



# West Virginia Purchasing Division

2019 Washington Street, East  
Charleston, WV 25305  
Telephone: 304-558-2306  
General Fax: 304-558-6026  
Bid Fax: 304-558-3970

The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.

Header

List View

General Information Contact Default Values Discount Document Information

Procurement Folder: 185234

SO Doc Code: CRFQ

Procurement Type: Central Master Agreement

SO Dept: 0612

Vendor ID: 000000173177

SO Doc ID: DPS1600000004

Legal Name: A V LAUTTAMUS COMMUNICATIONS INC

Published Date: 2/19/16

Alias/DBA:

Close Date: 3/3/16

Total Bid: \$100,935.00

Close Time: 13:30

Response Date: 03/01/2016

Status: Closed

Response Time: 16:24

Solicitation Description: Addendum No. 1 - Vehicular Repeaters

Total of Header Attachments: 0

Total of All Attachments: 0



Purchasing Division  
 2019 Washington Street East  
 Post Office Box 50130  
 Charleston, WV 25305-0130

**State of West Virginia  
 Solicitation Response**

**Proc Folder :** 185234

**Solicitation Description :** Addendum No. 1 - Vehicular Repeaters

**Proc Type :** Central Master Agreement

Date issued	Solicitation Closes	Solicitation No	Version
	2016-03-03 13:30:00	SR 0612 ESR03011600000003996	1

**VENDOR**

000000173177

A V LAUTTAMUS COMMUNICATIONS INC

**FOR INFORMATION CONTACT THE BUYER**

Tara Lyle  
 (304) 558-2544  
 tara.l.lyle@wv.gov

**Signature X** **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Interface Cable - GE/Ericsson Orion	10.00000	EA	\$64.000000	\$640.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - GE/Ericsson Orion

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	Interface Cable - Kenwood TK-690H	25.00000	EA	\$64.000000	\$1,600.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cables - Kenwood TK-690H

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	Interface Cable - Kenwood TK-5810	25.00000	EA	\$64.000000	\$1,600.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cables - Kenwood TK-5810

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	Interface Cable - Tait TM-9100	15.00000	EA	\$107.000000	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - Tait TM-9100

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	Interface Cable - Motorola XTL-2500 (high power)	15.00000	EA	\$107.000000	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface cable - Motorola XTL-2500 (High Power)

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
6	Interface Cable - Motorola XTL-2500 (Mid/Low power)	25.00000	EA	\$107.000000	\$2,675.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - Motorola XTL-2500 (Mid/Low power)

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
7	Interface Cable - Motorola APX-6500 (High power)	15.00000	EA	\$107.000000	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - Motorola APX-6500 (High power)

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
8	Interface Cable - Motorola APX-6500 (Mid/Low Power)	50.00000	EA	\$107.000000	\$5,350.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - Motorola APX-6500 (Mid/Low Power)

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
9	Interface Cable - Motorola APX-7500 (High Power)	15.00000	EA	\$107.000000	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - Motorola APX-7500 (High power)

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
10	Interface Cable - Motorola APX-7500 (Mid/Low Power)	50.00000	EA	\$107.000000	\$5,350.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Interface Cable - Motorola APX-7500 (Mid/Low power)

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
11	VHF Vehicular Repeater	50.00000	EA	\$1,011.000000	\$50,550.00

Comm Code	Manufacturer	Specification	Model #
43222817			

Extended Description : VHF Vehicular Repeaters

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
12	UHF Vehicular Repeaters	25.00000	EA	\$1,011.000000	\$25,275.00

Comm Code	Manufacturer	Specification	Model #
43222817			

Extended Description : UHF Vehicular Repeaters

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
13	Programming Software	5.00000	EA	\$0.000000	\$0.00

Comm Code	Manufacturer	Specification	Model #
43230000			

Extended Description : Programming Software

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
14	Programming Cable	25.00000	EA	\$59.000000	\$1,475.00

Comm Code	Manufacturer	Specification	Model #
26121629			

Extended Description : Programming Cables



**P Y R A M I D**  
COMMUNICATIONS

February 10, 2016

A.V. Luttamus Communications  
1344 Cove Hill Road  
Weirton, WV 26062

Dear Mr. Luttamus.:

Pyramid Communications is a manufacturer of Vehicular Repeaters and Mobile Data equipment with our corporate offices located in Irvine CA. Our company has been providing products and services to the Two-Way Radio Communications Industry and marketplace for 20 years.

We have structured our organization to utilize Manufactures Representative Firms and Dealers who are charged with the responsibility of soliciting and managing our dealer network. We primarily sell, service and provide warranty support for our products through our dealer network. However in the event that the dealer becomes unable to maintain or support the equipment, we guarantee maintenance and support per our Warranty Agreement.

Accordingly, please be advised that the following dealer is Authorized by Pyramid Communications to sell and service all products to West Virginia State and Local Government entities as well as to any additional State of West Virginia entities authorized by the State of West Virginia to procure products under any contract award resulting from their offering to the above referenced ITB.

A.V. Luttamus Communications  
1344 Cove Hill Road  
Weirton, WV 26062

We thank you for your attention to this matter.

Sincerely,

Seth Chandler  
Eastern Regional Sales Manager, Pyramid Communications

**SOLICITATION NUMBER: CRFQ– DPS1600000004**  
**Addendum Number: 1**

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The purpose of this addendum is to modify the solicitation identified as CRFQ DPS1600000004 (“Solicitation”) to reflect the change(s) identified and described below.

**Applicable Addendum Category:**

- Modify bid opening date and time
- Modify specifications of product or service being sought
- Attachment of vendor questions and responses
- Attachment of pre-bid sign-in sheet
- Correction of error
- Other

**Description of Modification to Solicitation:**

1. Responses to vendor questions attached.
2. The bid opening remains on 03/03/2016 at 1:30 pm.

**Additional Documentation:** Documentation related to this Addendum (if any) has been included herewith a Attachment A and is specifically incorporated herein by reference.

**Terms and Conditions:**

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

**ATTACHMENT A**  
**CRFQ DPS160000004**

**QUESTIONS:**

Q1: Would it be possible to get corresponding part numbers for each line item?

