode of operation. This chapter describes each of the CWID I/O terminals and explains its function and how the hookup of certain terminals determines the mode of operation. Chapter 4 shows specific hookup diagrams.

TERMINAL 1 - ID TRIGGER INPUT. Triggers a pending ID when momentarily closed to ground, after which an ID occurs at the end of the Interval Period. For COR/PTT Mode hook terminal 1 to 6. For CONTINUOUS Mode hook terminal 1 to 9 (gnd). (Exception is the CWID-51 which has an internal connection between 1 and ground when the front panel switch is in the CONT position.)

Dual Inhibit Only - Terminal 1, in addition, performs an internal inhibit function until terminal 1 is released from ground.

Terminal 1 must be hooked to either 9 or 6. If not, then the CWID will not ID.

TERMINAL 2 - ID INHIBIT INPUT. Inhibits (or delays) an ID if the ID Interval Period expires while terminal 2 is grounded. See Inhibit Release Delay below. For Inhibit function on Single Inhibit unit hook terminal 2 to 6.

Dual Inhibit Input - If the CWID has the Dual Inhibit feature (1N4148 diode is installed at designation D9) then terminal 1 takes over the Single Inhibit function (so that when terminal 1 is hooked to 6 the CWID will monitor the PTT or COR for activity before transmitting ID) and terminal 2 is available for a second inhibit input such as a ground from a receiver to indicate an active receiver.

Inhibit Release Delay - If an inhibit function comes into play a timer will automatically start a countdown after the release of the inhibit ground. The length of the countdown is the Inhibit Release Delay. The ID will not be transmitted until the countdown is complete. This Inhibit Release Delay is factory-set for 5 seconds. If the transmitter is keyed during this 5 seconds then the CWID will go back into the Inhibit function until the PTT ground is released. Hence, the ID will not be transmitted until there are 5 seconds of clear air time. This prevents an ID from transmitting during a two way conversation. See Inhibit Release Delay Table in Chapter 5, page 8.

The connection of terminal 2 is optional.

TERMINAL 3 - TEST INPUT. If terminal 3 is momentarily grounded the CWID will key the transmitter and send an ID. All models except the CWID-50 (PC board without enclosure), have a Push-to-Test button for initiating the ID when button is pushed and released. The Push-to-Test closure connects terminal 3 to ground. If an ID is in progress, this closure to ground will interrupt the ID and prevent ID transmission so long as it is closed. When it is released the ID is transmitted (from the beginning) after the Initial Delay Time expires.

Terminal 3 must not be permanently grounded.

TERMINAL 4 - Connect to Either Low Side of PTT or Ground. - Connect terminal 4 to transmitter PTT or repeater COR only if transmitter or repeater has a negative open-circuit voltage. (Most transmitters have a positive open-circuit voltage.) Maximum open-circuit voltage is -250 VDC. Maximum closed-circuit current is -400 ma. When terminal 4 is used for PTT output connect terminal 6 to 9. When terminal 6 is used for PTT output connect 4 to 9.

In most cases terminal 4 hooks to 9.

TERMINAL 5 - ACTIVITY OUTPUT. Terminal 5 is internally connected to ground during the time the ID sequence is in progress. Terminal 5 can be used in an LED

status circuit, for disabling tone squelch, or where a closure to ground is needed to activate a circuit. Terminal 5 has an internal open circuit when the CWID is not in ID sequence. This circuit can handle 50 ma when closed.

The connection of terminal 5 is optional.

TERMINAL 6 - PTT LINE OUTPUT. (FOR POSITIVE PTT LINES ONLY). Connect terminal 6 to transmitter PTT or repeater COR only if transmitter of repeater has a **positive**, open-circuit PTT voltage. (This applies to most transmitters.) Maximum open-circuit voltage is +250 VDC. Maximum closed-circuit current is +400 ma. When terminal 6 is used for PTT output connect terminal 4 to 9.

In most cases terminal 6 hooks to PTT.

TERMINAL 7 - AUDIO OUTPUT (LOW IMPEDANCE ONLY). Output is 4-volt peak-to-peak square wave into a 100 ohm load, capacitively coupled. This output is used only as a high-level modulation signal or for a low impedance (100 ohm) speaker.

In most cases terminal 7 is not used.

TERMINAL 8 - AUDIO OUTPUT (HIGH IMPEDANCE ONLY). Terminal 8 is the normal audio output for ID and should be hooked to the microphone audio high line. Output is 0 to 1.5 volts peak-to peak square wave into 600 ohm load, capacitively coupled. The output is continuously variable with a PC board-mounted trimpot. External DC voltages of up to ±15 volts such as for microphone bias may be applied to this terminal.

In most cases terminal 8 is hooked to microphone audio high.

TERMINAL 9 - POWER GROUND (ISOLATED FROM CWID CHASSIS). Connect 9 to transmitter chassis ground for all CWID units. For CWID-50 units (and all variations) also connect 9 to negative side of +12 VDC supply.

Terminal 9 must be hooked up to power ground.

TERMINAL 10 - DC POWER INPUT (REQUIRED FOR CWID-50 MODELS ONLY.) Hook up terminal 10 to the positive side of a continuous DC supply between +8 and + 30 VDC. Maximum current drain is 150 ma. The CWID-51 is capable of automatic switch-over from AC to DC in the event of an AC power loss. Terminal 10 can be used for +DC power input to the CWID-51, but should be limited to a maximum of + 13 VDC for proper automatic switch-over to DC.

For CWID-50, terminal 10 must be hooked up to DC power.

