Model

RC-10

TEN FUNCTION REMOTE CONTROL AND ALARM, STATUS DISPLAY

INSTRUCTION MANUAL

Features

- Automatic Push-to-Talk output.
- Test tone generator for radio alignment
- Lamp test mode

Switch/Lamp Group Features

- Remote Address
- Handshake Attempts
- Handshake Timing
- Power Up State
- Lamp Mode
- Polling Type
- Output Mismatch Action

Programmable Communication Features

- Keyup Delay
- CTCSS Tone
- CTCSS Level
- Busy Channel Delay
- Poll Interval
- Cor On Polarity

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SPECIFICATIONS

Operating Voltage ..... 12 VDC
Operating Current ..... <50 mA
LED Current..... 10 mA each
Max Total Current.....Approx. 200 mA

AUDIO INPUTS

Input Level ..... 400 mVRMS
Input Impedance.....470KW
Dynamic Range .....25 dB
Format..... DTMF
Sinad Ratio..... 9 dB
Band Width 2.5%
Twist .....10 dB

AUDIO OUTPUTS

Alarm Relay Output..... 1 Amp
Audible Alarm Output ..... Buzz Tone
PTT Output Current ..... 200 mA
Audio Output Level ..... 1V RMS
Audio Output Impedance..... 10KW or 27KW

TIMING

DTMF Tone On Time..... 50 ms
DTMF Tone Off Time ..... 50 ms
Key-Up Delay (Front Porch) ..... programmable
Total Packet Time..... 700msec min - 950msec Max

COMMAND SEQUENCE

5 to 8 Digits..... #XXXX*N#
(N=command) (XXXX=1 to 4 digit remote address)

TRANSPOND SEQUENCE

5 to 8 Digits..... #XXXX*N#
(N=remote status) (XXXX=1 to 4 digit remote address)

MECHANICAL

Standard Panel Size..... 3.10” deep, 5.35” wide, 6.60” long
Optional Panel Size .....Standard 19" Rack
Operating Temperature.....-30^{o} to +60^{o}C

WARRANTY

Midian Electronics, Inc., warrants this product to be free from defects in material and workmanship for two years from date of shipment. If such malfunction occurs, it will be repaired or replaced (at our option) without charge for materials or labor if returned to the factory. This warranty does not apply to any parts damaged due to improper use--including accident, neglect, unreasonable use, and improper installation--or to unauthorized alterations or modifications of the equipment. It does not extend to damage incurred by natural causes such as lightning, fire, floods, or other such catastrophes, nor to damage caused by environmental extremes, such as power surges and/or transients. It does not extend to microprocessors, if it is determined by Midian that the failure of a micro is due to static damage, application of improper voltages to the unit, or other problems not related to circuit design. In such case or in the case of a desire to update the micro to a different version of software, such request must be specified in writing, and there will be a charge agreed upon by both parties.

This product is warranted to meet published specifications and to operate as specified only when properly installed in radio equipment that complies with U.S. FCC specifications and the applicable radio manufacturer's specifications. Midian Electronics is not responsible for any operational problems caused by system design, outside interference, or improper installation.

Equipment for repair can be returned to the factory without prior written authorization. A brief letter describing the nature of the defect should be included with the merchandise. Repair by other than Midian Electronics, Inc., will void this warranty. In-warranty merchandise must be shipped, freight prepaid, to Midian Electronics. Midian Electronics will return, freight prepaid via UPS ground, the repaired or replaced equipment to purchaser, within the United States. Out-of-warranty repairs will be billed at the rate of $60 per hour, plus replacement parts.

This warranty applies to the original purchaser of the equipment only. Midian Electronics is not liable under this warranty, or any implied warranty, for loss of use or for other consequential loss or damage experienced by the purchaser. Some states do not permit the exclusion or limitation of implied warranties or consequential damages. This warranty provides special legal rights, and the purchaser may have other rights that vary from state to state.

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INSTALLATION INSTRUCTIONS

Installation Note

Midian products utilize CMOS integrated circuits, which are susceptible to damage from high static charges. Be sure to follow standard antistatic procedures when handling, including using grounded workstations and soldering irons and wearing grounding bracelets. Please be careful when selecting wire colors. It is sometimes difficult to distinguish between the grey, black, and brown wire colors under fluorescent lighting. We suggest using Color-Bright/Color-Corrected or incandescent lighting. If in doubt, compare wire positions on board layout for correct color code.