A1a: To delete Section 3.1.1.1 of the specifications in its entirety and replace with the following:

**3.1.1 VEHICULAR REPEATERS**

**3.1.1.1** The vehicular repeater must utilize an interface cable for one of the following radios:

**3.1.1.1(A)** GE/Ericsson Orion -7500-06-1014 (Low Band)

**3.1.1.1(B)** Kenwood TK-690H -7500-10-1045 (Low Band)

**3.1.1.1 (C)** Kenwood TK-5810 -7502-10-1045(UHF)

**3.1.1.1 (D)** Tait TM9100 - 7500-10-1010 (UHF)

**3.1.1.1 (E)** Motorola XTL-2500/5000 - 7505-10-1045  
(High Power)

**3.1.1.1 (F)** Motorola XTL-2500/5000 - 7505-10-1094  
(Mid/Low power)

**3.1.1.1 (G)** Motorola APX-6500 - 7506-10-1045  
(High Power)

**3.1.1.1 (H)** Motorola APX-6500 - 7506-10-1094  
(Low Power)

**3.1.1.1 (I)** Motorola APX-7500 - 7506-10-1045  
(High Power)

**3.1.1.1 (J)** Motorola APX-7500 - 7506-10-1094  
(Low Power)

A1b: To delete Section 3.1.1.2 of the specifications in its entirety and replace with the following:

**3.1.1.2** Repeater shall operate in one of the following bands:

**3.1.1.2(A)** VHF 150-174 MHZ BAND - SVR-200-VBN

**3.1.1.2(B)** UHF 450-470 MHZ BAND - SVR-200-UDN

A1c: To delete Section 3.1.4.10 of the specifications in its entirety and replace with the following:

**3.1.4.10** Programming cables shall be available for optional  
Purchase - Programming Cables---FY1

**OTHER INFORMATION:**

1. The bid opening remains on 03/03/2016 at 1:30 pm.

**ADDENDUM ACKNOWLEDGEMENT FORM**  
**SOLICITATION NO.: CRFQ DPS1600000004**

**Instructions:** Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

**Acknowledgment:** I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

**Addendum Numbers Received:**

(Check the box next to each addendum received)

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6  |
| <input type="checkbox"/> Addendum No. 2            | <input type="checkbox"/> Addendum No. 7  |
| <input type="checkbox"/> Addendum No. 3            | <input type="checkbox"/> Addendum No. 8  |
| <input type="checkbox"/> Addendum No. 4            | <input type="checkbox"/> Addendum No. 9  |
| <input type="checkbox"/> Addendum No. 5            | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

A.V Luttamus Communications

\_\_\_\_\_  
Company

*Jodd Work*

\_\_\_\_\_  
Authorized Signature

02/29/16

\_\_\_\_\_  
Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.

**ATTACHMENT A**

## **INSTRUCTIONS TO VENDORS SUBMITTING BIDS**

**1. REVIEW DOCUMENTS THOROUGHLY:** The attached documents contain a solicitation for bids. Please read these instructions and all documents attached in their entirety. These instructions provide critical information about requirements that if overlooked could lead to disqualification of a Vendor's bid. All bids must be submitted in accordance with the provisions contained in these instructions and the Solicitation. Failure to do so may result in disqualification of Vendor's bid.

**2. MANDATORY TERMS:** The Solicitation may contain mandatory provisions identified by the use of the words "must," "will," and "shall." Failure to comply with a mandatory term in the Solicitation will result in bid disqualification.

**3. PREBID MEETING:** The item identified below shall apply to this Solicitation.

A pre-bid meeting will not be held prior to bid opening

A **NON-MANDATORY PRE-BID** meeting will be held at the following place and time:

A **MANDATORY PRE-BID** meeting will be held at the following place and time:

All Vendors submitting a bid must attend the mandatory pre-bid meeting. Failure to attend the mandatory pre-bid meeting shall result in disqualification of the Vendor's bid. No one person attending the pre-bid meeting may represent more than one Vendor.

An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. The State will not accept any other form of proof or documentation to verify attendance. Any person attending the pre-bid meeting on behalf of a Vendor must list on the attendance sheet his or her name and the name of the Vendor he or she is representing.

Additionally, the person attending the pre-bid meeting should include the Vendor's E-Mail address, phone number, and Fax number on the attendance sheet. It is the Vendor's responsibility

to locate the attendance sheet and provide the required information. Failure to complete the attendance sheet as required may result in disqualification of Vendor's bid.

All Vendors should arrive prior to the starting time for the pre-bid. Vendors who arrive after the starting time but prior to the end of the pre-bid will be permitted to sign in, but are charged with knowing all matters discussed at the pre-bid.

Questions submitted at least five business days prior to a scheduled pre-bid will be discussed at the pre-bid meeting if possible. Any discussions or answers to questions at the pre-bid meeting are preliminary in nature and are non-binding. Official and binding answers to questions will be published in a written addendum to the Solicitation prior to bid opening.

**4. VENDOR QUESTION DEADLINE:** Vendors may submit questions relating to this Solicitation to the Purchasing Division. Questions must be submitted in writing. All questions must be submitted on or before the date listed below and to the address listed below in order to be considered. A written response will be published in a Solicitation addendum if a response is possible and appropriate. Non-written discussions, conversations, or questions and answers regarding this Solicitation are preliminary in nature and are nonbinding.

Submitted e-mails should have solicitation number in the subject line.

Question Submission Deadline: February 18, 2016 by 4:00 pm

Submit Questions to: Tara Lyle  
2019 Washington Street, East  
Charleston, WV 25305  
Fax: (304) 558-4115 (Vendors should not use this fax number for bid submission)  
Email: [Tara.L.Lyle@wv.gov](mailto:Tara.L.Lyle@wv.gov)

**5. VERBAL COMMUNICATION:** Any verbal communication between the Vendor and any State personnel is not binding, including verbal communication at the mandatory pre-bid conference. Only information issued in writing and added to the Solicitation by an official written addendum by the Purchasing Division is binding.

**6. BID SUBMISSION:** All bids must be submitted electronically through wvOASIS or signed and delivered by the Vendor to the Purchasing Division at the address listed below on or before the date and time of the bid opening. Any bid received by the Purchasing Division staff is considered to be in the possession of the Purchasing Division and will not be returned for any reason. The Purchasing Division will not accept bids, modification of bids, or addendum acknowledgment forms via e-mail. Acceptable delivery methods include electronic submission via wvOASIS, hand delivery, delivery by courier, or facsimile.

The bid delivery address is:  
Department of Administration, Purchasing Division  
2019 Washington Street East  
Charleston, WV 25305-0130

A bid that is not submitted electronically through wvOASIS should contain the information listed below on the face of the envelope or the bid may be rejected by the Purchasing Division.:

SEALED BID:  
BUYER:  
SOLICITATION NO.:  
BID OPENING DATE:  
BID OPENING TIME:  
FAX NUMBER:

In the event that Vendor is responding to a request for proposal, the Vendor shall submit one original technical and one original cost proposal plus \_\_\_\_\_ convenience copies of each to the Purchasing Division at the address shown above. Submission of a response to a request for proposal is not permitted in wvOASIS. Additionally, the Vendor should identify the bid type as either a technical or cost proposal on the face of each bid envelope submitted in response to a request for proposal as follows:

BID TYPE: (This only applies to CRFP)  
 Technical  
 Cost

**7. BID OPENING:** Bids submitted in response to this Solicitation will be opened at the location identified below on the date and time listed below. Delivery of a bid after the bid opening date and time will result in bid disqualification. For purposes of this Solicitation, a bid is considered delivered when confirmation of delivery is provided by wvOASIS (in the case of electronic submission) or when the bid is time stamped by the official Purchasing Division time clock (in the case of hand delivery).