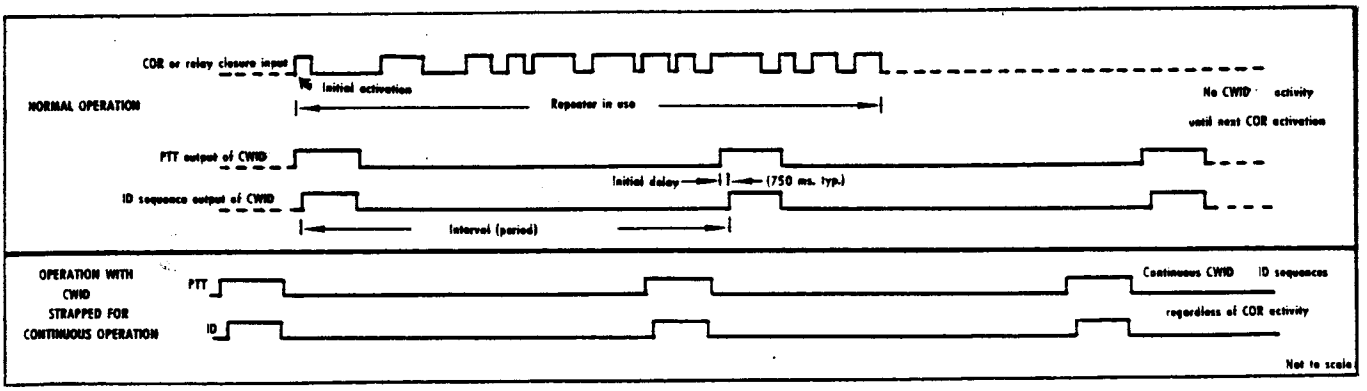


Figure 1. Typical Timing Diagram

4. ALTERNATIVE HOOKUP DIAGRAMS AND TECHNICAL NOTES -- ALL MODELS

Figures 2 through 5 show the hookup for alternative means of operation. Figures 6 and 7 are for special situations described below.

Note With Regard to Possible Microphone Loading - 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.

Adding Dual Inhibit Feature - A standard CWID can be converted to a Dual Inhibit Input unit by installing a 1N4148 diode in location D9 on the CWID-50 PC board. See Chapter 1, page 1 and Chapter 3, page 3 for description of Dual Inhibit.

Isolating PTT Line From CWID - Figure 6 may be used as a guide when it is necessary to isolate the transmitter PTT line from the output driver of the CWID. The 12 VDC relay should not have a coil current greater than 250 ma. The normally-open contacts of the relay may be connected to the transmitter PTT line, or may be used to actuate any other device.

Installing a CWID With Some RCA and Other Transmitters That Have Positive Closed-Circuit PTT - Figure 7 enables the CWID 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 CWID. 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 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.

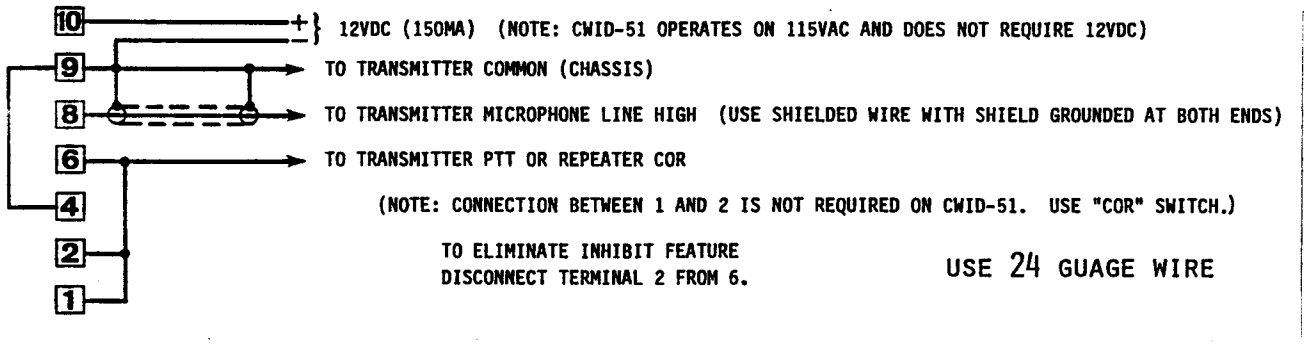


Figure 2. COR/PTT Mode With (Single) Inhibit. This is the Most Common Operational Mode. (For Transmitters and Repeaters With Positive Open-Circuit PTT.)

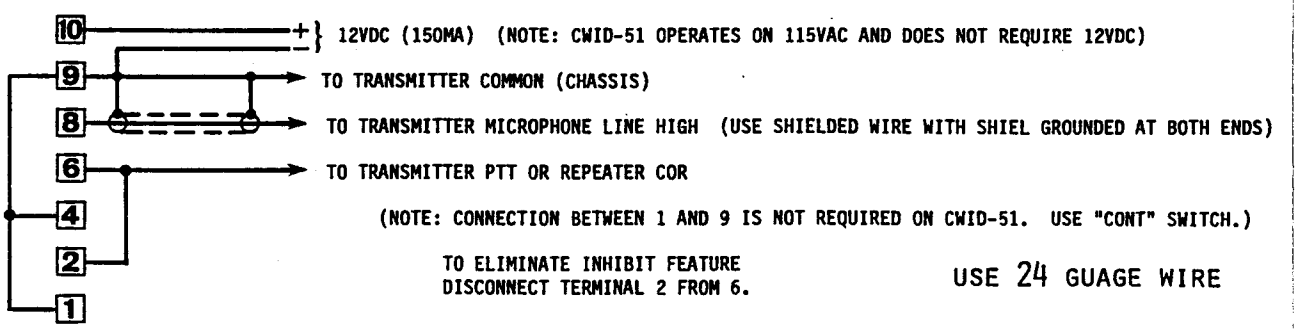


Figure 3. Continuous Mode With (Single) Inhibit. (For Transmitters and Repeaters With Positive Open-Circuit PTT.)

