



MOT-TVS-2-PRO-EL

Rolling Code Scrambler for Motorola Professional Entry Level Portable Radios

MOT-VPU-15-PRO-EL

Voice Inversion Scrambler for Motorola Professional Entry Level Portable Radios

Manual Revision: 2008-08-05

Covers Software Revisions:

MOT-PRO: 2.95 and Higher

Covers Hardware Revisions:

MOT-PRO-EL: 313D

This manual supports the following radios:

North America: CT-150, CT-250, CT-450, CT-450-LS

EMEA Region: P040, P080

Asia: GP-88S, GP-308

Latin America: PRO-3150

SPECIFICATIONS

Operating Voltage	3.3 VDC
Operating Current	8 mA
Operating Temperature	-30 - +60 C
Frequency Response	300-2100 Hz
Input Impedance	≥200 kΩ
Carrier Suppression	60 dB < Peak Voice
Audio Output Impedance	≤75 Ω
Tone Distortion	<1%

Encryption Specifications

TVS-2: Encryption Sequences	+40 Trillion
TVS-2: Random Number Generator	64 bits
TVS-2: Sequence Length (est.)	84 billion years
VPU-15: Inversion Codes Available	37

GENERAL INFORMATION

The MOT-TV2S-2-PRO series is a high-level rolling code scrambler that plugs into the Motorola Professional series radios. The TV2S-2 uses hopping type rolling code encryption for higher security rather than sweeping code type and offers 4 user-programmable hop rates and is down gradable to voice inversion. The scrambler is capable of features such as ANI, ENI, OTAR, Deadbeat Disable, Spy, and more when using Midian's Kryptic Signaling format with the CAD-300/DDU-300/TRC-300.

The MOT-VPU-15-PRO series is an entry level voice inversion scrambler that plugs into the Motorola Professional series radios. The scrambler is capable of features such as ANI, ENI, OTAR, Deadbeat Disable, Spy, and more when using Midian's Kryptic Signaling format with the CAD-300/DDU-300/TRC-300.

For more detailed information on the scramblers' features, troubleshooting and system information please reference the TV2S-2 Technical Reference Manual.

INSTALLATION OVERVIEW

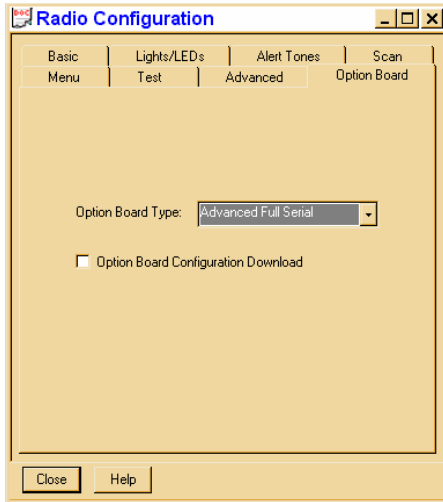
1. Test the radio for functionality.
2. Program the radio per the Radio Programming Section of this manual.
3. Install the scrambler into the radio per the Hardware Installation Section of this manual.
4. Program the scrambler per the Product Programming Section of this manual.

Note: Midian is not responsible for any damage/loss resulting from the use of Midian's products.

RADIO PROGRAMMING

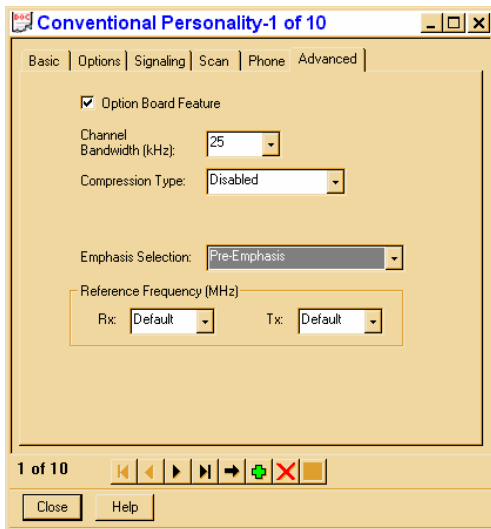
It is necessary to program the radio before installing the scrambler. This is because the option board feature of the radio must be enabled in order to hear confirmation beeps from the scrambler after programming the scrambler.