Bid Opening Date and Time: March 3, 2016 at 1:30 pm

Bid Opening Location: Department of Administration, Purchasing Division  
2019 Washington Street East  
Charleston, WV 25305-0130

**8. ADDENDUM ACKNOWLEDGEMENT:** Changes or revisions to this Solicitation will be made by an official written addendum issued by the Purchasing Division. Vendor should acknowledge receipt of all addenda issued with this Solicitation by completing an Addendum Acknowledgment Form, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

**9. BID FORMATTING:** Vendor should type or electronically enter the information onto its bid to prevent errors in the evaluation. Failure to type or electronically enter the information may result in bid disqualification.

**10. ALTERNATES:** Any model, brand, or specification listed in this Solicitation establishes the acceptable level of quality only and is not intended to reflect a preference for, or in any way favor, a particular brand or vendor. Vendors may bid alternates to a listed model or brand provided that the alternate is at least equal to the model or brand and complies with the required specifications. The equality of any alternate being bid shall be determined by the State at its sole discretion. Any Vendor bidding an alternate model or brand should clearly identify the alternate items in its bid and should include manufacturer's specifications, industry literature, and/or any other relevant documentation demonstrating the equality of the alternate items. Failure to provide information for alternate items may be grounds for rejection of a Vendor's bid.

**11. EXCEPTIONS AND CLARIFICATIONS:** The Solicitation contains the specifications that shall form the basis of a contractual agreement. Vendor shall clearly mark any exceptions, clarifications, or other proposed modifications in its bid. Exceptions to, clarifications of, or modifications of a requirement or term and condition of the Solicitation may result in bid disqualification.

**12. COMMUNICATION LIMITATIONS:** In accordance with West Virginia Code of State Rules §148-1-6.6, communication with the State of West Virginia or any of its employees regarding this Solicitation during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited without prior Purchasing Division approval. Purchasing Division approval for such communication is implied for all agency delegated and exempt purchases.

**13. REGISTRATION:** Prior to Contract award, the apparent successful Vendor must be properly registered with the West Virginia Purchasing Division and must have paid the \$125 fee, if applicable.

**14. UNIT PRICE:** Unit prices shall prevail in cases of a discrepancy in the Vendor's bid.

**15. PREFERENCE:** Vendor Preference may only be granted upon written request and only in accordance with the West Virginia Code § 5A-3-37 and the West Virginia Code of State Rules. A Vendor Preference Certificate form has been attached hereto to allow Vendor to apply for the preference. Vendor's failure to submit the Vendor Preference Certificate form with its bid will result in denial of Vendor Preference. Vendor Preference does not apply to construction projects.

**16. SMALL, WOMEN-OWNED, OR MINORITY-OWNED BUSINESSES:** For any solicitations publicly advertised for bid, in accordance with West Virginia Code §5A-3-37(a)(7) and W. Va. CSR § 148-22-9, any non-resident vendor certified as a small, women-owned, or minority-owned business under W. Va. CSR § 148-22-9 shall be provided the same preference made available to any resident vendor. Any non-resident small, women-owned, or minority-owned business must identify itself as such in writing, must submit that writing to the Purchasing Division with its bid, and must be properly certified under W. Va. CSR § 148-22-9 prior to contract award to receive the preferences made available to resident vendors. Preference for a non-resident small, women-owned, or minority owned business shall be applied in accordance with W. Va. CSR § 148-22-9.

**17. WAIVER OF MINOR IRREGULARITIES:** The Director reserves the right to waive minor irregularities in bids or specifications in accordance with West Virginia Code of State Rules § 148-1-4.6.

**18. ELECTRONIC FILE ACCESS RESTRICTIONS:** Vendor must ensure that its submission in wvOASIS can be accessed by the Purchasing Division staff immediately upon bid opening. The Purchasing Division will consider any file that cannot be immediately opened and/or viewed at the time of the bid opening (such as, encrypted files, password protected files, or incompatible files) to be blank or incomplete as context requires, and are therefore unacceptable. A vendor will not be permitted to unencrypt files, remove password protections, or resubmit documents after bid opening if those documents are required with the bid.

**19. NON-RESPONSIBLE:** The Purchasing Division Director reserves the right to reject the bid of any vendor as Non-Responsible in accordance with W. Va. Code of State Rules § 148-1-5.3, when the Director determines that the vendor submitting the bid does not have the capability to fully perform, or lacks the integrity and reliability to assure good-faith performance.”

**20. ACCEPTANCE/REJECTION:** The State may accept or reject any bid in whole, or in part in accordance with W. Va. Code of State Rules § 148-1-4.5. and § 148-1-6.4.b.”

**21. YOUR SUBMISSION IS A PUBLIC DOCUMENT:** Vendor’s entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

**DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.**

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled “confidential,” “proprietary,” “trade secret,” “private,” or labeled with any other claim against public disclosure of the documents, to

include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

## GENERAL TERMS AND CONDITIONS:

**1. CONTRACTUAL AGREEMENT:** Issuance of a Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

**2. DEFINITIONS:** As used in this Solicitation/Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation/Contract.

**2.1. "Agency" or "Agencies"** means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

**2.2. "Bid" or "Proposal"** means the vendors submitted response to this solicitation.

**2.3. "Contract"** means the binding agreement that is entered into between the State and the Vendor to provide the goods or services requested in the Solicitation.

**2.4. "Director"** means the Director of the West Virginia Department of Administration, Purchasing Division.

**2.5. "Purchasing Division"** means the West Virginia Department of Administration, Purchasing Division.

**2.6. "Award Document"** means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the contract holder.

**2.7. "Solicitation"** means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

**2.8. "State"** means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

**2.9. "Vendor" or "Vendors"** means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

**3. CONTRACT TERM; RENEWAL; EXTENSION:** The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

**Term Contract**

**Initial Contract Term:** This Contract becomes effective on  
Upon award \_\_\_\_\_ and extends for a period of one (1) year(s).

**Renewal Term:** This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal should be submitted to the Purchasing Division thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Renewal of this Contract is limited to three (3) successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed 36 months in total. Automatic renewal of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases. Attorney General approval may be required for vendor terms and conditions.