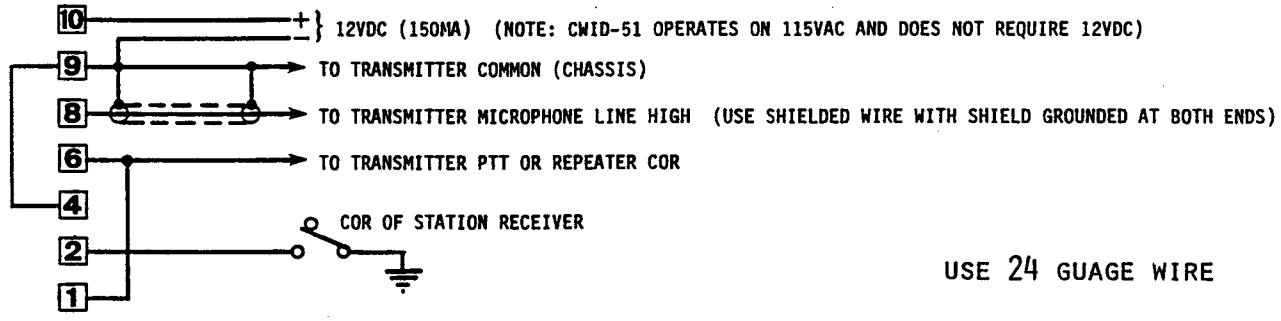


Figure 4. COR/PTT Mode With Dual Inhibit Input. (For Transmitters With Positive Open-Circuit PTT.)

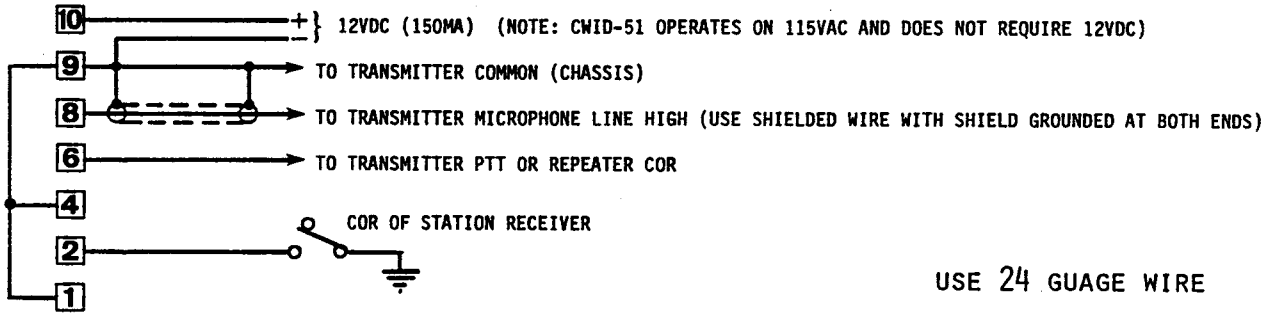


Figure 5. Continuous Mode With Dual Inhibit Input. (For Transmitters With Positive Open-Circuit PTT.)

5. CHANGING CALL SIGN AND ADJUSTING TIMING PARAMETERS -- ALL MODELS

CALL SIGN - The call sign is factory programmed in a "read-only-memory" (PROM) chip, U1 which is socket-mounted. To change the call sign you can order a replacement PROM from Control Signal. The old PROM cannot be re-programmed. (The PROM program listing is Control Signal priority and is not available.) For users who wish to program their own PROMs a PC-assist programmer, Model PRO-50, is available from Control Signal.

The CWID can operate with either a standard PROM or "Larger Memory" (LM) PROM. Either PROM will operate in any CWID (Rev F or later) unit, but when using the LM PROM the CWID requires two modifications to the CWID-50 PC board:

- Pin 12 of U2 must be jumpered to pin 14 of U1. To facilitate this modification (which is recommended to be done on the bottom side of the PC board), the two reference pins have square pads instead of round. However, pin 1 of each IC has a square pad also.

- A trace must be cut. This trace is identified by an "x" on the top side of the PC board next to the U1 (PROM) chip socket.

The standard PROM can store any FCC-issued call sign. The LM PROM can store about 30 characters (based on number of bits per character). When a CWID-50 PC board has been modified by the factory for the LM PROM, there will be a small "V" notch cut in the edge of the PC board next to the "Control Signal" name.If no PROM is in U1 the unit will transmit a **steady continuous tone.**

SPEAKER VOLUME - Trimpot VR1 adjusts the volume of the PC board-mounted speaker. In addition the CWID-51 unit has an ON-OFF switch for the speaker. The CWID-50 unit (PC board only-- no enclosure) does not include a speaker.

ID AUDIO OUTPUT LEVEL - Trimpot VR2 adjusts this level. The FCC (as of this printing date) requires for Part 90 of the Regulations that the level be a minimum of 40% modulation (2 KC deviation).

CODE SPEED - The FCC (as of this printing date) requires for Part 90 of the Regulations that the code speed be a maximum of 25 words per minute (wpm). Factory setting on code speed is 24 wpm. A typical 3-letter plus 3-number call sign takes approximately 6 seconds to transmit at 24 wpm.

To change the Code Speed adjust VR3 and/or change resistor R13. A clockwise (CW) turn of VR3 decreases the Speed, and a CCW turn increases it. The adjustment of VR3 can increase the Speed from the factory preset of 24 wpm to approximately 30 wpm, and VR3 can decrease it to approximately 12 wpm. Greater changes are possible by changing R13. To change the Speed by a predetermined percentage inversely change the sum total resistance of R13 and the setting of VR3 by that percentage. For example, to double the Speed you half the sum total resistance of R13 and the resistance setting of VR3. To measure R13 and VR3 it is necessary to remove R13. To check the Speed use a period counter at pin 10 of U2 during the ID transmission. This timing cycle is factory preset at 50 msec. For a Speed of double the factory preset value (24 wpm), halve the timing cycle to 25 msec. See Table 1, page 8.