RC-10 Connector P1	Input Function	Description of DB 15 connection
Pin 1	12 Volts DC	Connect to 12 volt.
Pin 2	Ground	Connect to nearest ground point.
Pin 3	COR Busy Lockout	This is used to detect a busy channel. Connect to point in Squelch or CTCSS circuit that changes logic level when a carrier is received. A radio whose squelch circuit provides a logic low or a logic high can readily turn the COR transistor on and off. If the point that this lead is hooked to only makes a minute change in voltage, it will be necessary to adjust the values of R13, R14, and R15 to cause Q1 to change states. ***NOTE: THIS CONNECTION IS MANDATORY.***
Pin 4	PTT Out	Connect to the radio's Push-To-Talk input circuit.
Pin 5	Modulation Audio	Connect to high impedance point in the radio's modulator. When using a low impedance point, it will be necessary to short out Resistor R37 to lower the output impedance. ***NOTE: ADJUST MOD POT R57 FOR 3.3 KC DEVIATION.***
Pin 6	Squelch Output	Not used.
Pin 7	Relay Contact	Normally open contact on alarm relay RLY1.
Pin 8	Relay Contact	Normally closed contact on alarm relay RLY1.
Pin 9	Relay Contact	Common contact between normally open and normally closed on alarm relay RLY1.
Pin 10	Program Input	Connects to KL-2 or KL-3 to program from the Windows Based KL-2 Programmer.
Pin 11	Program Enable	Not used.
Pin 12	Tone Input	Connect to a squelched or unsquelched audio point in the receiver, usually the high side of the volume control or discriminator output. ***NOTE: ADJUST RECEIVER AUDIO LEVEL TO APPROXIMATELY 300 MV PEAK TO PEAK AT THE TONE INPUT P1-18.***

There is an unused set of contacts on the on/off switch which may be used to switch 110 volts or some other voltage. Use caution when working with high voltages and put insulation over the contacts to prevent any shocks.

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1. OPERATION

1.1. General

The RC-10 is a ten-function remote control unit that can display the status and alarm condition for up to ten remote units or groups. When used in conjunction with Midian's RD-1 or RD-10 remote monitoring units, the RC-10 can control and monitor lighting systems, water pumps, well sites, industrial equipment, radio repeater sites, waste treatment facilities, pipeline monitoring equipment, mine shaft ventilator, etc. The RC-10 has 10 single keys that send commands to control ten remote output/input points.

The RC-10 is equipped with an alarm indicator LED combined with an audible alarm tone that can be silenced. Additionally, there is an optional alarm relay to control an external bell or alarm. This relay can be set to operate in either a normally open or closed contact.

The RC-10 has a powered-down memory feature that enables it to retain the last known state of each remote point when power is removed. It also has a programmable polling feature that can be separately set to poll remote sites automatically either on power up or at specifically-scheduled time intervals.

The RC-10's power on switch is a double pole switch; one pole controls 12 volts DC input to the RC-10, while the other pole can control 110 volts AC for existing external equipment

The front panel of the RC-10 has 10 switches and 10 LEDs (lamps); each Switch/Lamp Group is associated with a remote control point (an RD-1 single I/O group or one I/O group out of ten on an RD-10). Each of these Lamps can indicate several aspects of the system: transaction pending/in progress; the remote unit's output status, the remote unit's input status, the remote unit's alarm status, or transpond failures.

When a switch is pressed, the RC-10 will change the logic state of the switch and transmit a DTMF command to the RD unit When the RD unit transponds, the associated lamp on the RC-10 will display one of the following user programmable settings:

- The called remote unit's input status (On/Off).
- The called remote unit's output status (On/Off).
- The called remote unit's alarm status.

If the transpond is not received within a specified amount of time (which is programmable), the RC-10 will display an alarm condition for the associated Switch/Lamp Group.

1.2. Switch Operation

The switch in each of the ten Switch/Lamp Groups toggles the On/Off state of the remote unit's output.

Pressing a switch will toggle the internal state of the switch and will queue a transmission to the remote unit.