**Delivery Order Limitations:** In the event that this contract permits delivery orders, a delivery order may only be issued during the time this Contract is in effect. Any delivery order issued within one year of the expiration of this Contract shall be effective for one year from the date the delivery order is issued. No delivery order may be extended beyond one year after this Contract has expired.

**Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within \_\_\_\_\_ days.

**Fixed Period Contract with Renewals:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and part of the Contract more fully described in the attached specifications must be completed within \_\_\_\_\_ days.

Upon completion, the vendor agrees that maintenance, monitoring, or warranty services will be provided for one year thereafter with an additional \_\_\_\_\_ successive one year renewal periods or multiple renewal periods of less than one year provided that the multiple renewal periods do not exceed \_\_\_\_\_ months in total. Automatic renewal of this Contract is prohibited.

**One Time Purchase:** The term of this Contract shall run from the issuance of the Award Document until all of the goods contracted for have been delivered, but in no event will this Contract extend for more than one fiscal year.

**Other:** See attached.

**4. NOTICE TO PROCEED:** Vendor shall begin performance of this Contract immediately upon receiving notice to proceed unless otherwise instructed by the Agency. Unless otherwise specified, the fully executed Award Document will be considered notice to proceed.

**5. QUANTITIES:** The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

**Open End Contract:** Quantities listed in this Solicitation are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

**Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

**Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

**One Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

**6. PRICING:** The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification.

**7. EMERGENCY PURCHASES:** The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute a breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

**8. REQUIRED DOCUMENTS:** All of the items checked below must be provided to the Purchasing Division by the Vendor as specified below.

**BID BOND:** All Vendors shall furnish a bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

**PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of \_\_\_\_\_. The performance bond must be received by the Purchasing Division prior to Contract award. On construction contracts, the performance bond must be 100% of the Contract value.

**LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be delivered to the Purchasing Division prior to Contract award.

In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under \$100,000. Personal or business checks are not acceptable.

**MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

**INSURANCE:** The apparent successful Vendor shall furnish proof of the following insurance prior to Contract award and shall list the state as a certificate holder:

**Commercial General Liability Insurance:** In the amount of \_\_\_\_\_ or more.

**Builders Risk Insurance:** In an amount equal to 100% of the amount of the Contract.

The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether or not that insurance requirement is listed above.

**LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section entitled Licensing, of the General Terms and Conditions, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits prior to Contract award, in a form acceptable to the Purchasing Division.

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications prior to Contract award regardless of whether or not that requirement is listed above.

**9. WORKERS' COMPENSATION INSURANCE:** The apparent successful Vendor shall comply with laws relating to workers compensation, shall maintain workers' compensation insurance when required, and shall furnish proof of workers' compensation insurance upon request.

**10. LITIGATION BOND:** The Director reserves the right to require any Vendor that files a protest of an award to submit a litigation bond in the amount equal to one percent of the lowest bid submitted or \$5,000, whichever is greater. The entire amount of the bond shall be forfeited if the hearing officer determines that the protest was filed for frivolous or improper purpose, including but not limited to, the purpose of harassing, causing unnecessary delay, or needless expense for the Agency. All litigation bonds shall be made payable to the Purchasing Division. In lieu of a bond, the protester may submit a cashier's check or certified check payable to the Purchasing Division. Cashier's or certified checks will be deposited with and held by the State Treasurer's office. If it is determined that the protest has not been filed for frivolous or improper purpose, the bond or deposit shall be returned in its entirety.

**11. LIQUIDATED DAMAGES:** Vendor shall pay liquidated damages in the amount of

for \_\_\_\_\_

This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy.

**12. ACCEPTANCE:** Vendor's signature on its bid, or on the certification and signature page, constitutes an offer to the State that cannot be unilaterally withdrawn, signifies that the product or service proposed by vendor meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise indicated, and signifies acceptance of the terms and conditions contained in the Solicitation unless otherwise indicated.

**13. FUNDING:** This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available.

**14. PAYMENT:** Payment in advance is prohibited under this Contract. Payment may only be made after the delivery and acceptance of goods or services. The Vendor shall submit invoices, in arrears.

**15. TAXES:** The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

**16. CANCELLATION:** The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may also cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules §§ 148-1-6.1.e.

**17. TIME:** Time is of the essence with regard to all matters of time and performance in this Contract.

**18. APPLICABLE LAW:** This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code or West Virginia Code of State Rules is void and of no effect.

**19. COMPLIANCE:** Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendor acknowledges that it has reviewed, understands, and will comply with all applicable laws, regulations, and ordinances.

**20. PREVAILING WAGE:** Vendor shall be responsible for ensuring compliance with prevailing wage requirements and determining when prevailing wage requirements are applicable.

**21. ARBITRATION:** Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

**22. MODIFICATIONS:** This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any change to existing contracts that adds work or changes contract cost, and were not included in the original contract, must be approved by the Purchasing Division and the Attorney General's Office (as to form) prior to the implementation of the change or commencement of work affected by the change.

**23. WAIVER:** The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

**24. SUBSEQUENT FORMS:** The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

**25. ASSIGNMENT:** Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments. Notwithstanding the foregoing, Purchasing Division approval may or may not be required on certain agency delegated or exempt purchases.

**26. WARRANTY:** The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

**27. STATE EMPLOYEES:** State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

**28. BANKRUPTCY:** In the event the Vendor files for bankruptcy protection, the State of West Virginia may deem this Contract null and void, and terminate this Contract without notice.

**29. PRIVACY, SECURITY, AND CONFIDENTIALITY:** The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/default.html>.

**30. YOUR SUBMISSION IS A PUBLIC DOCUMENT:** Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

**DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.**

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

**31. LICENSING:** In accordance with West Virginia Code of State Rules § 148-1-6.1.e, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

**32. ANTITRUST:** In submitting a bid to, signing a contract with, or accepting a Award Document from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

**33. VENDOR CERTIFICATIONS:** By signing its bid or entering into this Contract, Vendor certifies (1) that its bid or offer was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid or offer for the same material, supplies, equipment or services; (2) that its bid or offer is in all respects fair and without collusion or fraud; (3) that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and (4) that it has reviewed this Solicitation in its entirety; understands the requirements, terms and conditions, and other information contained herein.

Vendor's signature on its bid or offer also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency. The individual signing this bid or offer on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or offer or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

**34. PURCHASING CARD ACCEPTANCE:** The State of West Virginia currently utilizes a Purchasing Card program, administered under contract by a banking institution, to process payment for goods and services. The Vendor must accept the State of West Virginia's Purchasing Card for payment of all orders under this Contract unless the box below is checked.

Vendor is not required to accept the State of West Virginia's Purchasing Card as payment for all goods and services.