1. In the Radio Configuration Window under the Option Board Tab, select “Advanced Full Serial” as the “Option Board Type”. Do not check the Option Board Configuration Download box.



2. When programming the “Conventional Personality”, Pre-Emphasis should be enabled, but De-Emphasis must not be enabled. This is because De-Emphasis will prevent the scrambler from decoding synchronization data. The scrambler by its very nature performs De-Emphasis function. Compression should not be used with the scrambler.

Checking the “Option Board Feature” box in this window will cause the option board to be enabled for that particular personality. If this is not done, the option board cannot be controlled. If you are planning to use radio features such as DTMF or menus, you will need to program some personalities with option board feature not checked and switch to those to gain control of the radio. On non-option board personalities, the only functions available in the radio are DTMF dialing and menu access. No voice can be transmitted or received on these channels.



HARDWARE INSTALLATION

Be certain to follow standard anti-static procedures when handling any of Midian's products.

Radio Firmware: For the portable radios listed, Midian recommends having radio firmware version R02.00.01 or higher. If the radio has an older firmware version you must have it upgraded.

Verifying the firmware version can be done several ways. On most radios, this information is on a label on the back of the radio. For keypad & display radios, selecting the SoftwareVer# option from the utility menu will report the version. Consult Motorola if you cannot determine the firmware version.

Disassembling the Radio:

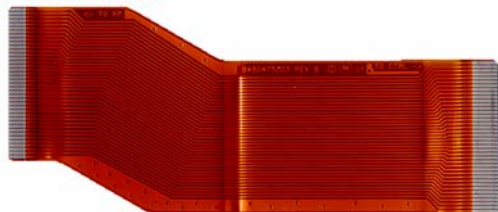
Additional disassembly instructions are also available in Motorola's Basic Service Manual.

1. Remove the antenna, knobs, and battery.
2. With a Chassis Opener tool from Motorola or a 3/16" flat blade screwdriver, gently insert the tool into the space between the case and the radio chassis at the bottom of the radio. Gently pull the tool downwards, separating the bottom of the chassis from the case. Make certain the rubber seal does not get damaged.
3. Pull the bottom of the chassis downward until the knob switches are clear from the case. Flip the chassis open so that the bottom of the case and the bottom of the chassis are end to end. Be careful when opening; as there are flex cables installed.
4. Lift the latch on the main board to release the 40-pin flex cable its connector and unplug the speaker cable.
5. Remove the RF shield in the front cover. This is done by inserting a flat blade screwdriver or a scribe behind the arm tab, pushing down, and then prying inwards. The tab should pop out. NOTE: Do not pry upwards from underneath the arm as damage could occur to the keypad electronics or Midian's scrambler if already installed. After releasing all 4 arm tabs, gently lift the bottom of the RF shield and then pull downward to get the 2 top tabs clear of the case.

Installing the Scrambler:

1. For radios without a keypad and display, there is a plastic piece in the front cover that should be removed, leave the rubber piece (if present) installed. Additionally, non-keypad/display models, the PRO Cable B will need to be ordered from Midian. For radios with a keypad and display, unlatch the flex connectors from the keypad electronics, remove the flex cables, and remove the keypad electronics.
2. Insert the 40-pin flex cable into the 40-pin flex connector on the scrambler, making certain it is seated properly, then close the latch. Install the scrambler with the 40-pin connector towards the bottom facing up.

Scrambler Side



Radio Side

3. Reinstall the display flex and close the latch. Insert the other side of the 40-pin flex cable into the 40-pin flex connector on the radio's main board. Reinstall the speaker cable.



Reassembling the Radio:

If you are using the KL-3 cable to program the scrambler, stop here and skip to the programming section.

Additional assembly instructions are also available in Motorola's Basic Service Manual.

1. Reinstall the RF shield over the Midian board, by first inserting the 2 top tabs and then snapping the 4 arm tabs back into place with a small flat blade screwdriver. Be certain the board is squarely aligned and not to damage the flex cables. The RF shield may bulge slightly in the center; this is normal.



2. Place the chassis into the front cover. Be certain the O-ring seal is properly aligned and does not get damaged. Push the chassis up into the case and then push the bottom down until it snaps.
3. Replace the knobs, antenna and battery.

HARDWARE ALIGNMENT

The MOT-TVS-2-PRO-EL and MOT-VPU-15-PRO-EL do not require any hardware adjustments.