If there is a busy channel and the switch is pressed again *before* the transmission has occurred, that transmission will be canceled. If the switch is pressed again, *after* the original transmission but *before* the remote unit has transponded, a second transmission will be queued and transmitted after the remote unit transponds.

1.3. TX Mute/Silence/Lamp Test Switch

The TX Mute/Silence/Lamp Test switch is a three position center Off toggle switch. In the up position, TX is muted, which prevents DTMF touch tones from being heard in the speaker. Only the alarm tone will be heard. In the center position, DTMF signalling tones, alarm tones and pushbutton tones can be heard. In the spring loaded down position, the alarm tone is muted but the alarm lamp will flash. Holding this button down for 3 seconds tests all of the lamps.

Note: The Busy Lamp and Transmit Lamp are not activated in the lamp test mode.

If the audible alarm has been silenced, pressing the Silence/Lamp Test switch again will turn it back on.

If the user has muted a current alarm situation, and all alarm conditions have subsequently been cleared, any new alarm will again be audible.

To generate a 5 second 1020 Hz test tone from the RC-10, turn the unit off, hold this switch down, turn the unit on and release the switch. If a longer tone is required, repeat the process and continue holding the switch down. The tone will repeat until the switch is released. The test tone feature is useful in aligning the radio equipment in the RC/RD path.

1.4. Lamp Operation

The lamps associated with each Switch/Lamp Group have three display modes:

SLOW FLASH: The lamps will flash at a slow rate (once a second) when a transmission is pending or when a transpond from a remote unit is pending.

FAST FLASH: The lamps will flash at a fast rate (4 times a second) when either an

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alarm condition has been reported from the remote unit or the remote unit has not transponded in a specified amount of time.

STEADY: The lamps will indicate the state of the remote unit's Input, the remote unit's Output, or the local Switch, depending on the setting in the **Lamp Content** field.

The COR Output from the radio's squelch circuit activates the Busy Lamp after any programmed Seizure Delay time.

When the RC-10 keys the radio, the Transmit Lamp will be activated.

The Alarm Lamp will flash a fast rate (4 times per second) when an alarm condition is detected on any of the 10 Switch/Lamp Groups. When all alarm conditions have been cleared, the Alarm lamp will extinguish.

1.5. Power Up Operation

When power is applied to the RC-10, the state of each switch is set to On, Off or its Last Known state, depending on how the **Power Up State** field is set.

A Status Query command is transmitted to any remote unit that has the **Power Up Poll** feature activated. The RC-10 will update the lamp displaying the remote unit's input status or output status (as programmed).

If, on Power Up Poll, a remote unit goes into alarm, the alarm condition will always be reported first by the remote unit, in which case the RC-10 will immediately show the alarm for the associated Switch/Lamp Group. If the remote unit does NOT transpond within a programmed period of time, the RC-10 will display an alarm for the associated Switch/Lamp Group.

An Acknowledge command is not transmitted after a remote unit responds to a Status Query command.

1.6. Output Mismatch Action

If the output status reported by the remote unit matches the state of the control switch, the RC -10 will transmit an acknowledge command to the remote unit. and the associated lamp will display the remote unit's transponded input or output status (as programmed).

If the output status reported by the remote unit does NOT match the state of the control switch, the RC-10 will take one of four programmable actions:

Ignore: The RC-10 will ignore the mismatch and still transmit the acknowledge command.

Force Remote: The RC-10 will transmit a command to the remote to force its output to the state of the RC-10's switch.

Show Remote: The RC-10 will change its switch status to reflect the output state reported by the remote unit.

Alarm: The RC-10 will display an alarm for the Switch/Lamp Group associated with the mismatch.

1.7. Periodic Polling

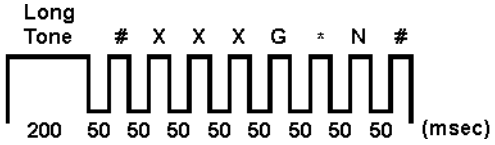
Periodic Polling can be implemented by setting the **Poll Interval** to the desired period, from 1 second to 86400 seconds (24 hours). Realistically, any period under 30 seconds may not work because a complete poll of all ten remote units may take 30 seconds to complete if mismatches are detected. The RC-10 will transmit a Status Query at the programmed interval for any Switch/Lamp Group that has the **Scheduled Polling** feature activated.

