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Foreword

Scope of this manual

This manual contains the specifications, functional description, operating instructions, schematic, parts locator and parts list for the SVR-P250 synthesized vehicular repeater.

This manual is intended for use by qualified service technicians to aid them with installation, interfacing, alignment and trouble shooting of the SVR-P250 when used with other land mobile radios.

Service manual revisions

Component changes, additions and deletions may occur in the circuit design to improve operation and will be reflected in future releases of this service manual. Specifications and circuit changes are subject to change without prior notice or obligation by Pyramid Communications.

Safety Information

The SVR-P250 is designed to operate within all applicable Federal regulations at the time of manufacture. Proper operation and service procedures will assure continued compliance with these regulations:

•   Do not operate the SVR-P250 without an antenna or appropriate RF load connected to the antenna connector.

•   Do not operate the SVR-P250 in the presence of unshielded electrical blasting caps or explosive environmental conditions.

•   Do not operate the SVR-P250 while refueling the vehicle or in the presence of explosive fumes.

•   Do not operate the SVR-P250 with persons standing closer than 2 feet from the mobile or repeater antenna.

FCC information

The SVR-P250 complies with the FCC rules parts 90 and 22 for radio frequency transmitters. The user must apply for a license to operate the SVR-P250 transmitter pursuant to parts 90.243 and 90.247. Other FCC rules may apply depending on the class of service the user qualifies for. A complete listing of FCC rules and regulations may be ordered from:

> Superintendent of Documents
> Government printing office
> Washington DC 20402

The following information pertaining to the SVR-P250 should be included in the FCC license application:

	VHF	UHF	700/800 MHz
Type Acceptance:	LRUSVR-P250V	LRUSVR-P250U	LRUSVR-P250M
Output Power:	0.25-2.0W	0.25-2.0W	0.25W-2.0W
Emission designators:	10K0F1D, 10K0F1E, 10K0F7D, 10K0F7E, 11K0F3E, 12K3F1D, 16K0F3E, 4K8F2D		
	7K6F1D, 8K1F1D, 8K1F1E, 8K1F7D, 8K1F7E, 8K4F2D		
Frequency band:	136-174 MHz	450-530MHz	764-870 MHz
Number of Channels:	20	20	20

Specifications

Transmitter:	**VHF**	**UHF**	**700/800 MHz**
Frequency Range:	136-174 MHz	450-530 MHz	764-776 + 850-870 MHz
Rf power out:	500mW - 2W	500mW - 2W	500mW - 1W
Spurious emissions:	-70dBc	-70 dBc	-70dBc
Freq stability -30°~+60°C:	1.5 PPM	1.5 PPM	1.5 PPM
Hum and Noise:	-43/-38dB (25/12.5kHz)	-43/-38dB (25/12.5kHz)	-40/-33dB (25/12.5kHz)
Audio response (300-3kHz):	Flat or +6dB/octave	Flat or +6dB/octave	Flat or +6dB/octave
Audio distortion:	<3% @ 60% deviation	<3% @ 60% deviation	<3% @ 60% deviation
Local mic sensitivity:	300mV-5VPP	300mV-5VPP	300mV-5VPP
FCC Type Acceptance:	LRUSVR-P250V	LRUSVR-P250U	LRUSVR-P250M
Industry Canada Approval:	2390A-SVRP250V	2390A-SVRP250U	2390A-SVRP250M

Receiver:			
Frequency Range:	136-174 MHz	450-530 MHz	764-776 + 850-870 MHz
RF sensitivity Analog:	.28μV	.28μV	.28μV
Digital (5% BER):	.20μV	.20μV	.20μV
Squelch sensitivity:	.2μV to 2μV adjustable	.2μV to 2μV adjustable	.2μV to 2μV adjustable
Selectivity:	75/65dB (30/15 kHz)	75/65dB (25/12.5 kHz)	75/65dB (25/12.5 kHz)
Spurious/image rejection:	75db	75db	75db
IMD response:	75db	75db	75db
Frequency stability:	1.5 PPM	1.5 PPM	1.5 PPM
Audio response (300-3kHz):	Flat or -6db/octave	Flat or -6db/octave	Flat or -6db/octave
Audio output:	0-5VPP AC coupled	0-5VPP AC coupled	0-5VPP AC coupled
Local Rx Audio:	400 mW 8 Ohms	400 mW 8 Ohms	400 mW 8 Ohms

Power Requirements:			
DC Supply	13.6 VDC	13.6VDC	13.6VDC
Standby	170 mA	170mA	170mA
Receive	250 mA	250mA	250mA
Transmit	1.5 A @ 2W	1.75A @ 2W	2A @ 1W

Physical:

Dimensions:	5.75"W x 8"L x 2.25"H
Weight:	36 oz.
Case:	One piece extruded aluminium

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Functional Description

Generally, vehicular repeaters are used as mobile extenders in cross-band operation: the link is VHF/UHF/800 MHz simplex and the mobile is Lo-band, VHF, UHF or trunking. In-band operation is possible, but care must be taken to prevent interference between the mobile's higher power transmitter and the repeater receiver. Proper frequency selection and antenna placement are important even in cross-band operation, but especially for inband use. Low power pre-selector cavities may be placed in line with the repeater antenna cable since it is simplex and low power.

☞ *Important Note Analog Operation*

The SVR-P250 is designed to operate on simplex frequencies; part of the multi-vehicle format dictates that all of the SVR-P250s must be able to monitor all link traffic on site and be able to determine if a handheld is transmitting, or if other repeaters are transmitting. In Analog mode, the handhelds must transmit CTCSS, but should be carrier squelch receive. *The handhelds should not use CTCSS decode if the repeater is utilizing the multi-vehicle format*, as this will interfere with the priority sampling which is essential for multi-vehicle operation. Also, the handhelds would have to have different encode and decode tones in order for the repeater to be able to tell the difference between handhelds and other repeaters, so the handhelds would not be able to hear each other. *The repeaters should not transmit CTCSS unless used only in a single vehicle environment*.

☞ *Important Note P25 Operation*

In P25 mode, the SVR-P250 must also operate on simplex frequenices. The handhelds must transmit a different NAC code than the SVR-P250 transmit NAC code, and the *Handheld Receive NAC code must be F7Eh (all call)* in order to hear the other handhelds and the SVR-P250's which transmit different NAC codes for different functions.