INTERVAL PERIOD - The Interval Period is the time between ID sequences. For most services the FCC requires the maximum Interval to be either 15 or 30 minutes. The Interval is programmed in the PROM. The Interval can be changed by one or both of the following two ways:

a. New PROM from Control Signal
b. Adjustment of VR4 and R12

To change the Interval adjust VR4 and/or change resistor R12. A clockwise (CW) turn of VR4 increases the Interval; a CCW turn decreases it. The adjustment of VR4 can change the Interval by up to about three minutes. Increasing R12 can increase the Interval up to about twice the preprogrammed Interval, and decreasing R12 can decrease the Interval by up to half. To change the Interval by a predetermined percentage, change the sum total resistance of R12 and the setting of VR4 by that percentage. For example, to double the Interval remove R12 and measure both the resistance of R12 and the resistance setting of VR4. Add the two to get a total resistance. Then change R12 so that the total resistance of VR4 and the new R12 is twice the original total.

To check the Interval without waiting for the 15 or 30 minutes to elapse, use a period counter at pin 10 of U2 during the Interval Period. This timing cycle is factory set at one minute. A two-minute timing cycle would be double the preprogrammed Interval. A 30-second timing cycle would be half the Interval.

AUDIO TONE FREQUENCY - Resistor R9 controls the Audio Tone Frequency, which is factory-set at 1200 Hz. To change the frequency R9 must be changed. Refer to Table 2 for frequency vs R9 values. Resistor R9 is on a pair of stand-off pins which facilitates the resistor change.

INHIBIT RELEASE DELAY TIME - This time can be changed by changing resistor R24, which is on a pair of stand-off pins which facilitates the resistor change. Table 3 provides the resistor value vs the number of seconds of Inhibit Release Delay Time. This time is factory-set for 5 seconds.

INITIAL DELAY - The Initial Delay is the time period between the closure of the PTT line by the CWID and the beginning of the ID. The Initial Delay is factory set in the PROM at 750 msec. To change it a new PROM is required.

TABLE 1. CODE SPEED

WORDS PER MINUTE	UNIT PULSE LENGTH, MS
18	69.4
20	62.5
22	56.8
24	52.1
26	48.1

TABLE 2.
AUDIO TONE FREQUENCY
RESISTOR (R9) VALUE

TONE FREQUENCY, HZ	R9 VALUE
400	860K
500	680K
600	560K
800	430K
1000	360K
1200	300K
1400	240K
1600	220K
1800	200K
2000	180K

TABLE 3.
INHIBIT RELEASE DELAY
RESISTOR (R24) VALUE

SECONDS	R24 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	10.0 MEG

6. THEORY OF OPERATION -- ALL MODELS

In this discussion "terminal" refers to one of the 10 positions of the CWID I/O connector.

The CWID 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 12 of the PROM U1 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 trigger input (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 ID sequence begins when terminal 1 is grounded by the transmitter PTT line or COR 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 ID sequence is pending. If the inhibit input is not active (i.e., 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, 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 11 of counter U2 resetting all the outputs to low levels or the "zero" state. As was mentioned previously, in the "ready" condition pin 12 of U1 is high. When the counter U2 is reset, U1 pin 12 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 input terminals 1 and 2. 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 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 10 of counter U2. The oscillation frequency of A2 is different during the initial delay, identification, and interval periods as determined by the PROM U1.

The PROM U1 contains not only the factory-programmed call sign, but also performs important control functions within the unit. The outputs from U2 form the input address to U1. There are 4 outputs of U1 that control the CWID operation. Pin 9 controls the audio tone oscillator based on the Morse code string. A high on U1-9 turns on the 1200 Hz audio. U1-10 controls the A2 master timer. A low output turns off Q6 and the frequency of oscillations is primarily controlled by VR3 and R13 and C15. The period of oscillation define the Initial Delay and Code Speed. This period is nominally 50 ms. U1-11 controls the PTT switch closure circuits and is used to reset the COR latch. U1-12 defines the end of the PROM sequences and terminates the CWID operation if no additional COR's have been received. The Initial Delay is the start of the ID cycle where the transmitter is activated but the ID delays to allow the system to be at operating level. The Initial Delay is controlled by the PROM. This information programmed into the PROM in increments of 50 ms; nominal is set to 750 ms. During Initial Delay and the ID, U1-11 turns on Q2 and Q1. Q1 can drive either a positive or negative PTT Line. If the Line is positive, the PTT line is connected to the collector and the emitter is grounded. If the line is negative, the PTT Line is

connected to the emitter and the collector is grounded.

After the Initial Delay, the ID begins. The Morse code is created by a series of ones and zeroes that are shifted out of U1-9. When this keying signal applied to pin 9 of U3 is high, U3 oscillates at a frequency determined by R9 and C11, generating a "mark". When pin 9 is low U3 does not oscillate and a "space" occurs. R9 can be changed to alter the pitch. The output of pin 4 is applied to a buffer amplifier of Q4 and Q5 and then to audio level trimmer VR2 which is adjusted to provide the proper modulation level at the transmitter. The audio ID is available at 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 terminal 7. A built in speaker can be activated by connecting b and g on the 5 position connector. The volume can be controlled by VR1. The CWID-51 has a front panel switch to activate the speaker.

When the ID is complete a timing period commences before the ID can occur again. During this period output pin 11 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 11 goes high until C16 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 pin 10 is high so that VR3 is out of the A2 master timing circuit. A2 timing is now determined solely by C15, VR4 and R12. VR4 can be changed to vary the timing. This mode normally continues for the number of pulses from A3 for each minute of interval.