As with power-up operation, if a remote unit reports an alarm condition, the RC-10 will immediately display that alarm condition. Also, if a remote unit does NOT transpond within a specified period of time, an alarm condition will be displayed. Finally, if the remote unit transponds while a poll is pending, the poll will be canceled.

1.8. Security

The RC-10 provides a secure mode of operation to eliminate false operation from spurious transmissions, which can help thwart hacking attempts.

The lead in digit is timed at 200ms and the following tones are timed using a base of 50ms on time and 50ms inter-digit time.



The digits A to D are used to issue commands, as well as for remote addresses. These do not appear, however, on most 12-button radio keypads.

1.9. Multiple or Continuous Transmission

When the RC-10 is programmed to expect a transpond from the RD, the RC-10 can send a command multiple times or continuously. This can help ensure that the RD unit will decode a command in a noisy or marginal RF environment. When **Handshake Attempts** is set to a number greater than 1, the RC-10 will attempt to transmit a

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command that number of times before showing an alarm if the remote unit does not transpond. The RC-10 will stop transmission attempts if a transpond is received. By setting it to *Transpond*, the RC-10 will continue to transmit commands at the interval defined by the **Handshake Timing** field. The transmissions will continue until a transpond is received from the remote unit. In this situation, an alarm condition will not be displayed. The only indication that the remote unit is not transponding is that the lamp will continue to indicate a pending transmission or a pending transpond.

Correspondingly, the RD unit also has a multiple/continuous transmission mode. By setting Transmit Attempts to Until Ack(nowledge) the remote unit will continue to transpond until the transpond is acknowledged by the RC-10.

1.10. Timing Considerations

When operating in the RC to RD communications mode, each RC and RD unit will transmit when power is applied if **Power Up Polling** is enabled on the RC units and **Power Up Reporting** is enabled on the RD units. This can tie up the frequency if many RD units are sharing a radio channel or sharing the same radio. **Power Up Polling** may not be necessary if the system has battery back up power.

The **Busy Channel Delay** field provides a method of modifying the timing of when each unit will grab the channel.

The time delay specified by **Busy Channel Delay** is a function of the COR from the radio. Once the radio detects loss of carrier, the Busy Chennel Delay timer must expire before the RC or RD unit can key-up and transmit. The time delay specified by **Busy Channel Delay** is also applied after each transmission, and must expire before the unit can transmit again. **Busy Channel Delay** is also used to delay Power Up transmissions.

In RC-to-RD communications mode, the RC unit should have the longer Busy Channel Delay compared to the RD. This allows any RD unit to interrupt polling and immediately report an alarm condition. It also allows the RD unit to transpond to a query or command before the RC unit transmits another query or command.

Repeater key up delays, CTCSS delay and synthesizer delay in the radios should be taken into account when setting **Busy Channel Delay**.

In a simple point-to-point radio system, the RC-10 unit might have its **Busy Channel Delay** set to 200ms and the RD-10 might have its **Busy Channel Delay** set to 100ms.

If two RD units are being controlled, the first RD unit's **Busy Channel Delay** should be set to 100ms, while the second RD unit's **Busy Channel Delay** should be set to 200ms. In this case, the RC-10's **Busy Channel Delay** should set to 300ms.

Power Up Reporting should be used sparingly if many RD units are used on a single radio channel. **Power Up Polling** and **Power Up Reporting** may not be necessary if a the system has battery back up power.

2. USING THE REMOTE PROGRAMMER

All Midian's remote control products require the Remote Programmer. It requires Windows® 3.1 or later to run. To install the Remote Programmer, insert the provided diskette in to the 'A' or 'B' drive on your computer. From the program manager, Run A:setup or B:setup depending on which drive the diskette is in.

Connect the KL-2 or KL-3 to an available serial port on your computer (typically COM2).

Connect the KL-3's programming clip lead to the program input (pin P1-10; Molex pin 8) on the RC-10. Connect the KL-3 ground lead to the ground (pin P1-2; Molex pin 1)

To run the Remote Programmer just click on this icon in Windows:

Change the data appearing on the screen to values desired. Save your file for future reference.

Click on the Program button in the Remote Programmer software.

If another serial port is being utilized, click the Settings button and select the correct port.