PRODUCT PROGRAMMING

Install the KL-3 programming software if you have not done so already. The MOT-TVS-2-PRO series version 2.8 and higher can be programmed via the Motorola RIB box.

Start the KL-3 software. From the product selection screen on the KL-3 software, locate and select MOT-TVS-2-PRO or MOT-VPU-15-PRO and then PRO-EL (Entry Level Portable) from the list.

Configure the programming software by selecting File->Preferences. Select the appropriate COM port. If using the RIB box, make certain there is a check mark next to 'Rib Box Enable' by clicking on it.

Set the parameters of the scrambler software to fit the application. If any clarifications on a feature are required, move the mouse cursor over the feature name until the question mark appears and right click, an on-line help for that feature will be shown. On the radio tab it is necessary to select the proper Radio Model. For the entry level radios the following should be the selected model:

(1) MDC/LTR Portable with R02.15.00 or greater, EL portable in Advanced Mode (Full Control)

After entering the parameters, save the file by going to File - Save As. Enter the file name in the File Name block and click Save. Saving the file will allow for quick and easy reprogramming of units. Turn power on to the radio and then the RIB. Click ProgramUnit! in the KL-3 software. You will hear 1-3 beeps from the radio if programmed successfully.

To read the parameters from the scrambler, Click on ReadUnit!.

The radio and RIB should be powered down for 3 seconds after reading or programming.

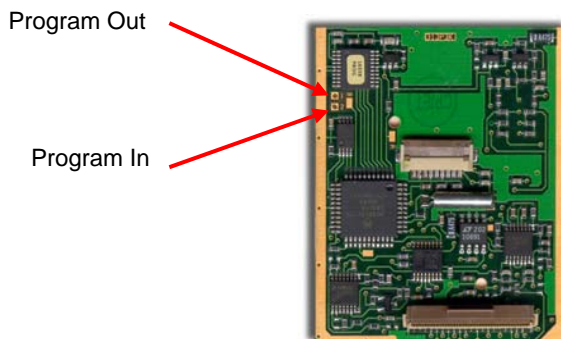
Important Note: Do not attempt to 'clone' the scrambler by reading one and then programming another. When the scrambler is read, the security codes will be read out as zeroes. If another scrambler is then cloned with this information, the scramblers will be incompatible because they have different security codes. To ensure scramblers communicate with each other, program them from a saved *file*.

RIB Box Programming: If programming the scrambler through Motorola's RIB box, install the Midian scrambler into the radio according to the installation section. Turn power on to the radio and click "Program Unit" in the KL-3 software.

RIB Box Reading: This feature is currently not supported in this product.

KL-3 Programming: After plugging the board into the radio, but with the radio still open, connect the black lead of the KL-3 to a common ground and the green clip lead to the Program In. Turn power on to the radio and click "Program Unit" in the KL-3 software.

KL-3 Reading: It will be necessary to connect the yellow clip lead to the Program Out, in addition to having the green clip lead connected to the Program In. Follow the same procedure to read the unit, but select "Read Unit" in the menu bar. It is necessary to cycle power after programming or reading.



Option Board Feature: Enabling the option board feature tells the radio to report events such as button press, PTT press, carrier detect, etc. to the option board. This feature enables communication between the option board and the radio.

When controlling the scrambler with a radio button, it is absolutely required to enable this feature on all channels. For scrambling on a per channel basis only enable the option board on scrambled channels and the power up mode of the scrambler should be Scramble. On display models, the following icon appears on the LCD when option board mode is on:



Mode Selection:

Mode selection means a method of turning the scrambler on and off. In the MOT-TVS-2-COM and MOT-VPU-15-COM series there are two ways of doing this:

Option Board On/Off Button: The scrambling function may also be controlled by assigning a button to “Option Board” via the CPS programmer. This button may then be used to turn the scrambler on and off. This mode of operation requires that the Power-up Mode of the scrambler be set to Scramble.

For the above mode, the option board icon is displayed when scrambling is enabled. When the icon is not displayed, the scrambler board is completely disabled. It cannot decode scrambled audio, nor can it respond to commands from a CAD-300 or DDU-300.