When the user leaves the vehicle, they activate the SVR-P250 via their mobile radio front panel or a separate switch. When the mobile radio is receiving carrier and proper tone, the SVR-P250 will begin transmitting on the handheld's receive frequency. The user is able to hear and respond to all radio traffic, including other handhelds at the site. In analog mode the SVR-P250 can be programmed to give the handhelds priority in a conversation by periodically sampling for handheld activity (carrier and proper tone) during base-to-portable transmissions. During sampling, if the SVR-P250 detects a handheld transmission, it will cease transmissions, key the mobile radio and repeat portable-to-base. This allows the handheld to respond during repeater hang time or during full duplex interconnect calls. Priority sampling can be enabled/disabled through PC programming and the interval can be programmed between .25 seconds and 2.5 seconds in .25 second increments. *Priority sampling is not available in P25 mode.*

The SVR-P250 has a programmable time out timer for base-to-portable transmissions. If the mobile COR is active for more than the programmed time (and the SVR-P250 is the priority unit) it will send a double blip and cease transmission until the mobile COR is inactive. The time-out is in affect regardless of whether the SVR-P250 is programmed for priority sampling or not.

Multi-vehicle operation

The SVR-P250 has 2 different multi-vehicle priority formats; both are compatible with the existing SVR-200 and Motorola PAC/RT formats. The new SVR-P250 with ESP™ logic has enhanced features that ensures a priority vehicle is selected and ready to transmit during the idle time rather than during voice transmissions. The 2 formats are explained below:

SVR-200 Legacy format

When the SVR-P250 is first activated, it will transmit a short "lock tone" that alerts the user that the system is functioning. It will then assume the priority status and be ready to repeat any base-to-portable or portable-to-base transmissions. If another unit arrives on scene and is activated, it too will transmit the "lock tone"; when

the first SVR-P250 detects the lock tone from the second unit, it will increment a "priority counter" and will no longer repeat any transmissions. The recently arrived unit will be the priority repeater, and the first unit will be 1 count away from priority. This process will continue for each unit that arrives at the site, creating a priority hierarchy for up to 256 vehicles, each with a unique count and only one unit at priority status. The SVR-P250 will not transmit its lock tone if the radio channel is busy when first enabled. It will wait in non-priority status until all transmissions cease, then send its lock tone and become the priority unit.

Even though the other SVR-P250s are not at priority status, they will continue to monitor the channel for activity. If the priority unit were to leave the scene or become disabled, the other units will detect the condition to repeat and determine that there is no priority unit repeating the transmission. They will then begin to decrement their priority counters until one of them reaches the priority status and begins repeating the transmission. Since the SVR-P250s are all at different counts, only one will reach priority status and begin transmitting. The other units will sense the new priority repeater and cease counting down, preserving the priority hierarchy.

If another unit were to arrive from a different scene and it is still the active priority, there will be two active repeaters on the air when a condition to repeat exists. When one of the SVR-P250s unkeys to check for handheld activity (analog mode only), it will detect the presence of the other active SVR-P250 and increment its priority counter and cease transmission. This is the self clearing mode to prevent radio collisions.

ESP™ Priority

The SVR-P250 Enhanced Sensor Priority works similar to the SVR-200 and PAC/RT formats and is completely backward compatible with those systems. The SVR-P250 determines if there is a priority (and re-establishes the priority if missing) during idle time between conversations rather than at the critical start of a conversation. When a condition to repeat exists, the SVR-P250 is always ready.

The priority SVR-P250 will transmit a short tone burst every 10 seconds. This serves 2 purposes: It informs the handheld operator that they are still within range of the vehicle and it alerts the non-priority units that a priority vehicle is still on scene. As long as the non-priority units hear this "beacon" every 10 seconds, they preserve their counts and maintain the priority hierarchy. If the priority vehicle leaves the scene, after 10 seconds, the non-priority vehicles will not hear the "beacon" and begin counting down. When one of the counts=0, that SVR-P250 will send lock tone for 800 mS, assume priority and begin sending the "beacon" tone every 10 seconds as before. Since the "beacon" tone must be heard every 10 seconds, it does not have busy carrier lock out and will send the tone if 2 handhelds are communicating directly or in the presence of co-channel interference.

Local Mic Repeat

If the handheld operator is out of the vehicle and their partner still in the vehicle were to key the mobile radio using the local mic, the SVR-P250 will detect the local PTT and repeat the transmission to the other handhelds so that both sides of the conversation will be heard by everyone on the link. The local mic repeat function can be enabled/disabled via the PC software.

The SVR-P250 also has a local receive audio speaker jack that enables the person in the vehicle to monitor portable-to-base transmissions that are being repeated through the mobile.

If the users wish to communicate portable-to-portable without accessing the mobile repeater, they may transmit on the same frequency without tone/code (or a different tone/code); the SVR-P250 only responds to carrier and proper tone/code from the handhelds.

Trunking operation

When the SVR-P250 is connected to a trunking mobile and the handheld operator wishes to access the system, they key their handheld briefly then release. The SVR-P250 will attempt to acquire a voice channel on the trunking system by keying the mobile for 800mS and monitoring the on-air detect line from the mobile. If it does not see the radio transmit at all (system is busy), it will send a low tone to the hand held operator to alert them that the system is busy. The SVR-P250 will automatically retry every 5 seconds and send busy tone to the handheld with each unsuccessful attempt to indicate progress of the call attempt. If unsuccessful after 30 seconds, the SVR-250 will transmit intercept tone to alert the handheld operator that the call attempt failed.

When the SVR-P250 detects that the mobile is transmitting, it will continue to monitor the on-air line until the transmitter remains keyed for at least 250mS to ensure that the radio is not handshaking or retrying. After successful acquisition of a voice channel, it will continue to hold the mobile PTT active for 2 seconds and transmit a go-ahead blip to the handheld operator. The user then keys their handheld to speak on the voice channel. If the user does not key up within the 2 second period, the SVR-P250 will unkey the mobile and send intercept tone as before.

If the user keys their handheld only once, or they key the first time for more than 1 second, the SVR-P250 will cancel the call attempt and send intercept tone to the handheld operator. All of the queuing and error tones will only be sent if the handheld is not transmitting to ensure that the user hears the proper tones.

The SVR-P250 can also be programmed to work in a similar way for use with the MSV mobile satellite phones, except the time delays are extended to work properly within the network.

Emergency Operation (P25 mode Only)

The SVR-P250 can be programmed for Emergency operation on a per channel basis. If enabled, the SVR-P250 can detect an Emergency NAC code as well as portable-to-base NAC code. The Emergency NAC code is used to indicate an Emergency condition from the portable and will assert an output pin when decoded. There are 2 different Emergency formats: Emg output only or Emg output with voice repeat. Emg output only will assert pin 10 on the main cable for as long as the Emergency NAC code is being received; it is used as a momentary output to the mobile to initiate an Emergency sequence. This is the most common configuration with Motorola or MA/Com radios. Emg output with voice repeat will assert pin 10 as before, but will also key the mobile and repeat portable-to-base as long as the Emergency NAC code is being received. This format is used with the Tait mobiles. Additionally, there is a solder jumper on the main logic PCB that determines if the Emg output signal pulls to ground (NO) or breaks ground (NC).