Click the Go button, The programmer will program the RC-10.

The Busy lamp on the RC-10 will flash once if programmed correctly.

The Busy lamp on the RC-10 will flash for 5 seconds if not programmed correctly.

The RC-10 will reset and begin executing the downloaded program.

If you wish to download the program again or program multiple units, just click the Go button again.

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Clicking the "TONE" button in the program panel will cause the RC-10 to generate a 5 second test tone of 1020 Hz. Unit will be reset after test tone. Test tone can be used to align radio equipment between controller and remote devices. Note: RC programmer will not support shared interrupts on COMM ports.

2.1. GETTING HELP IN THE DEVELOPMENT SYSTEM

To get help while running the Remote Programmer and development system, just double click on the name you want help on. For instance, if you need help on KEYUP DELAY, just double click on KEYUP DELAY or click in the KEYUP DELAY window and press F1 or click on the Help button.

The Help system contains a description of every programmable feature on the RC-10 as well as how to use them.

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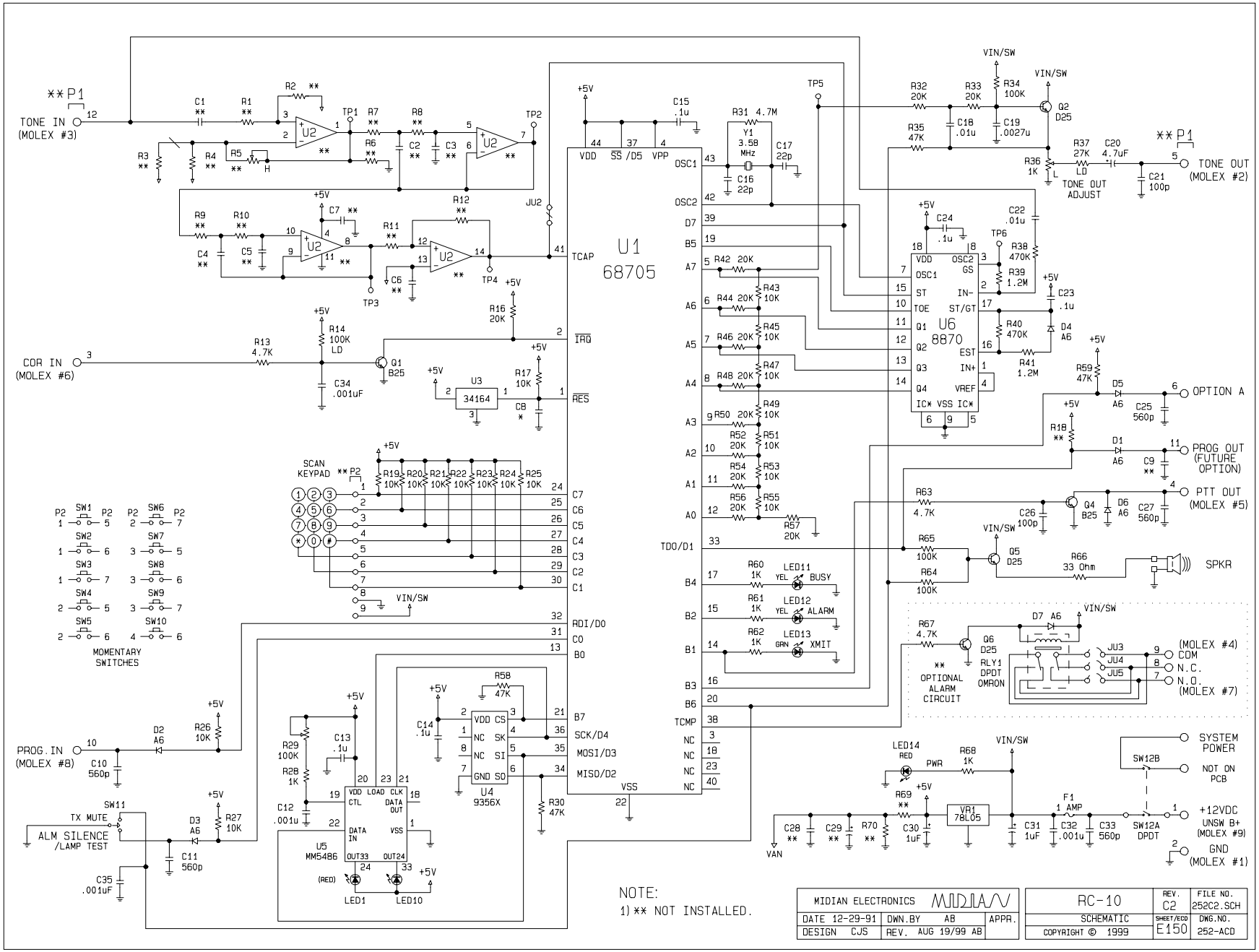