**35. VENDOR RELATIONSHIP:** The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, etc. and the filing of all necessary documents, forms, and returns pertinent to all of the foregoing.

Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

**36. INDEMNIFICATION:** The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

**37. PURCHASING AFFIDAVIT:** In accordance with West Virginia Code § 5A-3-10a, all Vendors are required to sign, notarize, and submit the Purchasing Affidavit stating that neither the Vendor nor a related party owe a debt to the State in excess of \$1,000. The affidavit must be submitted prior to award, but should be submitted with the Vendor's bid. A copy of the Purchasing Affidavit is included herewith.

**38. ADDITIONAL AGENCY AND LOCAL GOVERNMENT USE:** This Contract may be utilized by other agencies, spending units, and political subdivisions of the State of West Virginia; county, municipal, and other local government bodies; and school districts ("Other Government Entities"). Any extension of this Contract to the aforementioned Other Government Entities must be on the same prices, terms, and conditions as those offered and agreed to in this Contract, provided that such extension is in compliance with the applicable laws, rules, and ordinances of the Other Government Entity. If the Vendor does not wish to extend the prices, terms, and conditions of its bid and subsequent contract to the Other Government Entities, the Vendor must clearly indicate such refusal in its bid. A refusal to extend this Contract to the Other Government Entities shall not impact or influence the award of this Contract in any manner.

**39. CONFLICT OF INTEREST:** Vendor, its officers or members or employees, shall not presently have or acquire an interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

**40. REPORTS:** Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at [purchasing.requisitions@wv.gov](mailto:purchasing.requisitions@wv.gov).

**41. BACKGROUND CHECK:** In accordance with W. Va. Code § 15-2D-3, the Director of the Division of Protective Services shall require any service provider whose employees are regularly employed on the grounds or in the buildings of the Capitol complex or who have access to sensitive or critical information to submit to a fingerprint-based state and federal background inquiry through the state repository. The service provider is responsible for any costs associated with the fingerprint-based state and federal background inquiry.

After the contract for such services has been approved, but before any such employees are permitted to be on the grounds or in the buildings of the Capitol complex or have access to sensitive or critical information, the service provider shall submit a list of all persons who will be physically present and working at the Capitol complex to the Director of the Division of Protective Services for purposes of verifying compliance with this provision. The State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check.

Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

**42. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS:** Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

- a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.
- b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:
- c. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars (\$2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or
- d. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

**43. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL:** In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars (\$50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a “substantial labor surplus area”, as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products. This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

**CERTIFICATION AND SIGNATURE PAGE**

By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

A.V Luttamus Communications

\_\_\_\_\_  
(Company)

*Todd Wotring*

Todd Wotring Senior Account Manager

\_\_\_\_\_  
(Authorized Signature) (Representative Name, Title)

304-216-9869 Office 304-723-7461 Fax 02/29/16

\_\_\_\_\_  
(Phone Number) (Fax Number) (Date)

REQUEST FOR QUOTATION  
CRFQ DPS1600000004 - Vehicular Repeaters

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SPECIFICATIONS

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of West Virginia State Police, West Virginia Natural Resources Police, DHHR, and all agencies within the Department of Military Affairs and Public Safety to establish an open-end contract for Vehicular Repeaters.
  
2. **DEFINITIONS:** The terms listed below shall have the meanings assigned to them below. Additional definitions can be found in section 2 of the General Terms and Conditions.
  - 2.1 **“Contract Item” or “Contract Items”** means the list of items identified in Section 3, Subsection 1 below.
  
  - 2.2 **“Pricing Pages”** means the schedule of prices, estimated order quantity, and totals contained in wvOasis or attached hereto as Exhibit A, and used to evaluate the Solicitation responses..
  
  - 2.3 **“Solicitation”** means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.
  
3. **GENERAL REQUIREMENTS:**
  - 3.1 **Contract Items and Mandatory Requirements:** Vendor shall provide Agency with the Contract Items listed below on an open-end and continuing basis. Contract Items must meet or exceed the mandatory requirements as shown below.
    - 3.1.1 **VEHICULAR REPEATERS**
      - 3.1.1.1 The vehicular repeater must utilize an interface cable for one of the following radios:
        - 3.1.1.1(A) GE/Ericsson Orion
        - 3.1.1.1(B) Kenwood TK-690H
        - 3.1.1.1 (C) Kenwood TK-5810
        - 3.1.1.1 (D) Tait TM9100
        - 3.1.1.1 (E) Motorola XTL-2500 (High power)
        - 3.1.1.1 (F) Motorola XTL-2500 (Mid/Low power)
        - 3.1.1.1 (G) Motorola APX-6500 (High Power)
        - 3.1.1.1 (H) Motorola APX-6500 (Mid/Low power)
        - 3.1.1.1 (I) Motorola APX-7500 (High power)
        - 3.1.1.1 (J) Motorola APX-7500 (Mid/Low Power)

**REQUEST FOR QUOTATION**  
**CRFQ DPS1600000004 - Vehicular Repeaters**

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- 3.1.1.2** Repeater shall operate in one of the following bands:
  - 3.1.1.2(A)** VHF 150-174 MHZ BAND
  - 3.1.1.2(B)** UHF 450-470 MHZ BAND
  
- 3.1.1.3** Cable must have manufacturer's plugs (dual gender) to allow direct connection. Interface cables shall be listed as options and priced individually. Repeater shall be priced with no cable included, but one will normally be purchased in conjunction with the repeater purchase. **GENERIC CABLES REQUIRING CUTTING INTO THE MANUFACTURERE'S RADIO CABLE ARE NOT ACCEPTABLE.**
  
- 3.1.1.4** Unit shall operate on 13.6 VDC, negative ground,  $\pm 25\%$ . Unit shall draw no more than 170mA when in standby mode. Unit shall draw no more than 250 mA, @ 400 mW Receive audio when in receive mode. Unit shall draw less than 1A @ rated output.
  
- 3.1.1.5** Dimensions of the unit shall not exceed the following: 6" wide, 6 1/5" long, and 2" high.
  
- 3.1.1.6** Unit shall be capable of interfacing to a variety of existing mobiles and communications formats (conventional, trunking, narrowband) and be upwardly compatible with new radios and technologies.
  
- 3.1.1.7** Unit shall be capable of multi-vehicle operation with automatic priority repeater establishment and maintenance. Units shall provide means of responding during full duplex mobile reception and repeater hang time.
  
- 3.1.1.8** Repeater should be single channel receive and transmit in the selected band.
  
- 3.1.1.9** Unit shall meet or exceed the following Mil/Std 810 D/E specifications: 501.2, 501.3, 507.2, 510.2, 514.3, and 516.3.
  