Wide Band / Narrow Band Channels (Analog Mode Only)

The SVR-P250 can be programmed for Wide/Narrow band operation on a per channel basis. Wide band operation is 25kHz for UHF and 800 MHz, 30kHz for VHF. Narrow band is 12.5kHz for UHF and 800 MHz, 15kHz for VHF. In addition to changing the receiver bandwidth and transmitter modulation characteristics, the audio levels into and out of the SVR-P250 are automatically adjusted so the levels at the mobile will be correct with either bandwidth selected.

Courtesy Beep

If enabled, the SVR-P250 will send a short beep to the handheld user at the end of each portable-to-base transmission to confirm that the user is still within range.

Power Up Channel

The SVR-P250 can be programmed to revert to the last channel used when powered down or a pre-programmed "Home" Channel.

LEDs

The SVR-P250 has a 2 digit channel display as well as eight status LEDs:

CPU:	Flashes at a 1 Hz rate to indicate proper operation of the microprocessor.
PRI:	When on, indicates that the unit is at priority count zero and will repeat all transmissions.
RCOR:	Repeater Carrier detect.
RTONE:	Repeater sub-audible decode; when on, indicates a condition to repeat portable-to-base.
RTX:	Repeater transmit indicator.
MCOR:	Mobile unmute detector indicating a condition to repeat base-to-portable.
MTX:	Mobile transmit indicator.
OPT:	Emergency Tone/Code Decode.

☞ If the decimal point is illuminated in the 2 digit channel display it indicates a P25 channel is selected.
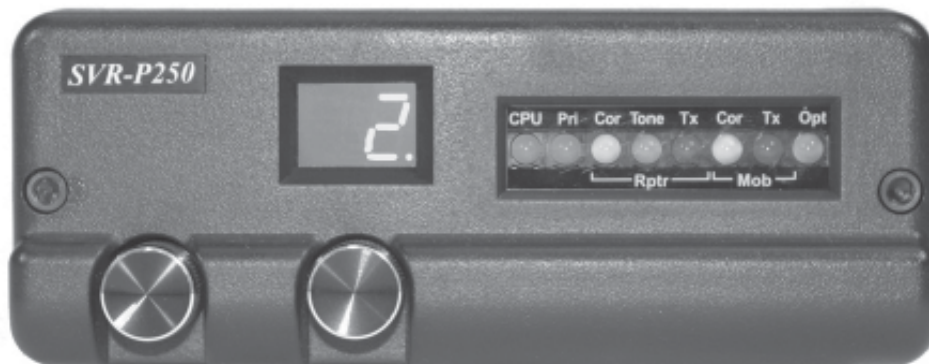
Installation

Before installing the SVR-P250, ensure that the mobile radio is properly aligned per the manufacturer's tuning instructions. Additionally, ensure that the SVR-P250 jumpers are properly configured for use with the particular mobile radio that it will be connected to:

J1   Controls the maximum drive level of the transmit audio output to the mobile radio. If J1 is installed, output amp U1A will have an adjustment range of 0-100 mVPP. If J1 is removed, U1A can be adjusted between 0-5VPP.

J2   Controls the output impedance of the transmit audio line to the mobile radio. If connected to a low impedance point in the mobile, installing JP2 sets the output impedance to 600 ohms. If JP2 is open, the output impedance is 2.2Kohms. Install the jumper for radios that require a lot of modulation drive or that have low impedance microphone circuits. Remove the jumper if the SVR-P250 installation decreases local microphone audio at the mobile.

J4   Used to internally tie the local mic input of the SVR-P250 to the transmit audio output line which is usually connected to the mic hi line in the mobile.

J5   Used to internally tie the on-air detect input of the SVR-P250 to the PTT output. Do so *only on conventional radios*; trunking radios *must have the on-air detect line connected to a line indicating that the radio is transmitting*.

J6   Changes the maximum gain of the local mic input amp from unity (Out) to 10x (In).

J7   Changes the maximum gain of the receive audio line input from unity (Out) to 7x (In).

J8   Adds a pull up (+ position) or pull down (- position) resistor to the remote enable line (blue).

J9   Adds a pull up resistor (10K to 5VDC) to mobile COR line (violet)

J10 Connects the front panel on-off control to the remote enable line to enable the SVR-P250 from the front panel.

J11 Adds (Out) or removes (In) a 100KOhm resistor in series with the Tx audio line for applications with low level mic audio and alternator whine problems (see Service Bulletin 113).

J13 Selects the Emergency output polarity: NO=pull to ground during Emg NC=break ground during Emg.

Make the connections between the mobile radio and the SVR-P250 cable as follows:

Pin 1:   ***Ground***. Connect to the radio's chassis or ground plane.
Black/Shield

Pin 2:   ***Mobile transmit audio***. Connect to the mobile transmit audio path or tone input. If connected to the
White   mobile mic input, ensure that the SVR-P250 is programmed for flat (common data). If connected after pre-emphasis, ensure that the SVR-P250 transmit audio path is programmed for pre-emphasis. Pin 2 is AC coupled and has an output impedance of 600 or 2.2Kohms (determined by J2). RV3 sets the transmit audio output level and J1 sets the adjustment range between 0-5VPP (J1 open) or 0-100mVPP (J1 shorted).

Pin 3:   ***Remote enable/disable***. Connect to the radio's auxiliary output or a separate switch to remotely
Blue   enable or disable the repeater. If this line goes high to activate the repeater, ensure that JP1 is set to the "+" position. If this line goes to ground, set JP1 to the "-" position. J8 has two positions to add a pull up (+) or pull down (-) resistor to this line if used with an open collector or dry contact output. J10 connects this line to the front panel on/off control.

Pin 4:
Green

Mobile PTT output. Connect to mic PTT on the mobile radio, or a line that goes active low to transmit. Pin 4 is an open drain output rated at 2A at 15VDC.

Pin 5:
Red

12 VDC input. Connect to the radios 12V switched supply or a point capable of supplying at least 2A of current.

Pin 6:
Yellow

Mobile receive audio. Connect this line to the mobile receive audio path before the volume control. If pin 6 is connected to the mobile discriminator, ensure that the SVR-P250 receive path is programmed for de-emphasis (common data). If connected after de-emphasis, program the receive path for flat. Pin 6 is AC coupled and high impedance (>15K ohm). RV5 sets the receive audio level sensitivity; this input should be between 30mVPP and 5VPP. J7 sets the gain of the receive input amp. If open, the input has a maximum gain of one; if installed, the input has a maximum gain of 7.

Pin 7:
Violet

Mobile COR detect. This line is used to indicate when the SVR-P250 should repeat the transmission to the handheld. Connect to a logic point in the radio that indicates proper tone and carrier have been detected or the audio unmute line. If this line goes more positive during an unmute condition, program the mobile COR line as active high (common data). If the line goes more negative during an unmute condition, program the mobile COR line as active low. The input from pin 7 is high impedance and does not have to go rail to rail. The SVR-P250 uses a voltage comparator as a COR threshold detector and is factory set at 1.6VDC. The COR input must go at least 0.5VDC on either side of this threshold.