Scramble On/Off Button: To use this feature each channel should have the Option Board Feature box enabled in the radio programming software. The desired button should be programmed to no function in the radio programming software. In the KL-3 software on the Radio tab in the Button Assignment area set the desired button to “Mode Select”. Pressing and releasing this button will toggle the mode of the scrambler between scramble and clear. A medium tone followed by a high tone indicates the scrambler is in Scramble mode and a medium tone followed by a low tone indicates the scrambler is in Clear mode.

Code Selection:

The TVS-2 or VPU-15 can have up to 4 different codes programmed.

Code Selection Button: To use this feature multiple security codes must be programmed into the TVS-2 or VPU-15 scrambler. The desired button should be programmed to no function in the radio programming software. In the KL-3 software on the Radio tab in the Button Assignment area set the desired button to “Code Select”. Pressing and releasing this button will step the scrambler to the next security code. The scrambler will emit a number of beeps corresponding to the code number the scrambler stepped to (i.e. 2 beeps equals security code 2). The maximum number of codes is 4.

TECHNICAL NOTES

Radio Compatibility: Midian has taken the utmost care to ensure the option board integrates into the radio with minimal impact to the features of the radio. However, some features may not be available in the radio when an option board is used. If a feature is not available, please contact Midian to see if the feature can be added.

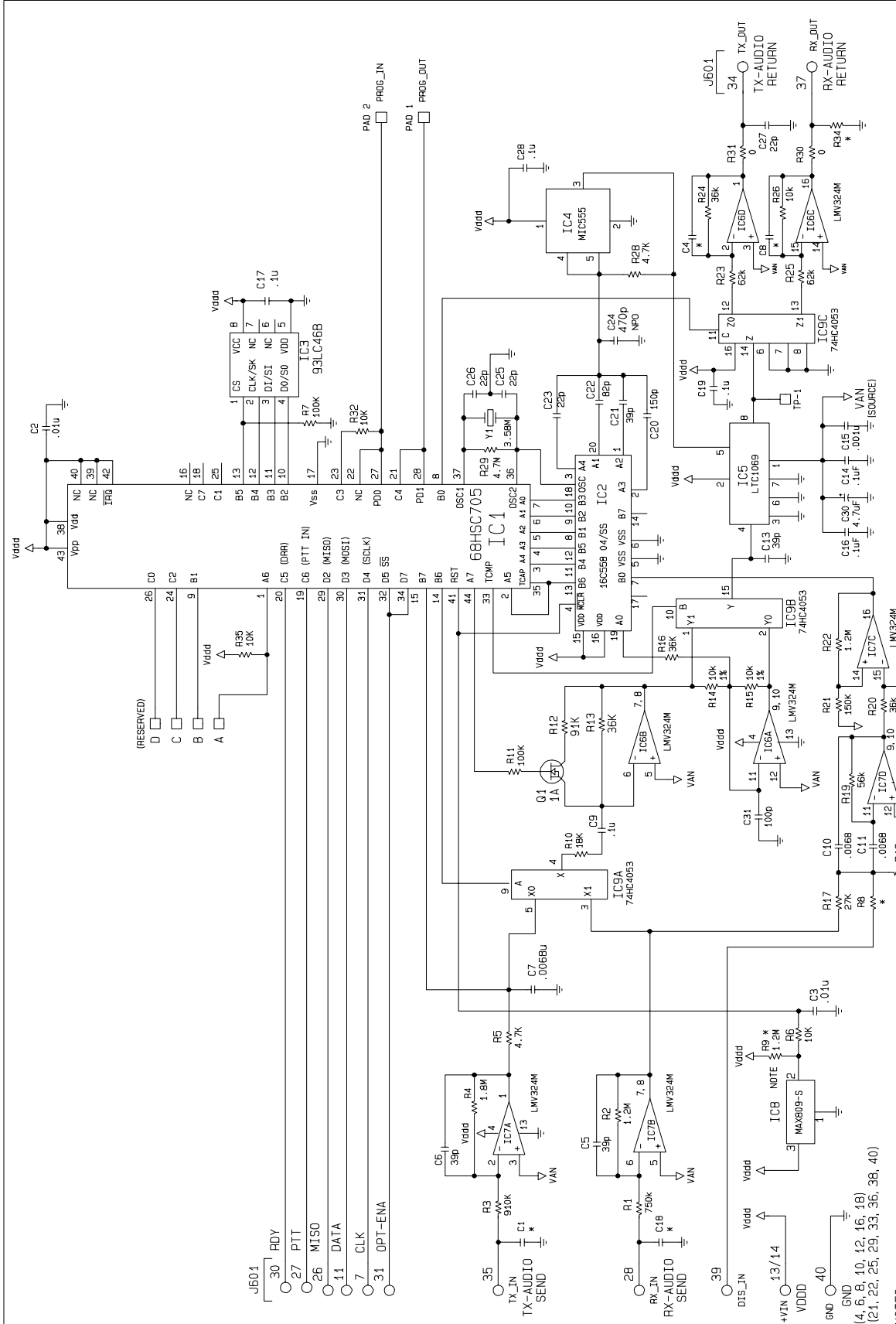
Radio Firmware: Midian recommends having the latest firmware in the radio when installing the scrambler. However, it should be noted that occasionally firmware updates may cause a conflict with proper option board/radio communications. This may appear that the scrambler is not working properly, but it is a conflict in the serial communication between the option board and radio. If this happens it will be necessary to go back to the original firmware revision.