- 3.1.1.10** Repeater must be synthesized and programmable for frequencies, tones and operating parameters. Vendor should state method of programming and provide a copy of software.
  
- 3.1.1.11** Activation of mobile repeat mode must be tone squelch protected.

REQUEST FOR QUOTATION  
CRFQ DPS160000004 - Vehicular Repeaters

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**3.1.2 TRANSMITTER REQUIREMENTS**

- 3.1.2.1 Repeater shall operate in the following bands as ordered: VHF 150-174 MHz, UHF 450-470 MHz.
- 3.1.2.2 Operation of the repeater shall be capable and configured to narrowband operation.
- 3.1.2.3 Transmitter power output shall be a minimum of two (2) watts, adjustable to 250mW to prevent interference with adjacent system operation.
- 3.1.2.4 Transmitter conducted spurious output shall be -50dbc minimum.
- 3.1.2.5 Transmitter frequency stability shall be 1.5ppm over an operating range of -30°C to +60°C.
- 3.1.2.6 Transmitter audio response shall be +1/-3db within a +6db/octave pre-emphasis curve from 300Hz to 31Hz.
- 3.1.2.7 Transmitter audio distortion shall be maximum 5% at 60% deviation with a 1kHz tone.
- 3.1.2.8 Repeater shall be capable of transmitting a single frequency burst tone at 60% deviation for a duration of 500-800 mSec in compliance with the multi-vehicle protocol utilizing the following tones: 832.5, 847.5 and 682.5 hz.
- 3.1.2.9 Repeater shall be capable of transmitting local mobile microphone audio to the handheld, the level shall be adjustable for  $\pm 3$ kHz deviation.
- 3.1.2.10 During base to portable transmissions, the repeater shall periodically unkey to check for transmissions from handhelds or other vehicular repeaters on site. The sampling interval shall be programmable and a random offset shall be employed to prevent 2 repeaters from sampling at the same time. The sampling duration shall be less than 50 mSec. During the sampling interval, the receiver shall be capable of detecting 2 CTCSS tones simultaneously. If tone from the handheld is detected, the repeater will cease transmissions and revert to portable to base mode. If tone from another is detected, the receiving unit will revert to non-priority status. If no tone or wrong tone is detected, the repeater will continue to operate in base to portable mode. NOTE: CO-

REQUEST FOR QUOTATION  
CRFQ DPS160000004 - Vehicular Repeaters

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CHANNEL INTERFERENCE SHALL NOT CAUSE  
THE REPEATERS TO CEASE OPERATION.

**3.1.3 RECEIVER REQUIREMENTS**

- 3.1.3.1 Repeater shall operate in the following bands as ordered:  
VHF 150-174 MHz, UHF 450-470 MHz.
- 3.1.3.2 Operation of the repeater shall be capable of and  
configured for narrowband operation.
- 3.1.3.3 Receiver sensitivity shall be a minimum of  $.4\mu\text{V}$  for 12  
db Sinad operation.
- 3.1.3.4 Receiver adjacent channel selectivity shall be a minimum  
of 57 db for 12.5kHz channel spacing.
- 3.1.3.5 Receiver spurious and imag rejection shall be a minimum  
of 60 db.
- 3.1.3.6 Receiver 3<sup>rd</sup> tone intermodulation response shall be a  
minimum of 60 db.
- 3.1.3.7 Receiver audio response shall be  $\pm 3\text{db}$  within a  
6db/octave de-emphasis curve from 300 Hz to 3kHz.
- 3.1.3.8 Receiver modulation acceptance shall be a minimum of  
 $\pm 7.5/\pm 3.75\text{kHz}$ .
- 3.1.3.9 Receiver shall be capable of accurately decoding CTCSS  
from the handheld. Mobile transmit activation shall not  
occur in the absence of tone. The receiver shall be  
capable of decoding at least 2 sub-audible CTCSS tones  
simultaneously. If the primary tone is detected from the  
handheld operator, the vehicular repeater shall repeat the  
transmission handheld to base mode. If, during priority  
sampling, the secondary tone is detected from other  
vehicular repeaters, the receiving unit will remove itself  
from priority mode and cease transmissions.
- 3.1.3.10 Reception of carrier without tone, or carrier with a  
CTCSS tone different from the handheld tone or the  
vehicular repeater encode tone shall not cause the system  
to malfunction. The system shall be capable of detecting  
co-channel interference and continue to operate properly  
in the presence of carrier sources outside of its system.
- 3.1.3.11 Receiver shall be capable of decoding in-band single tone  
bursts with a duration of 500-800 mSec from other  
repeaters and revert to a non-priority status upon proper

REQUEST FOR QUOTATION  
CRFQ DPS160000004 - Vehicular Repeaters

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decoding. The repeater shall maintain a count of the number of decoded tone bursts and adjust its priority status accordingly (increment count for each burst). The repeater shall be capable of maintaining a priority hierarchy for up to 100 vehicles. The receiver shall be capable of decoding 832.5Hz, 847.5Hz, and 682.5Hz.

**3.1.3.12** Receiver shall continue to monitor all radio activity even when not at priority status, and shall take positive steps to re-establish a priority unit when the absence of a priority repeater is detected. Repeaters at priority status shall be capable of detecting the presence of other repeaters transmitting and automatically take appropriate action to prevent radio "collisions".

**3.1.3.13** Receiver shall provide repeater receiver audio from the handheld for local monitoring. Audio power shall be a minimum of 400mW into 8 Ohms resistive.

**3.1.4 GENERAL REQUIREMENTS**

**3.1.4.1** Some method of enabling and disabling the repeater shall be provided so that the driver may activate the repeat mode only when leaving the vehicle.

**3.1.4.2** The repeater shall have a minimum of the following indicators: DC power/activation, priority status, mobile receiver status, mobile transmit indication, repeater receiver status, and repeater transmit indication. The indicators must be visible from a wide viewing angle and easily readable in ambient light conditions.

**3.1.4.3** The repeater shall be capable of operating with a wide variety of existing radios or radios purchased in the future. Interfacing of the repeater shall be upwardly compatible with different communication formats including trunking and narrowband technologies.

**3.1.4.4** Bidder shall provide the following documentation regarding the repeater, prior to contract award, however, documentation should be provided with bid:

- A. System description and operating instructions, including theory of operation and complete description of all controls and functions.
- B. Complete installation instructions and description of optional configurations.
- C. Alignment instructions.
- D. Programming Software and Manual.

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- E. Detailed schematics and parts list.
- F. Parts locator diagram.