At the end of the timing interval U1 pin 12 goes high. If no COR activity has occurred since U3 pin 11 went high the master timer will halt and CWID unit will enter the "ready" state. If there has been COR activity the counter U2 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 depending upon external conditions. If terminal 2 is grounded C8 is discharged through R27 and D8 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 time A2 will halt when U1 pin 12 goes high at the end of the timing interval. When the ground on terminal 2 is released C8 will hold U4c pin 9 low until it charges to the CMOS logic threshold through inhibit-release resistor R24. If terminal 2 is grounded again before C8 discharges, the inhibit continues, and the inhibit-release delay time is re-initialized. When the voltage on C8 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 R24. (See Table 3, page 8). 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 Inhibit input feature installed D9 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.

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 R7 and C10 being longer than that of R27

and C8. The latch does, however, become set and the ID will occur after terminal 2 goes high.

Any CWID which does not contain the Dual Inhibit option may be strapped for CONTINUOUS operation by permanently grounding terminal 1. The CWID-51 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--D9 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 ID can be obtained at any time regardless of the state of other control inputs by momentarily grounding terminal 3, or pushing the Push-to-Test button. Grounding terminal 3 causes pin 5 of U5b to go low and pin 6 to go high resetting counter U2. When the ground is released the sequence begins with the initial delay, 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 IC's are operated at +5 VDC by voltage regulator A1. In the CWID-50 a voltage source of +8 to +30 VDC at 150 ma must be provided at terminal 10. The external power is applied through input protection diode D3 which protects the circuitry if the power leads are reversed.

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

Power may be from a source of 117 VAC or +8 to +30 VDC at 150 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 D1 when no 117 VAC input is present at the transformer primary. When the unit is operating from the DC source a light emitting diode (D102) 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 D103 and D104 (and D105 and D106 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. D1 will be back biased and no power will be drawn from the external supply on terminal 10. The LED (D102) will also be back biased and extinguished. D1 also serves to protect the unit against accidental reversal of the power supply leads.

7. TROUBLESHOOTING -- ALL MODELS

In this chapter as in previous chapters "terminal" refers to one of the 10 positions of the CWID I/O connector. If, in troubleshooting the CWID-51-E or -ER model it becomes necessary to disassemble the unit see Section I of this chapter.

A. Power Supply Checks (CWID-51 Power/Control Board) - Plug the power cord into 117 VAC outlet. **CAUTION: WITH COVER OFF THERE IS 117 VAC EXPOSED.** Place the front panel power switch 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 line cord for continuity. Next check the AC voltage on the secondary of transformer T101. It should be about 20 volts in the bridge rectifier configuration. If no reading is present replace transformer, T101. If the reading is normal check D103-D106 and replace if necessary.

If 18 volts DC is present across C101 but not on pin 1 of A1, check D101 and the + voltage line between the power/control board and the CWID-50 board.

Application of +8 to +30 volts DC to terminal 10 with ground to terminal 9 should cause LED (D102) to be lighted when the power switch S103 is in the DC position. If it does not light, replace D102.

TABLE 4. TROUBLESHOOTING GUIDE

PROBLEMS	SEE SECTION
No ID or PTT Activation	A,B,F,G,E,H
PTT Activation, But no ID Tone	C,G,F,H
IDs Only With Push-To-Test Switch	E,H
ID is Incomplete or Short	F,G,H
IDs But no PTT Output	D,H
IDs Continuously Every Period	E,H
ID is Started, PTT Stays Keyed	G,F,H
ID is Normal, PTT Stays Keyed	D,H
Interval Period Not Proper Length	F
Audio Tone Wrong Frequency	C
Inhibit Input Does Not Inhibit ID	E
No ID at End of Interval Period With COR Activity	E
Operates on DC Only (CWID-51)	A

B. 5-volt Regulator Checks - Apply +8 to +30 VDC to terminal 10 and the ground return, terminal 9. The voltage between U5 pin 14 and U5 pin 7 should be between

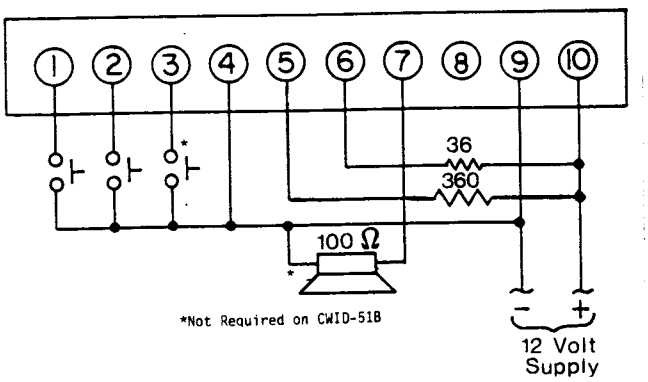
4.7 and 5.2 volts. If the voltage is zero, check the solder joints on the 5 volt regulator, A1. If good, check the voltage on pin 1 of A1. If this voltage is within 1 volt of the input voltage, replace A1, if not replace D3. If the voltage is low, one of the other components in the unit has failed and is loading the regulator down.

C. Audio Tone Generator Checks - Remove PROM (U1). Install a small jumper wire between U1-16 and U1-9. Apply power. A continuous tone should be heard. Adjust VR1 for volume control. An external, 100 ohm speaker may be connected between terminals 7 and 9. Wave forms can be verified at terminals 7 and 8 with respect to ground at terminal 9. The output at terminal 8 is variable by VR2.

If no tone signal is present, check for a square wave at U3-10 and U3-4. Verify a logic high at U3-9. If U3 is not oscillating verify components and solder joints of U3, C11, R8, R9. If no defect is found replace U3. If U3 is oscillating check at Q4 and Q5. If signal is at the gates of Q4 and Q5 but the output does not have any signal, replace Q4. If there is a partial signal out of Q4 and Q5, Q5 is suspect. If U3, Q4 and Q5 are operating trace to point of signal loss through D5, C13, C14, VR1, VR2, R5, and R10. Replace defective component. If tone frequency is incorrect, change C11 or R9 to desired tone.