Pin 8:
Brown

Local mic audio. If programmed for local mic repeat, the SVR-P250 will go into transmit mode and repeat the audio from this line whenever the mobile radio is keyed by the local mic. Connect this line to the mobile transmitter audio path before limiting or filtering. This input is AC coupled and high impedance (>5.6Kohms). The input level at this pin should be 300mV to 5VPP. RV2 sets the local mic sensitivity. If the mic high line has sufficient drive for this input, install J4 and leave pin 8 unconnected. J6 sets the gain of the local mic input amp. If open, the maximum gain is one; if installed, the maximum gain is 10.

Pin 9:
Gray

On-Air detect.

Trunking: Connect to a point in the radio that indicates the mobile transmitter is actually on the air. This is not the same as mic PTT. If pin 9 goes positive during transmit, program the on-air detect line for active high (common data). If pin 9 goes to ground during transmit, program the on air detect line for active low.

Conventional: Used for local mic repeat indication from the mobile. Connect pin 9 to pin 4 of the SVR-P250 and program the on-air detect line for active low. Solder jumper J5 will connect pin 9 to pin 4 (PTT output) and can be used on *conventional systems only*. **Do not install J5 for trunking operation**.

Pin 10:
Black/White

Emergency Output. Connect to the Emergency input on the mobile radio. On Motorola radios, the Emergency input opens from ground on activation and jumper J13 should be in the "NC" position. On all other radios, the Emergency input pulls to ground on activation and jumper J13 should be in the "NO" position.

 Install the SVR-P250 in the vehicle using the supplied mounting bracket and hardware. Install the unit where it will be easily visible by the driver and will not interfere with the drivers vision or constitute a hazard during a vehicle collision. The SVR-P250 mounts in the bracket using the four 8-32 x ¼" machine screws. Do not use longer screws to mount the SVR-P250 to the bracket or circuit damage may result.

Alignment

Before aligning the SVR-P250, ensure that the mobile radio is aligned per the manufacturer's service procedure; Ensure that the SVR-P250 is properly programmed and the jumpers are set per the previous section.

In order to properly align the SVR-P250, you will need two service monitors and the mobile radio that the repeater will be installed with.

Dis-assemble the repeater by removing the two cap screws on the front panel; disconnect the front panel from the main chassis by removing the 2 connectors. Remove the two cap screws from the rear panel and slide the main circuit board out of the housing with the rear panel attached. Re-connect the front panel to the main PCB. Connect one service monitor to the SVR-P250 TNC jack and the other to the mobile antenna jack. Connect the cable from the mobile radio to the SVR-P250 (See figure 4 on page 11). Turn on the mobile and activate the SVR-P250.

Adjust the repeater squelch control (RV9) so that the repeater COR led is off. Adjust the mobile so that the audio is squelched.

SVR-P250 Transmitter

1. *Maximum deviation/lock tone deviation*: Press S3 (Test) and adjust RV7 (Lock Tone) for maximum. Adjust RV8 (repeater deviation) until the wave form just enters clipping; adjust RV7 for total 60% deviation . Release S3.

2. *Mobile COR*: Measure the voltage at TP2 (R11) on the SVR-P250 main PCB and record. Ensure the mobile COR LED on the front panel is off. Set the mobile service monitor for the mobile receive frequency, 1mV RF output and CTCSS modulation of 15% deviation. Measure the voltage again at TP2 and record. Ensure the mobile COR LED on the front panel is on. The 2 voltages at TP2 must be at greater than 2.1VDC and less than 1.1 VDC.

3. *RX audio sensitivity/CTCSS deviation*: Set the service monitor connected to the mobile for the mobile receive frequency and 1mV RF output. Modulate the signal generator with a 1kHz tone at 60% deviation and CTCSS tone at 15% deviation. Ensure that the SVR-P250 mobile COR and repeater PTT LED's are on. Adjust RV5 on the SVR-P250 main board for 75% deviation if CTCSS/DCS transmit is programmed, adjust for 60% deviation if carrier squelch transmit, as read on the service monitor connected to the SVR-P250. Turn the RF output from the mobile service monitor off and ensure that the SVR-P250 mobile COR and repeater PTT LEDs are off.

4. *Local mic repeat*: If the SVR-P250 is programmed for local mic repeat, key the mobile local mic and inject an audio signal into the local mic to produce 60% deviation on the service monitor connected to the mobile. Confirm that the SVR-P250 repeater PTT LED is on; adjust RV6 for 60% deviation as read on the service monitor connected to the SVR-P250. Unkey the mobile radio.
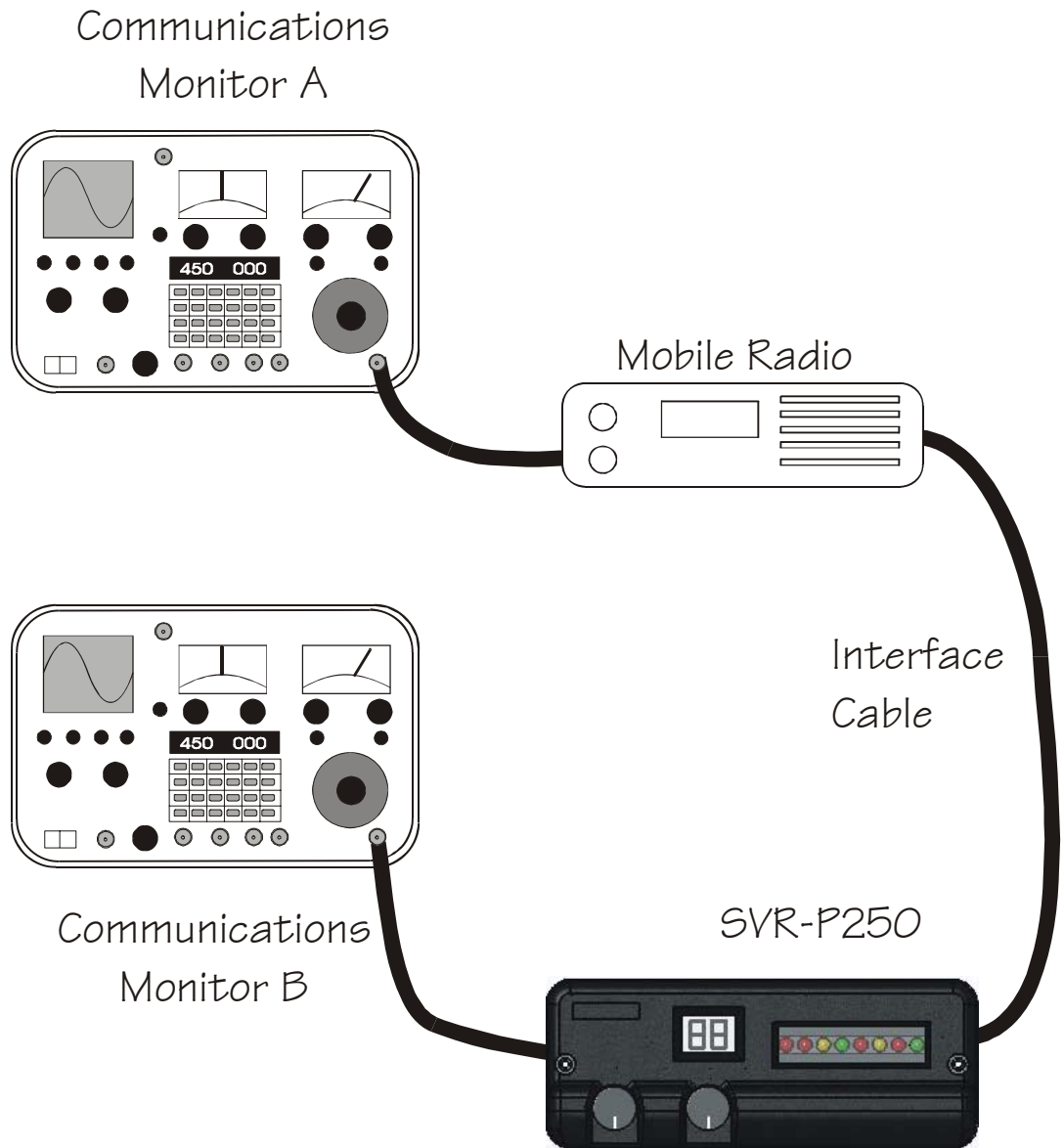
Communications
Monitor A