NOTE:
1) ** NOT INSTALLED.

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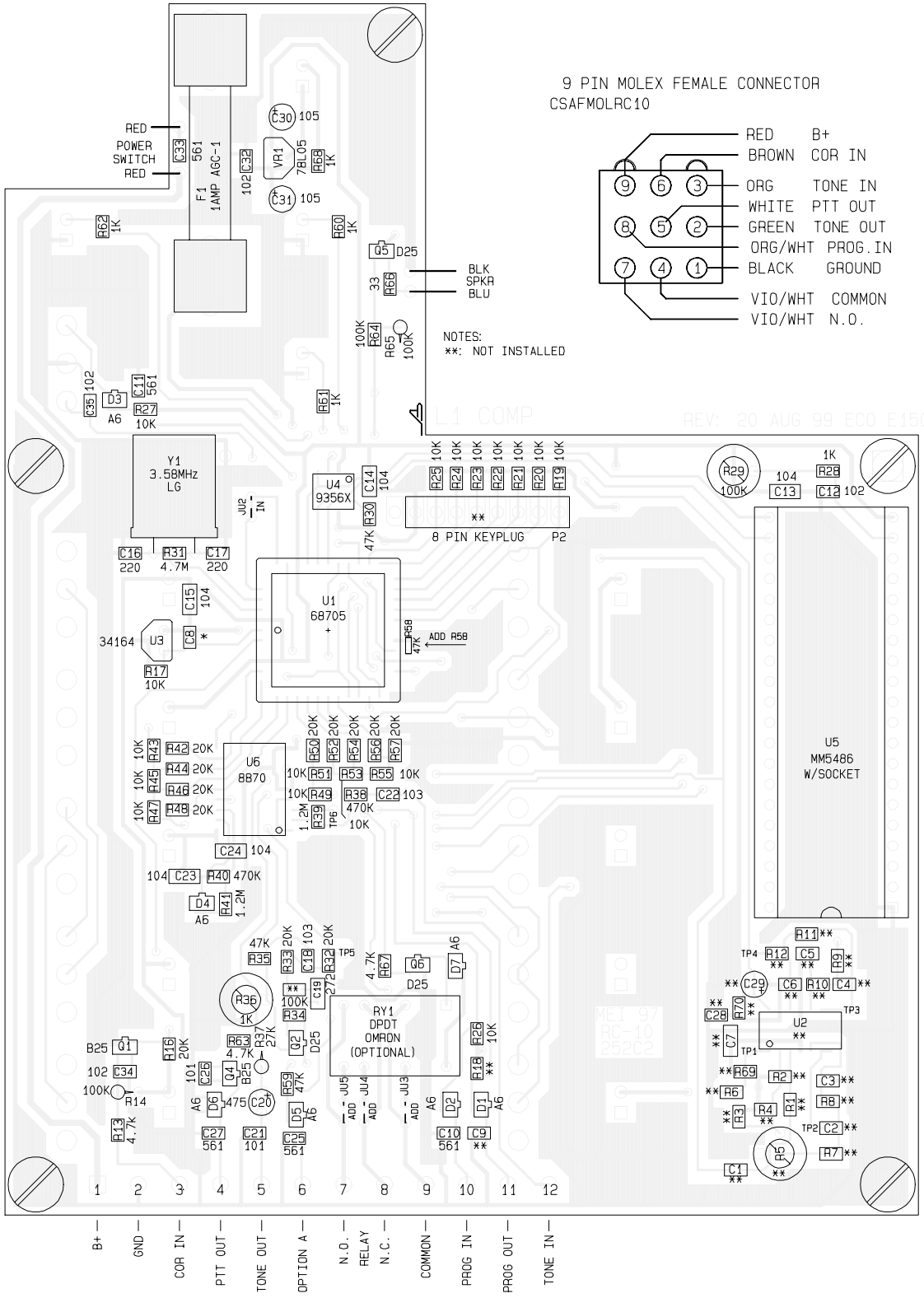