D. PTT Output Checks - Remove the PROM (U1) from the unit. Connect terminal 4 to 9, and a resistor (36 ohms, 5 watt if you use a 12 volt power supply) between terminals 10 and 6 to simulate the 300 ma load of a PTT line. Connect a resistor (360 ohm, 1/2 watt if you use a 12 volt power supply) between terminals 5 and 10 to form a 30 ma current source for Q3. See Figure 8. Apply +12 VDC to terminal 10 and the return to 9. With a jumper lead connect U1 pins 11 and 8 together. The voltage between terminals 6 and 9 should be less than 0.5 volts and the voltage between terminals 5 and 9 should be less than 0.5 volts. Remove the jumper between U1 pin 11 and pin 8. The voltage between terminals 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 PROM (U1) is installed and the unit passes all the other tests that are done with the PROM out of the unit the PROM needs to be replaced.

E. Input Control Section Checks - To aid in checking the input control section, the following test setup is recommended.



1. Install normally-open (N.O.) pushbutton between terminals 1 and 9 to activate the COR input.
2. Install N.O. pushbutton between terminals 2 and 9 to activate the Inhibit input.
3. Unsolder and lift one end of D9 in Dual-Inhibit units.
4. Tack solder a 24K resistor between pins 1 and 7 of A2 to shorten the ID Interval Period to about 10 seconds. (This step will also increase Code Speed.)
5. On CWID-51 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 D7. Push and release the Push-to-Test pushbutton; one ID sequence should be heard. This action checks the test input (and D6 if an 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 D8, R24 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 D7, U4, R7, C10, D5, R27 and R17. If ID's occur every 10 seconds continuously check U4, U5, D5, R27 and R17.

To check operation in the Continuous mode place the COR/CONT switch to the CONT position on CWID-51 units or on CWID-50 units push and hold in the switch connect 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, D7, D5 and U5.

If the unit is equipped with dual inhibit option reinstall D9. 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 D9.

If the PROM (U1) is faulty some of the above checks will fail. (See Section H). Remove 24K resistor that was tack soldered.

F. Oscillator Circuit Checks - Connect a N.O. pushbutton switch between terminals 1 and 9. Apply power to the unit. Press and release the pushbutton switch connected to terminal 1. Pin 3 of A2 should oscillate during each part of the ID sequence as follows: (1) at a frequency of about 2500 Hz for an initial delay of 2500 Hz, and (2) for a code speed of 24 words per minute, and (3) for an Interval Period of 15 minutes. If these tests fail, check the solder joints around A2 and check 16, D4, R12, R13, VR3, VR4; then replace A2. A bad PROM (U1) could also cause a problem here; see Section H. With the PROM removed, press and release the switch on terminal 1. Pin 3 of A2 should oscillate at about 2.1 Hz.

G. Counter Circuit Checks - The counter circuit may be checked with the following setup (clip-leads recommended as jumpers):

1. Remove PROM (U1).
2. Jumper pin 8 to pin 12 of U1.
3. Apply power.
4. Push and hold the Push-to-Test switch. Verify that all pins (9, 7, 6, 5, 3, 2, 4, 13) of U2 counter outputs are low . Release the switch and verify that each state of the counter divides by 2 using an oscilloscope in the following order: 9, 7, 6, 5, 3, 2, 4, 13 of U2.

If one of these stages fails replace the counter. In areas where there is considerable ambient RF noise a 0.1 microfarad disc capacitor added between pins 16 and 8 of U2 may restore proper operation.

H. PROM code checks - Tack Solder a 0.1 mfd capacitor across C15 to slow the code to 10 words per minute. 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 PROM is installed in the circuit. If not, the PROM should be replaced or tried in a different unit. Remove .1 mfd capacitor.

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	————.

I. Disassembling the CWID-51-E and CWID-51-ER - The unit cannot be disassembled without unsoldering the front panel switches and LED. The procedure is:

1. Unplug power cord and unplug I/O connector.
2. Using a 1/4" open-end wrench hold the plastic standoffs from turning while you remove the three screws that hold the CWID-50 PC board to the side of the chassis.
3. Unplug the CWID-50 PC board from the CWID-51 power/control PC board by gently sliding it toward the rear.
4. To test the CWID-50 PC board independent from the power/control board, jumper "b" and "g" positions of the 5-position interface connector for speaker operation. Provide DC power to terminal 10 of the I/O connector. Hook up a test button by soldering its wires to the two large holes on PC board that are inside a circle marked SW1.

THE FOLLOWING STEPS REFER TO THE CWID-51 power/control board.

5. Remove the two nuts holding the transformer.
6. Remove the two nuts holding the PC board on the two long (9/16") hex spacers located between the transformer and the side of the chassis.
7. Unsolder from the PC board the two upper transformer wires.
8. Move the transformer away from the board and unsolder the front panel switches, pushbutton and LED. This releases the board.
9. Use **CAUTION** if AC power is applied to the PC board while the cover is off or while the PC board is removed from the chassis. **THERE IS EXPOSED 117 VAC AND IT CAN CAUSE DANGEROUS SHOCK. TAKE SPECIAL CARE NOT TO ACCIDENTALLY TOUCH THE FUSE HOLDER CLIPS (ON THE POWER BOARD) WHICH ARE PARTICULARLY EXPOSED.**