Mobile Radio

Interface
Cable

Communications
Monitor B

SVR-P250

Figure 4

Programming

Using the Software

The SVRP250CPS personalization software is used to program the SVR-P250 for all of the operating parameters and options. The software is compatible with Windows 2000 and later operating systems The software is menu driven and on-line help is available at any time by clicking the left mouse button on the HELP icon on the right side of the tool bar.

Important Note:

Before attempting to program the SVR-P250 start the software and ensure the FY-4 programming cable is plugged into the correct serial port. The com port may be selected under the "Transfer" menu. Plug the FY-4 programming cable into P7 on the front of the SVR-P250; the channel indicator should show "PC".
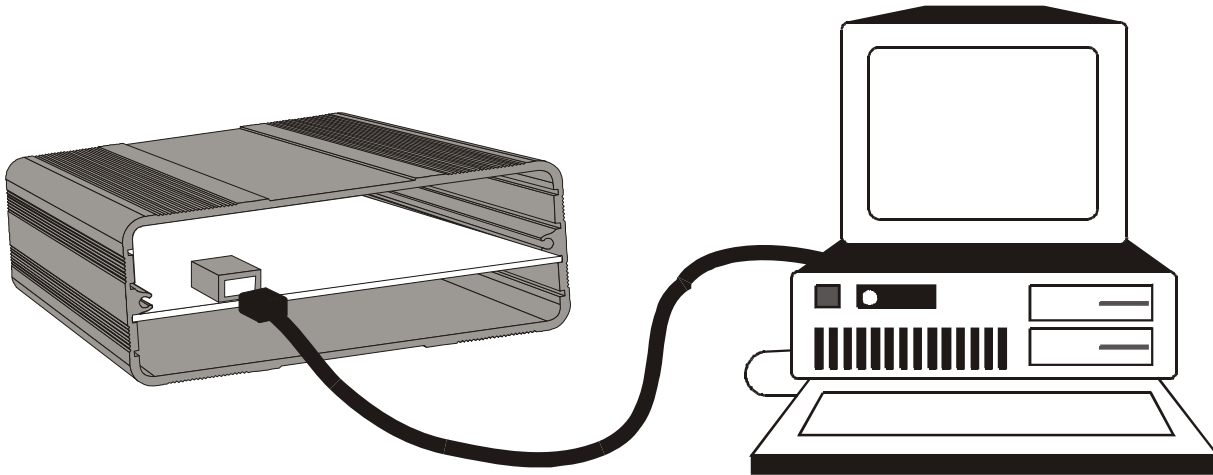
Menu selections

File

Open: Allows you to load a previously saved file from disk. Enter the file name or select from the Windows Dialog box. Only files with the .P25 extension can be loaded.

Save: Allows you to save the current configuration to disk. Enter the file name to save as or select a previous file from the Windows Dialog box to overwrite. The .P25 extension is automatically added to the file name. The program will prompt you before overwriting an existing file.

Print: Sends the current configuration to the selected printer. Make sure the printer is on line and paper is loaded before executing this command.

Exit: You will be asked to confirm before exiting the program. The software will also prompt you if the configuration has changed since program start up and data has not been saved to disk.

Common Data

File Name: 15 character name for this profile stored in E²PROM.

Number of Channels: Select 1-20 channels

Radio Unit ID: Used for P25 channels only, each SVR-P250 should have a unique Radio ID. Range is 0000001-9999999.

Band: Select the frequency band to match your SVR-P250. Changing bands resets all data to default values (confirmation req.)

COR Polarity: Determines if the COR signal from the mobile is active high or low.

On-Air Polarity: Determines if the Tx indication from the mobile is active high or low.

Radio Type: Select either Conventional, Trunking or MSV Satellite. If Trunking or MSV is selected, the SVR-P250 will go through the voice channel acquisition procedure during portable-to-base repeat mode.

Tx Audio: If the mobile Tx audio from the SVR-P250 to the mobile is connected to the mic input, select Flat response. If connected after pre-emphasis, select Pre-Emp.

Rx Audio: If the Rx audio from the mobile to the SVR-P250 is connected to the discriminator, select De-Emp. If connected after de-emphasis, select Flat response.

Power Up Channel: Select either Last Channel or Home Channel.

Local Mic Repeat: Enables or disables the local mic repeat function; if enabled, ensure the on-air polarity is set correctly and the Grey wire or J5 is configured correctly (see pages 8 & 9).

Priority Sampling: If the SVR-P250 is used in a multi-vehicle environment, priority sampling must be enabled for proper operation. Priority sampling is in effect for ***Analog Channels Only***.

Sampling Rate: If Priority sampling is enabled, this selects the sampling interval. Range is 0.25 seconds to 2.5 seconds in .25 sec increments. The higher this setting, the longer the handheld operator must wait before speaking after pressing PTT during base-to-portable sampling.

Time Out Timer: This is the maximum duration of a single base to portable transmission that will be allowed.

Emergency Format: Emg Out Only will assert pin 10 of the main connector for as long as secondary tone is decoded. Emg Out with voice will assert pin 10 but also repeat portable-to-base mode.