Scan: Midian strongly recommends not using the radio's Scan function when using voice scramblers. First of all synchronization packets will most likely not be decoded by the receiving radios, as the receiving radio may be looking at a different channel when sync is transmitted. Additionally if using a combination of scrambling on a per-channel basis and a mode select button to control the state of the scrambler, when the scan function is used the radio will ignore the button. This is best resolved by using per-channel scrambling OR a mode select button, but not both. If using scan and a mode-select button the Option Board Feature box in the radio programming section must be enabled on all channels.

MIDIAN CONTACT INFORMATION

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SHEET	DWG. NO.
1/2	313 HCD
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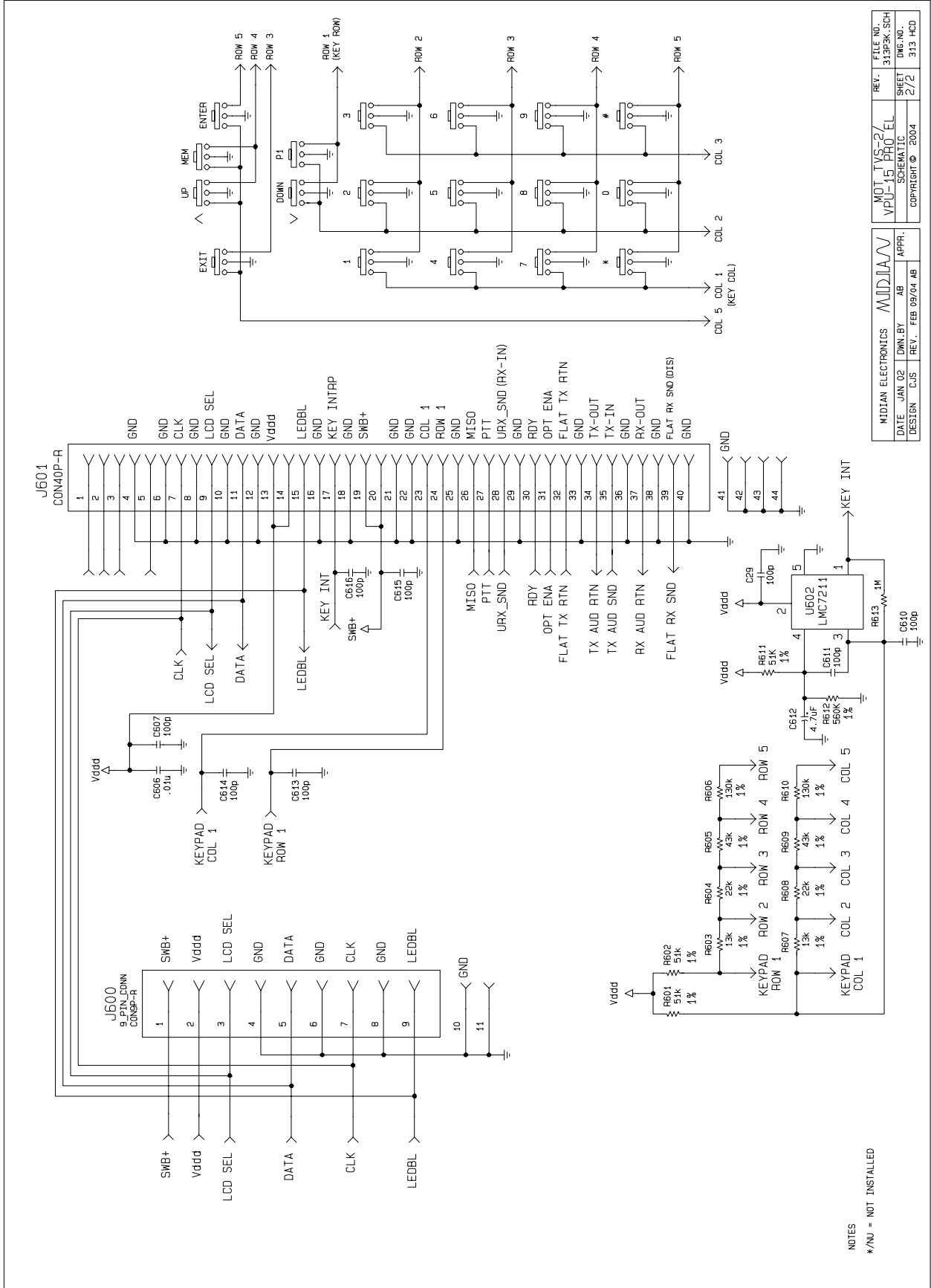
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DESIGN: C.S	REV.: FEB 9/04 AB
APPR.	