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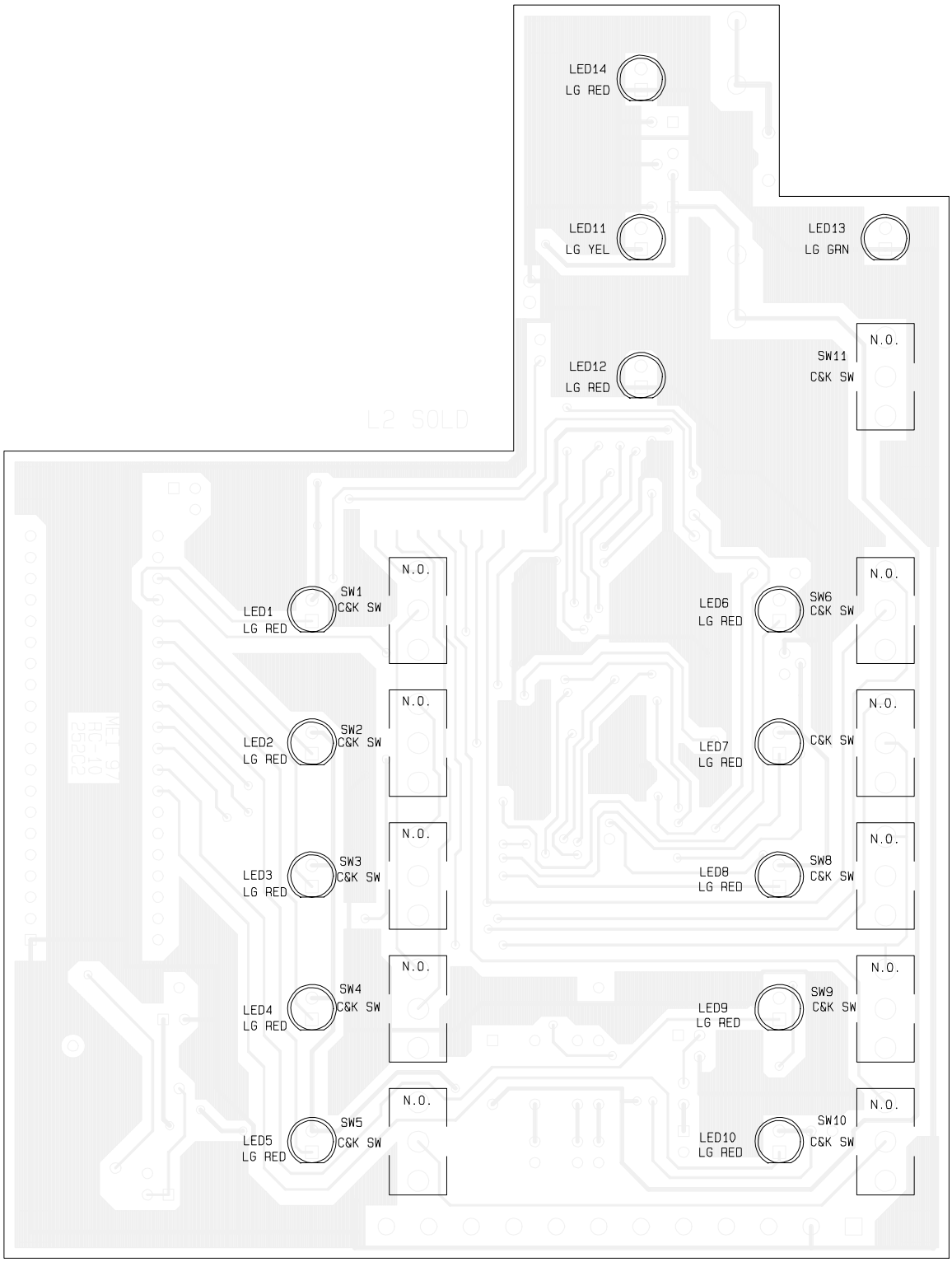

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