Priority Format: The SVR-P250 has an enhanced signalling format to determine if the priority vehicle has left the scene during idle time. Select SVR-200 legacy to turn off this feature. Both formats are fully SVR-200 compatible.

Channel Data

☞ *Note:* The number of channels available is determined by the setting in Common Data.

Tx and Rx Frequency: Enter the Transmit and Receive frequencies for each channel. The frequency must be in the range for the band selected under Common Data and will be rounded to the nearest channel step.

Squelch Type: Select either CTCSS or DCS (NAC for P25). These can be selected on a per channel basis, but cannot be mixed within a channel.

Rx Code: The primary tone/code, when received will put the SVR-P250 into portable-to-base repeat mode.

Emg Code: The secondary tone/code, when received will initiate an Emergency sequence.

Tx Code: In Analog mode, the SVR-P250 does not normally transmit sub-audible signalling. In P25 mode, the SVR-P250 must transmit a NAC code. If enabled, the Tx code should not be the same as the Rx or Emg Code.

Lock Tone: This is the tone burst (Analog Mode) or NAC code (P25 mode) first transmitted when the SVR-P250 is enabled and sent every 10 seconds if ESP™ priority mode is selected. The tone must be the same in all vehicular repeaters in the system.

Encrypt Key: In P25 mode this specifies which stored Encryption key is used. Range 1-16.

P25: If selected the channel will be P25 phase 1 CAI compliant. If not selected, the channel is analog.

Encrypton: If selected the channel will be encrypted (P25 mode Only).

PL Encode: If selected, sub-audible transmit is enabled for that channel (Analog Mode Only).

EMG: If selected, the Emergency function is enabled for that channel (P25 Mode Only).

NB: If selected, the channel BW is 12.5/15 kHz. If not selected the channel BW is 25/30kHz (Analog Mode Only).

Courtesy Beep: If selected, a short beep will be sent to the handheld user at the end of each portable-to-base transmission to confirm they are still within range.

Tx Pwr: The transmitter power can be set on a per channel basis. Select 0.5W, 1W or 2W.

SVR-P250 Channel Data

Ch #	Rx Frequency	Tx Frequency	Squelch Type	Rx Code	Emg Code	Tx Code	Lock Tone	Encrypt Key	P25	Encryption	PL Enc	EMG	NB	Courtesy Beep	Tx Pwr
1	160.61000	160.61000	CTCSS	67.0	71.9	69.3	682.5		☐	☐	☐	☐	☐	☐	0.5W
2	160.61000	160.61000	NAC	293	505	296	682	1	☑	☐	☐	☐	☐	☐	1.0W
3	160.61000	160.61000	DCS	023	026	025	682.5		☐	☐	☑	☐	☐	☐	2.0W
4	160.61000	160.61000	CTCSS	67.0	71.9	69.3	682.5		☐	☐	☐	☐	☐	☐	1.0W
5	160.61000	160.61000	NAC	293	505	296	682	1	☑	☑	☐	☑	☐	☐	0.5W

OK

Transfer

Send: Downloads the current configuration to the SVR-P250. The program will prompt you to make the FY-4 connection before downloading. Download takes approx 2 seconds.

Receive: Uploads the current configuration from the SVR-P250. The program will prompt you to make the FY-4 connection before uploading. Download takes approx 1 second.

Com Port: Selects the serial port to use for uploading and downloading between the PC and the SVR-P250. Comm ports 1-8 are supported.

Help

On-line context sensitive help is available for all entry fields by selecting the field on a form and clicking on the Help Icon on the tool bar.

Additional help menu items:

About: Gives you version information about the software and contact information for Pyramid Communications.

Remote Tech Support: Remote Tech Support is a utility that allows the Customer Service Technicians at Pyramid Communications to remotely access your computer via the internet in order to troubleshoot any problems you might be having with the software or to assist you in operation of the program. Please call Pyramid Communications during normal business hours prior to selecting remote support. The Technician will give you a password to enter and the remote connection screen will appear:
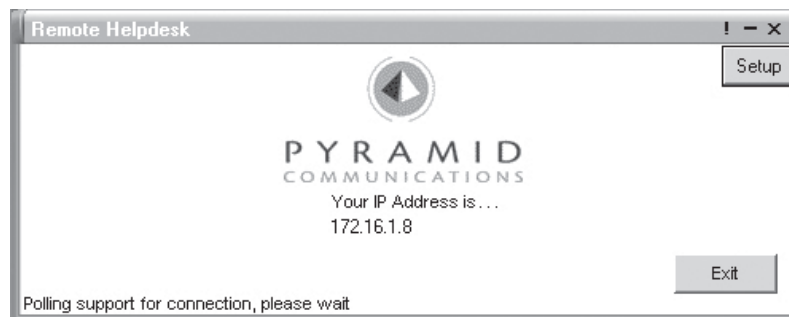
Once the internet connection is made, the Technician will be able to see your computer screen at their location and assist you with the program. The remote connection is only active when this item is selected and can only be enabled by the local PC user.

Flash Programming

The SVR-P250 uses an Atmel 89C51RB2 microprocessor which contains the operating system. The chip can be reprogrammed in-circuit using Atmel's FLIP software and a PC running Windows 2000 or XP. The FLIP software can be downloaded from Pyramid's web site:

   www.pyramidcomm.com/support

 Warning- Do not attempt to re-flash the SVR-P250 µP unless you are familiar with operation of the SVR-P250 and reasonably competent using Windows software. If the µP is not programmed correctly, it can render the SVR-P250 inoperable.

Install the software onto your PC; the download will include several config (.cfg) and hex data (.hex) files. Ensure these are copied into the *\Program Files\Atmel* directory on your computer.   Perform the flash programming in the *EXACT* steps as outlined below:

Prior to starting the FLIP software, disassemble the SVR-P250 by removing the 2 cap screws on the front panel. Disconnect the front panel from the main PCB by unplugging the 2 cables. Remove the 2 cap screws from the rear panel and carefully slide the entire assembly out of the extrusion. Reconnect the front panel to the main PCB.

Connect the radio cable to the SVR-P250 and apply power. Connect the FY-4 DB9 connector to your computer and the modular connector to P7 at the front of the SVR-P250 main PCB; the channel indicator should show "PC". Start the FLIP software. Install a shorting jumper onto J12.

Flash Program U3:

1. Press the Reset switch S2. In the FLIP software, press F4 (load config) and locate the Atmel directory on your computer; select and load the ***SVRP250.cfg*** file. The FLIP software will automatically establish communications with the IC in the SVR-P250. If it does not, wait until it times out, click OK to close the error message, check the com port, cable etc., and start at the beginning of step **1**. When FLIP is successful, it will populate the device data fields on the right side of the PC screen. ***Do not change any of these settings!***

2. On the left side of the screen, confirm the *Erase, Blank Check, Program* and *Verify* boxes are checked. In the center of the screen, confirm the ***SVR-P250.HEX*** file is loaded. Click the **Run** button to flash U3 with the hex file. Each of the checked boxes will turn green in series as things progress. If any of them fail, verify all of the connections as above and start over at step **1**.