- 3.1.4.5 Application note shall be available for all radios specified above to allow modifications and programming required for operation with purchased interface cable.
- 3.1.4.6 Bidder must provide proof of authorization to purchase and resell manufacturer's equipment prior to contract award. Documentation is preferred with vendor's submitted bid.
- 3.1.4.7 All equipment shall be warranted by the manufacturer for at least three (3) years, including parts and labor.
- 3.1.4.8 The equipment warranty period shall begin when the equipment is first placed in service, not to exceed six (6) months from the date of purchase.
- 3.1.4.9 Programming software shall be compatible with Windows© XP, or newer and shall be available for purchase. Programming software shall contain unlimited seats.
- 3.1.4.10 Programming cables shall be available for optional purchase.

**4. CONTRACT AWARD:**

- 4.1 **Contract Award:** The Contract is intended to provide Agencies with a purchase price on all Contract Items. The Contract shall be awarded to the Vendor that provides the Contract Items meeting the required specifications for the lowest overall total cost as shown on the Pricing Pages.
- 4.2 **Pricing Pages:** Vendor should complete the Pricing Pages by filling in the unit price, the extended price, the total and the vendor information. Vendor should complete the Pricing Pages in their entirety as failure to do so may result in Vendor's bids being disqualified.

The Pricing Pages contain a list of the Contract Items and estimated purchase volume. The estimated purchase volume for each item represents the approximate volume of anticipated purchases only. No future use of the Contract or any individual item is guaranteed or implied.

Vendor should type or electronically enter the information into the Pricing Pages through wvOasis, if available, or as an electronic

REQUEST FOR QUOTATION  
CRFQ DPS160000004 - Vehicular Repeaters

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**5. ORDERING AND PAYMENT:**

- 5.1 Ordering:** Vendor shall accept orders through wvOasis, regular mail, facsimile, e-mail, or any other written forms of communication. Vendor may, but is not required to, accept on-line orders through a secure internet ordering portal/website. If Vendor has the ability to accept on-line orders, it should include in its response a brief description of how Agencies may utilize the on-line ordering system. Vendor shall ensure that its on-line ordering system is properly secured prior to processing Agency orders on-line.
- 5.2 Payment:** Vendor shall accept payment in accordance with the payment procedures of the State of West Virginia.

**6. DELIVERY AND RETURN:**

- 6.1 Delivery Time:** Vendor shall deliver standard orders within 30 working days after orders are received. Vendor shall deliver emergency orders within 15 working day(s) after orders are received. Vendor shall ship all orders in accordance with the above schedule and shall not hold orders until a minimum delivery quantity is met.
- 6.2 Late Delivery:** The Agency placing the order under this Contract must be notified in writing if orders will be delayed for any reason. Any delay in delivery that could cause harm to an Agency will be grounds for cancellation of the delayed order, and/or obtaining the items ordered from a third party.

Any Agency seeking to obtain items from a third party under this provision must first obtain approval of the Purchasing Division.

- 6.3 Delivery Payment/Risk of Loss:** Standard order delivery shall be F.O.B. destination to the Agency's location. Vendor shall include the cost of standard order delivery charges in its bid pricing/discount and is not permitted to charge the Agency separately for such delivery. The Agency will pay delivery charges on all emergency orders provided that Vendor invoices those delivery costs as a separate charge with the original freight bill attached to the invoice.
- 6.4 Return of Unacceptable Items:** If the Agency deems the Contract Items to be unacceptable, the Contract Items shall be returned to Vendor at Vendor's expense and with no restocking charge. Vendor shall either make arrangements for the return within five (5) days of being notified that items are unacceptable, or permit the Agency to arrange for the return and reimburse Agency for delivery expenses. If the original packaging cannot be utilized for the return, Vendor will supply the Agency with appropriate return packaging upon request. All returns of unacceptable items shall be F.O.B. the Agency's location. The returned product shall either be replaced, or the Agency shall receive a full credit or refund for the purchase price, at the Agency's discretion.

REQUEST FOR QUOTATION  
CRFQ DPS1600000004 - Vehicular Repeaters

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**6.5 Return Due to Agency Error:** Items ordered in error by the Agency will be returned for credit within 30 days of receipt, F.O.B. Vendor's location. Vendor shall not charge a restocking fee if returned products are in a resalable condition. Items shall be deemed to be in a resalable condition if they are unused and in the original packaging. Any restocking fee for items not in a resalable condition shall be the lower of the Vendor's customary restocking fee or 5% of the total invoiced value of the returned items.

**7. VENDOR DEFAULT:**

**7.1** The following shall be considered a vendor default under this contract.

- 7.1.1 Failure to provide Contract Items in accordance with the requirements contained herein
- 7.1.2 Failure to comply with other specifications and requirements contained herein.
- 7.1.3 Failure to comply with any laws, rules and ordinances applicable to the Contract Services provided under this contract.
- 7.1.4 Failure to remedy deficient performance upon request

**7.2** The following remedies shall be available to Agency upon default.

- 7.2.1 Immediate cancellation of the Contract
- 7.2.2 Immediate cancellation of one or more release orders issued under this Contract
- 7.2.3 Any other remedies available in law or equity.

**8. MISCELLANEOUS**

**8.1 No Substitutions:** Vendor shall supply only Contract Items submitted in response to the Solicitation unless a contract modification is approved in accordance with the provisions contained in this Contract.

**8.2 Vendor Supply:** Vendor must carry sufficient inventory of the Contract Items being offered to fulfill its obligations under this Contract. By signing its bid, Vendor certifies that it can supply the Contract Items contained in its bid response.

**8.3 Reports:** Vendor shall provide quarterly reports and annual summaries to the Agency showing the Agency's items purchased, quantities of items purchased, and total dollar value of the items purchased. Vendor shall also provide reports, upon request, showing the items purchased during the term of this contract, the quantity purchased for each of those items, and the total value of purchases for each of those items. Failure to supply such reports may be grounds for cancellation of this contract.

REQUEST FOR QUOTATION  
CRFQ DPS1600000004 - Vehicular Repeaters

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**8.4 Contract Manager:** During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list Contract manager and his or her contact information below.