8. CIRCUIT BOARD LAYOUTS AND SCHEMATIC DIAGRAM

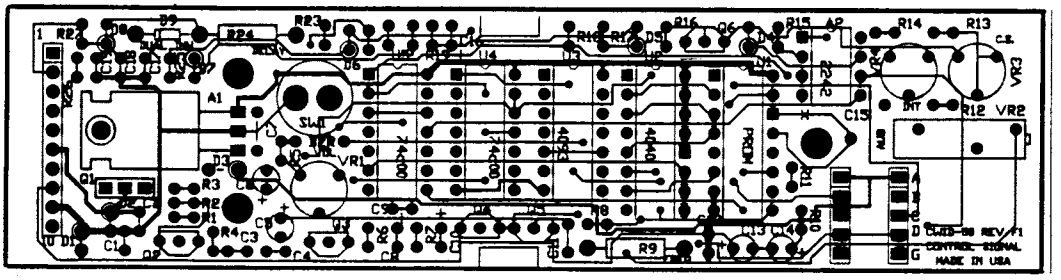


Figure 9A. CWID-50 PCB (Timing and Logic) Top Layer

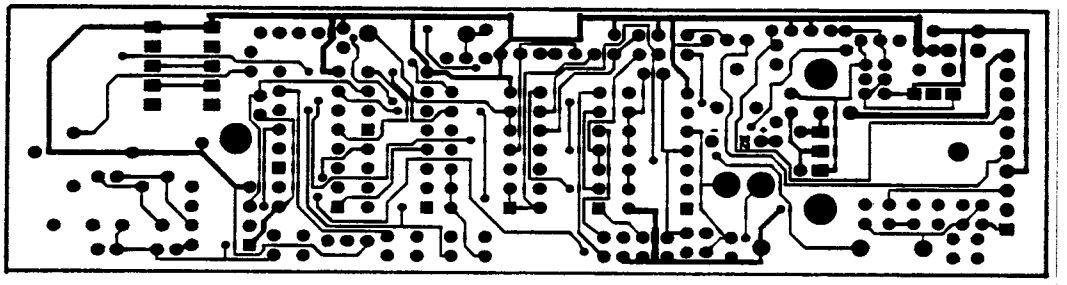


Figure 9B. CWID-50 PCB (Timing and Logic) Bottom Layer

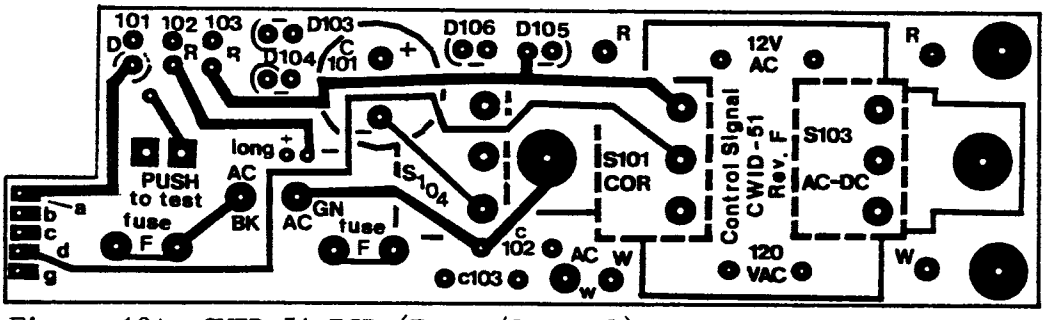


Figure 10A. CWID-51 PCB (Power/Control) Top Layer

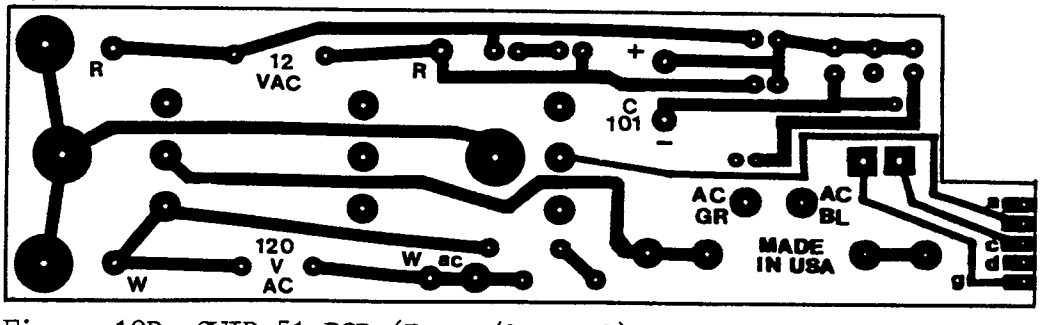
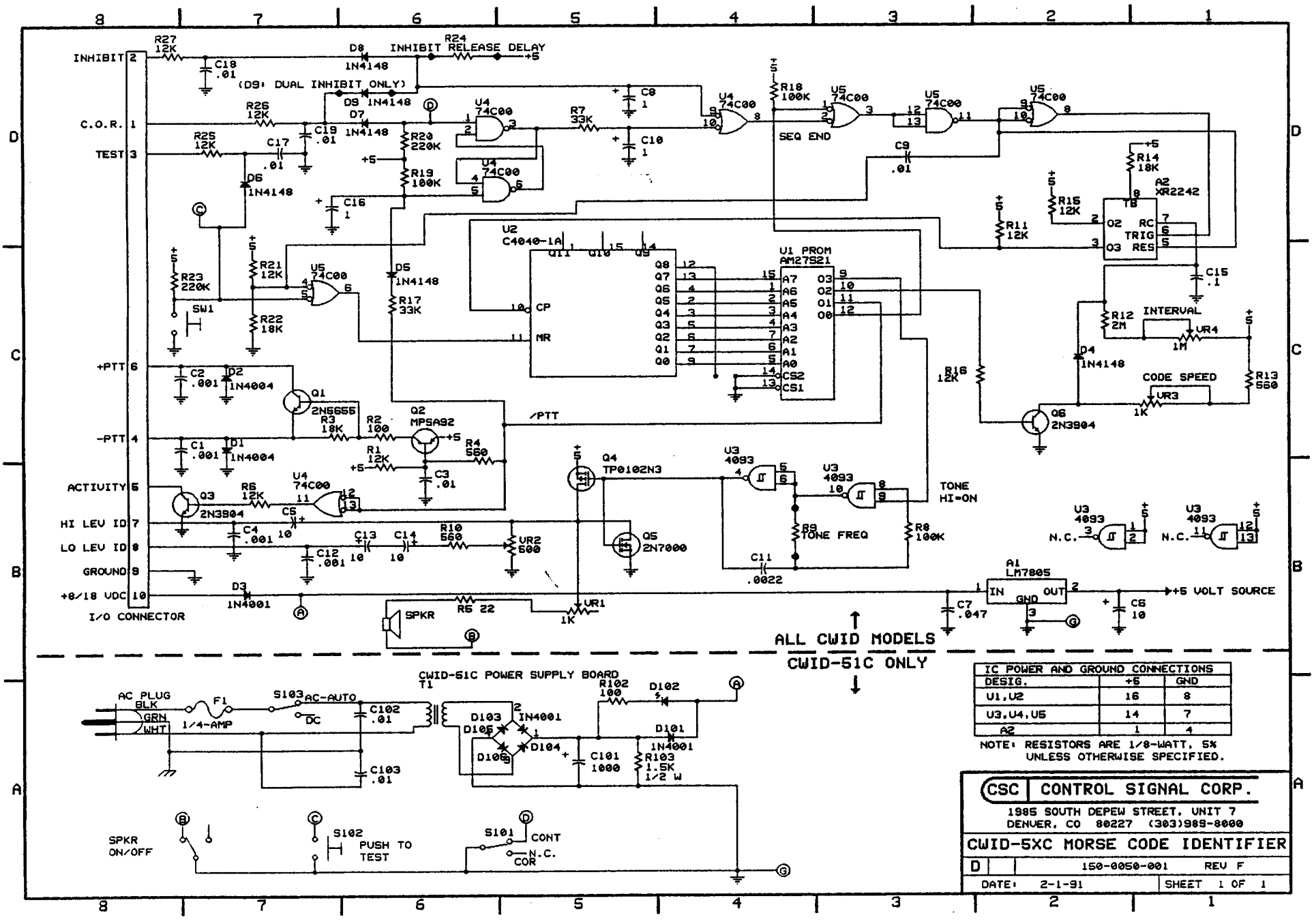