Encryption Key Loading

Key loading is accomplished by using our standard FY-4 programming cable, a Motorola KVL-3000 *Plus* key loading device and the Pyramid Communications KLA-250 key loader adapter as shown in figure 1.

☞ The SVR-P250 cannot be loaded with encryption keys unless ordered with AES / DES capability. Please contact Pyramid Communications technical support for more information.

Entering Key Load Mode:

Remove the SVR-P250 from its chassis and connect the control head to the unit so the channel display is visible. Do not connect the FY-4 cable at this time.

Ensure Jumper J7 on the SVR-P250 controller PCB is set to the "RF" position. Apply power to the SVR-P250 while holding the S3 (TEST) switch down. The display of the SVR-P250 will indicate ". ." during the initialization of key load mode.

Loading Keys:

The SVR-P250 display will indicate "LL" when it is ready to accept a key load device. Connect the FY-4 to the SVR-P250 P7 programming jack within 15 seconds of seeing the "LL" appear.

You can view and write keys as long as the display shows "LL". If "Er" is displayed, a time out or communications error has occurred with the key load device. Start the process over from power up.

☞ The SVR-P250 must use encryption key CKR numbers between 1-16. The CKR(s) is referenced in the SVR-P250 CPS programming.
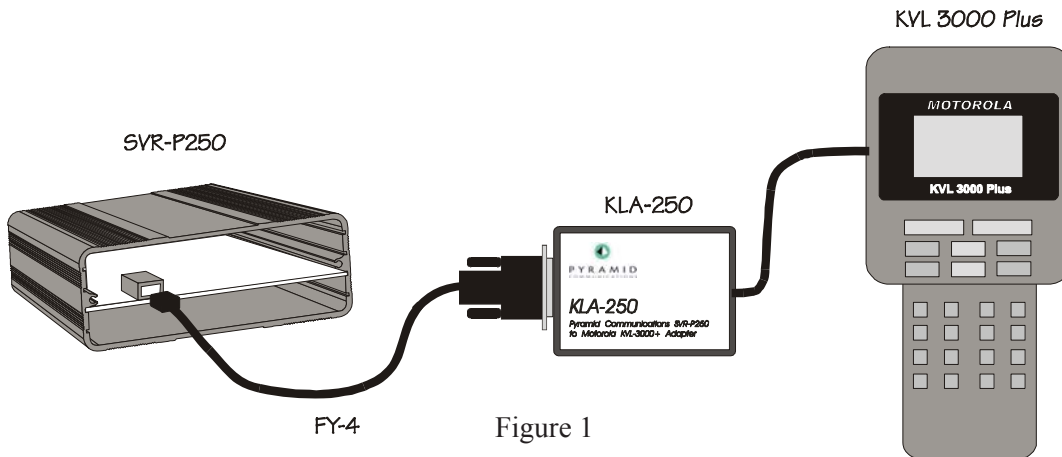

Figure 1

☞ Return J7 to the "U3" position for normal programming operation.

Parts List

Reference	Description	Part #
C1,C2,C43	6.8µFd 16V tantalum chip capacitor	1610-25-6685
C3-C5,C10,C15,C16,C18,C25,C26,C28,C29, C31-34,C37-C40	.1µFd chip capacitor	1010-02-5104
C6,C20-C22	100µFd elctrolytic cap	1400-08-7107
C7,C36,C42	2.2µFd tantalum chip capacitor	1610-04-6225
C8,C9	5pFd chip capacitor	1010-02-5509
C11-C14,C41,C42	2.2µFd tantalum chip capacitor	1610-05-6474
C17	22µFd tantalum chip capacitor	1610-05-6226
C24	2200pFd chip capacitor	1010-02-5222
C23,C35	1000pFd chip capacitor	1010-02-5102
C27,C44	.01µFd chip capacitor	1010-02-5103
C30	100pFd chip capacitor	1010-02-5101
C41	3300pFd chip capacitor	1010-02-5332
D1-D4	BAV99 dual diode SOT23	3110-01-0099
F1	2A SMT Pica fuse	2610-04-0020
JP1,J17	0.1" 3 position vertical header	7300-53-0103
JP12	0.1" 2 position vertical header	7300-53-0102
P1	DB-15 M right angle PCB	7400-00-0012
P2	3.5mm RA speaker jack	7401-02-0051
P3	5 circuit RA header	7301-04-0105
P4	2 x 9 vertical header 0.1"	7300-15-0209
P5	6 circuit RA header	7301-04-0106
P7	RJ11 programming jack	7401-04-0011
P8	MCX RF connector	7400-00-0005
P9	TNC RA bulkhead connector	7401-02-0007
Q1,Q2,Q5,Q10	2N4401 NPN transistor SOT23	3010-01-4401
Q3	IRF-5305 P Ch MOSFET TO251	3300-26-5305
Q8,Q13	N Ch MOSFET TSOP6	3310-01-1902
Q4,Q12	Dual NPN transistor TSOP6	3010-03-4210
Q11	P Ch JFET SOT23	3310-01-0175
RV8	200K 3mm SMT pot	2030-08-8204
RV3,RV5,RV6,RV7	100K 3mm SMT pot	2030-08-8104
RV9	10K 3mm SMT pot	2030-08-8103
R1-R3,R5,R7-R9,R42-R44,R47,R56,R65,R68, R69,R71,R72,R77	22K chip resistor	2010-02-5223
R4,R15,R16,R29,R30-32,R63,R64	2.2K chip resistor	2010-02-5222
R6,R14,R19	820 Ohm chip resistor	2010-02-5821
R10	5.6K chip resistor	2010-02-5562
R11,R13,R17,R23,R25,R26,R35,R38,R39, R41,R45,R46,R51-R53,R55,R57,R12,R27	100K chip resistor 56K chip resistor	2010-02-5104 2010-02-5563
R18,R22,R75,R76,R79,R80	10K chip resistor	2010-02-5103
R20	10 Ohm chip resistor	2010-02-5100
R21	8.2 Ohm 1W resistor	2000-10-5829
R24,R28,R40,R50,R74	1.0M chip resistor	2010-02-5105
R33	470 Ohm chip resistor	2010-02-5471
R34	1K chip resistor	2010-02-5102