NOTES

*NU = NOT INSTALLED

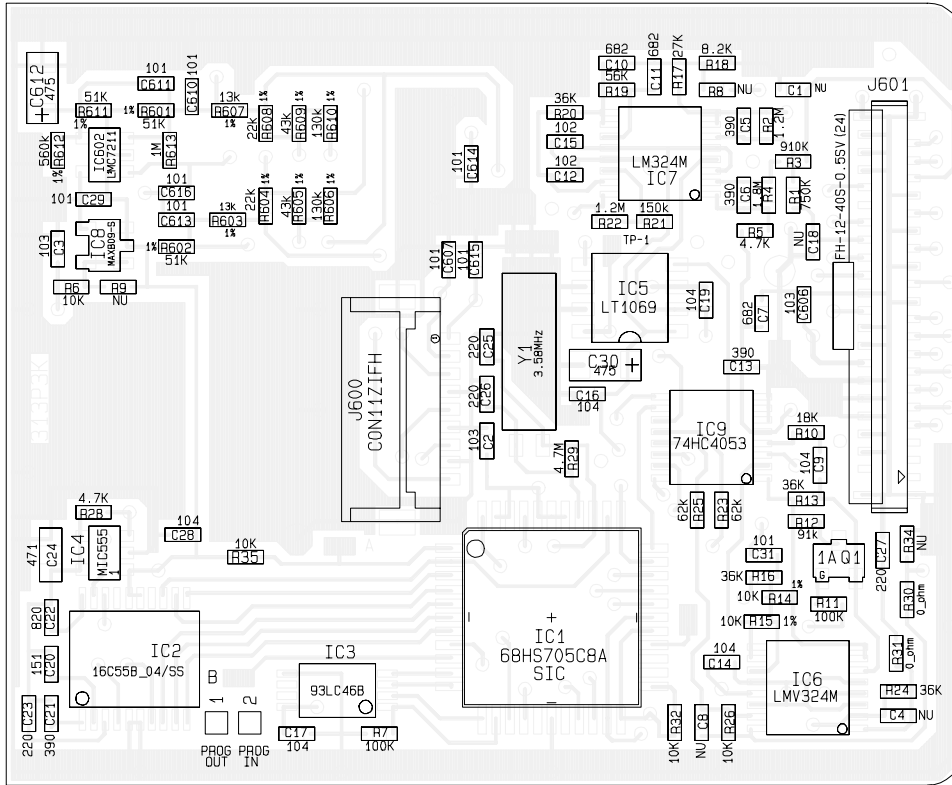
INSTALL R9 WHEN IC8 NOT PRESENT

IC6 & IC7 ARE 16 PIN CHIPS. PINS 8, 9 NOT USED - WHITE 14P PKG SKIP PINS 8, 9



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 */NU = NOT INSTALLED

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DATE JAN 02	DWN BY AB	VPU15 PRO EL	313PK SCH
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