Figure 10B. CWID-51 PCB (Power/Control) Bottom Layer



IC POWER AND GROUND CONNECTIONS		
DESIG.	+5	GND
U1,U2	16	8
U3,U4,U5	14	7
A2	1	4

NOTE: RESISTORS ARE 1/8-WATT, 5% UNLESS OTHERWISE SPECIFIED.

CSC CONTROL SIGNAL CORP.

1985 SOUTH DEPEW STREET, UNIT 7
DENVER, CO 80227 (303)989-8000

CWID-5XC MORSE CODE IDENTIFIER

D | 150-0050-001 REV F

DATE: 2-1-91 | SHEET 1 OF 1

9. PARTS LIST -- ALL MODELS

Designation numbers over 100 (like C101) are those parts on the CWID-51 Power/Control PC Board.

Capacitors (mf)

C1,C2	.001, 50v Monolythic Ceramic
C3	.01, 50v Monolythic Ceramic
C4	.001, 50v Monolythic Ceramic
C5,C6	10, 16v Electrolytic
C7	.047, 50v Monolythic Ceramic
C8	1, 25v Dipped Tantalum
C9	.01, 50v Monolythic Ceramic
C10	1, 50v Dipped Tantalum
C11	.0022, 100v Polyester
C12	.001, 50v Monolythic Ceramic
C13,C14	10, 16v Electrolytic
C15	.1, 50v Polyester
C16	1, 25v Dipped Tantalum
C17,C18,C19	.01, 50v Monolythic Ceramic
C101	1000, 25v Electrolytic
C102,C103	.01, 1000v Ceramic Disk

Resistors and Trimpots(1/8 1/4 watt, 5% unless otherwise noted) (ohms)

R1	12K
R2	100
R3	18K
R4	560
R5	22
R6	12K
R7	33K
R8	100K
R9 (Tone Frequency) (1200 HZ)	240K - 360K
R10	560
R11	12K
R12	2 Meg
R13	560
R14	18K
R15,R16	12K
R17	33K
R18,R19	100K
R20	220K
R21	12K
R22	18K
R23	220K
R24 (Inhibit-Release Delay) (5 Sec)	5.1 Meg
R25,R26,R27	12K
R102	100
R103	1.5K, 1/2 Watt, 10%
VR1 (Speaker Volume)	1K Trimpot
VR2 (Audio Level)	500 Trimpot
VR3 (Code Speed)	1K Trimpot
VR4 (Interval Adjust)	1 Meg Trimpot

Integrated Circuits	
A1	LM340T5-5.0 Regulator
A2	XR2242CP Timer/Counter
U1	SN82S129 or SN82S131N (Large Memory) Read-Only Memory
U2	CD4040 Counter
U3	CD4093
U4,U5	74HC00 Gate
Transistors and Diodes	
Q1	TIP48 or 2N5655
Q2	MPSA92
Q3	2N3904
Q4	TP0102N3
Q5	2N7000
D1,D2	1N4004
D3	1N4001
D4,D5,D6,D7,D8,D9	1N4148
D101	1N4001
D102	LED ID5752
D103,D104,D105,D106	IN4001
Switches	
SW1	Pushbutton Switch, SPST (N.O.)
S101	Rocker Switch, SPST
S102	Pushbutton Switch, SPST (N.O.)
S103	Rocker Switch, SPST
S104	Rocker Switch, SPST
Miscellaneous	
T101	Transformer, 12v, .3 amp
SP101	Speaker Transducer, 30 ma
F101	Fuse, 1/4 amp
I/O Connector	Header, 10 pos., Molex 22-05-3101
I/O Mating Connector	Terminal Housing, 10 pos., Molex 22-01-3107
I/O Mating Connector Terminals	Terminals, Crimp, Molex 08-50-0114.
Board-to-Board Connector	Connector, 5 pos., Molex 90148-1105

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.