R36,R37	470K chip resistor	2010-02-5474
R48	24K chip resistor	2010-02-5243
R49	33K chip resistor	2010-02-5333
R54	4.7K chip resistor	2010-02-5472
R58,R59,R70,R73	15K chip resistor	2010-02-5153
R60	220K chip resistor	2010-02-5224
R61,R62	47K chip resistor	2010-02-5473
R66,R67	330 Ohm chip resistor	2010-02-5331
R78	620 Ohm 1206 chip resistor	2010-04-5621
S2,S3	3x6mm Tact Switch	7010-06-0101
TP1, Rx Ant, Tx Ant	1 pin header	7300-13-0101
U1	TLC2272 dual op-amp	3410-01-2272
U2	LM386 audio amp	3410-01-0386
U3,U4	AT89C51RB2 Microprocessor	3611-02-8951
U5	24C128 Serial E²PROM	3610-01-4128
U6	74HC595 Shift Register	3510-01-4595
U7	LM7805CV 1.5A reg D2PAK	3410-27-7805
U8	LM7809CV 1.5A reg D2PAK	3410-27-7809
U9	LM7833CV 1.5A reg D2PAK	3410-27-7833
U10,U15	TLC2274 Quad op-amp	3410-01-2274
U14	MCP101-300 reset controller	3410-11-0300
U16-U18,U24	LM321 op-amp SOT23-5	3410-12-0321
U19	MAX32322 RS232 Driver	3410-01-3232
U20,U21	4053 Analog Mux	3410-01-4053
U22,U23	Max4583 Analog Mux	3410-01-4583
VAR1	18V MOV	2580-02-0018
X1	14.7456 MHz CSM7	6010-01-1474

Extruded aluminium case	8100-01-0250
Aluminium end panel	8200-04-0250
Rear panel gasket	8200-07-0252
4.5" Dual MCX cable	7504-04-0505
10ft. radio cable with DB-15F conn.	7500-10-1201
Shorting block for JP1	7200-03-0102
Mounting bracket	9600-05-0250
4-40 SS jack screw	8000-42-4404
8-32 x ¼" SS philips	8000-24-8324
8-32 x 3/8" SS cap screw	8000-34-8323
4-40 x ¼" SS philips	8000-24-4404
4-40 x .156" aluminium spacer	8000-65-4425
4-40 x .250" aluminium spacer	8000-65-4404
Aluminium heat sink (Tx module)	8400-05-0010
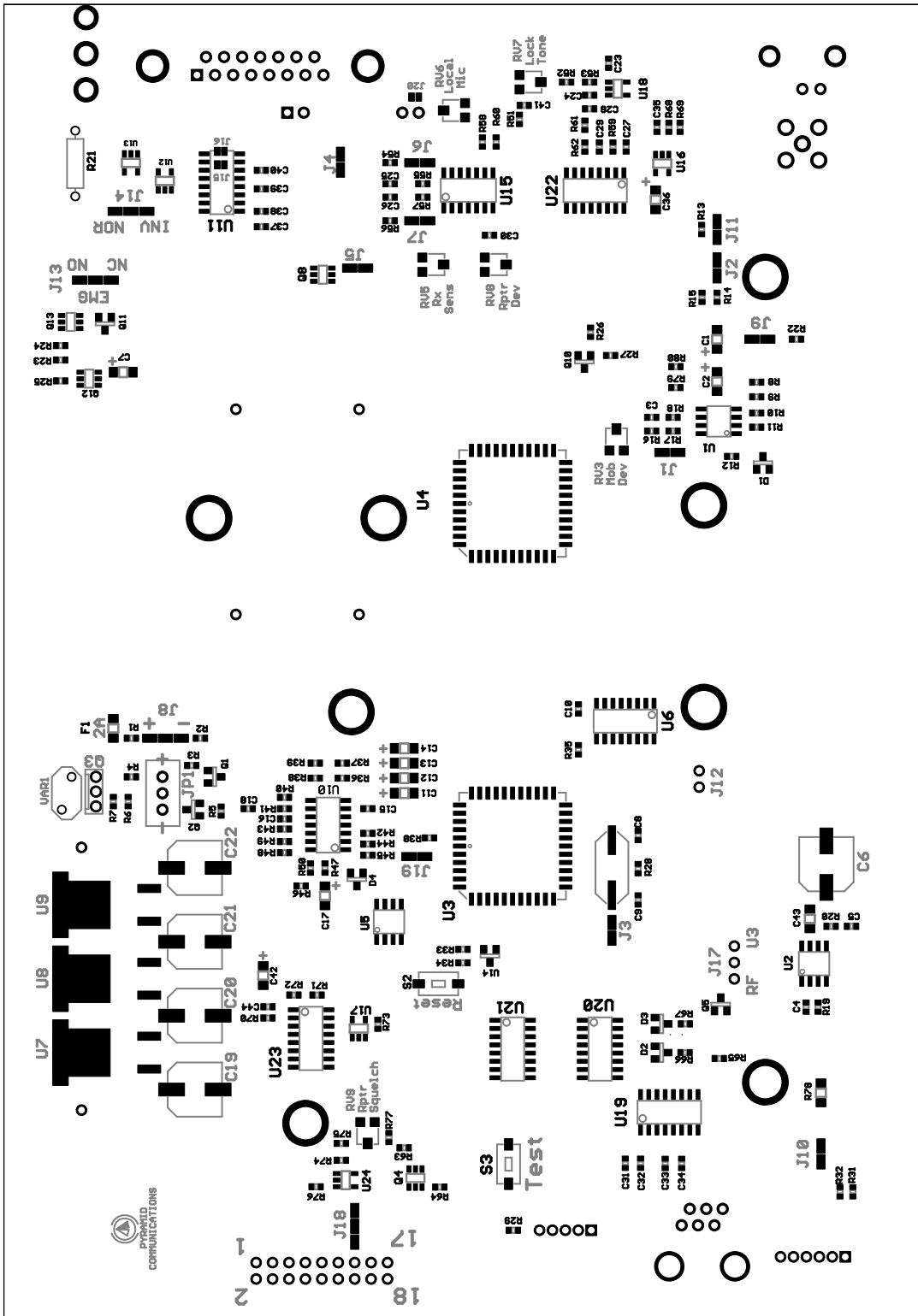
Front Panel Assembly

Reference	Description	Part #
DS301	8 LED Multi-Color Display	4001-08-0200
DS302	2 Digit 7 Segment LED Display	4012-02-0704
P301	5 Conductor 4" cable 2mm	7504-04-0504
P302	6 Conductor 4" cable 2mm	7504-04-0604
RV304	20K Pot w/on-off Switch	2021-04-5203
R301-R324	330 Ohm chip resistor 0603	2010-02-5331
RS301	Rotary Quadrature Channel Switch	7001-04-0290
U301-U303	74HC595 Shift Reg	3510-01-4595
	ABS Plastic front panel	8200-03-2510
	Front panel gasket	8200-08-0210
	8-32 x 7/8" SS cap screw	8000-34-8327
	Volume Knob w/Line	8700-04-0210
	Channel Knob w/o Line	8701-04-0210