**Contract Manager:** Todd Wotring  
**Telephone Number:** 304-216-9869  
**Fax Number:** 304-723-7461  
**Email Address:** toddwotring@lauttamus.com



Purchasing Division  
 2019 Washington Street East  
 Post Office Box 50130  
 Charleston, WV 25305-0130

State of West Virginia  
 Request for Quotation  
 31 — Public Safety

Proc Folder: 185234

Doc Description: Vehicular Repeaters

Proc Type: Central Master Agreement

Date Issued	Solicitation Closes	Solicitation No	Version
2016-02-05	2016-03-03 13:30:00	CRFQ 0612 DPS1600000004	1

**BID RECEIVING LOCATION**

BID CLERK  
 DEPARTMENT OF ADMINISTRATION  
 PURCHASING DIVISION  
 2019 WASHINGTON ST E  
 CHARLESTON WV 25305  
 US

**VENDOR**

Vendor Name, Address and Telephone Number:  
 A.V Luttamus Communications / Todd Wotring  
 3007 Fallen Oak Road Morgantown, WV 26508  
 304-216-9869 Office toddwotring@luttamus.com

**FOR INFORMATION CONTACT THE BUYER**

Tara Lyle  
 (304) 558-2544  
 tara.l.yle@wv.gov

Signature X  FEIN # 31-1416652 DATE 02/29/16

All offers subject to all terms and conditions contained in this solicitation

**ADDITIONAL INFORMAITON:**

The West Virginia Purchasing Division is soliciting bids on behalf of WV State Police, WV Division of Natural Resources Police, WV Department of Health and Human Resources and all agencies within the WV Department of Military Affairs and Public Safety (DMAPS), to establish an open-end contract for vehicular repeaters, per the attached documentation.

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Interface Cable - GE/Ericsson Orion	10.00000	EA	\$64.00	\$640.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	Orion Cable	7500-06-1014

**Extended Description :**

Interface Cable - GE/Ericsson Orion

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Interface Cable - Kenwood TK-690H	25.00000	EA	\$64.00	\$1,600.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	TK-690 Cable	7500-10-1045

**Extended Description :**

Intrface Cables - Kenwood TK-690H

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Intrface Cable - Kenwood TK-5810	25.00000	EA	\$64.00	\$1,600.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	TK-5810 Cable	7502-10-1045

**Extended Description :**

Interface Cables - Kenwood TK-5810

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Interface Cable - Tait TM-9100	15.00000	EA	\$107.00	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	TM-9100 Cable	7500-10-1010

**Extended Description :**

Interface Cable - Tait TM-9100

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Interface Cable - Motorola XTL-2500 (high power)	15.00000	EA	\$107.00	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	XTL-2500 Cable	7505-10-1045

**Extended Description :**

Interface cable - Motorola XTL-2500 (High Power)

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
6	Interface Cable - Motorola XTL-2500 (Mid/Low power)	25.00000	EA	\$107.00	\$2,675.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	XTL-2500 Cable	7505-10-1094

**Extended Description :**

Interface Cable - Motorola XTL-2500 (Mid/Low power)

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
7	Interface Cable - Motorola APX-6500 (High power)	15.00000	EA	\$107.00	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	APX-6500 Cable	7506-10-1045

**Extended Description :**

Interface Cable - Motorola APX-6500 (High power)

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
8	Interface Cable - Motorola APX-6500 (Mid/Low Power)	50.00000	EA	\$107.00	\$5,350.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	APX-6500 Cable	7506-10-1094

**Extended Description :**

Interface Cable - Motorola APX-6500 (Mid/Low Power)

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
9	Interface Cable - Motorola APX-7500 (High Power)	15.00000	EA	\$107.00	\$1,605.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	APX-7500 Cable	7506-10-1045

**Extended Description :**

Interface Cable - Motorola APX-7500 (High power)

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
10	Interface Cable - Motorola APX-7500 (Mid/Low Power)	50.00000	EA	\$107.00	\$5,350.00

Comm Code	Manufacturer	Specification	Model #
26121629	Pyramid	APX-7500 Cable	7506-10-1094

**Extended Description :**

Interface Cable - Motorola APX-7500 (Mid/Low power)

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
11	VHF Vehicular Repeater	50.00000	EA	\$1,011.00	\$50,550.00

Comm Code	Manufacturer	Specification	Model #
43222817	Pyramid	VHF Vehicular Repeater	SVR-200VBN

**Extended Description :**

VHF Vehicular Repeaters Note: All Pyramid Vehicular Repeaters On This Bid Come With a 3 Year Manufactures Warranty

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
12	UHF Vehicular Repeaters	25.00000	EA	\$1,011.00	\$25,275.00

Comm Code	Manufacturer	Specification	Model #
43222817	Pyramid	UHF Vehicular Repeater	SVR-200UDN

**Extended Description :**

UHF Vehicular Repeaters Note: All Pyramid Vehicular Repeaters On This Bid Come With a 3 Year Manufactures Warranty

INVOICE TO		SHIP TO	
VARIOUS AGENCY LOCATIONS AS INDICATED BY ORDER		STATE OF WEST VIRGINIA VARIOUS LOCATIONS AS INDICATED BY ORDER	
No City	WV99999	No City	WV 99999
US		US	

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
13	Programming Software	5.00000	EA	Included With Programming Cable	



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**ADDITIONAL TERMS AND CONDITIONS**

See attached document(s) for additional Terms and Conditions

STATE OF WEST VIRGINIA  
Purchasing Division**PURCHASING AFFIDAVIT**

**MANDATE:** Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

**EXCEPTION:** The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

**DEFINITIONS:**

**"Debt"** means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

**"Employer default"** means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

**"Related party"** means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

**AFFIRMATION:** By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

**WITNESS THE FOLLOWING SIGNATURE:**Vendor's Name: A. V Luttamus Communications Todd Wotring Senior Account ManagerAuthorized Signature: *Todd Wotring* Date: 3-1-16State of West VirginiaCounty of Monongalia, to-wit:Taken, subscribed, and sworn to before me this 1<sup>st</sup> day of March, 2016.My Commission expires July 15<sup>th</sup>, 2020.**AFFIX SEAL HERE****NOTARY PUBLIC***Michael T. Vira*  
*Purchasing Affidavit (Revised 07/01/2012)*

# SVR-200 Vehicular Repeater

This manual is intended for use by qualified technicians and includes all necessary information pertaining to the SVR-200 operation, circuit design and maintenance. Changes that occur after date of printing will be incorporated in supplemental service publications.

# Foreword

## Scope of this manual

This manual contains the specifications, functional description, operating instructions, schematic, parts locator and parts list for the SVR-200 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-200 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-200 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-200 without an antenna or appropriate RF load connected to the antenna connector.
- Do not operate the SVR-200 in the presence of unshielded electrical blasting caps or explosive environmental conditions.
- Do not operate the SVR-200 while refueling the vehicle or in the presence of explosive fumes.
- Do not operate the SVR-200 with persons standing closer than 2 feet from the mobile or repeater antenna.

## FCC information

The SVR-200 complies with the FCC rules parts 90 and 22 for radio frequency transmitters. The user must apply for a license to operate the SVR-200 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-200 should be included in the FCC license application:

	VHF	UHF	700/800/900 MHz
Type Acceptance:	LRUSVR-200VB	LRUSVR-200U	LRUSVR-200M
Output Power:	0.25-2.0W	0.25-2.0W	100mW-600mW
Emission designator:	11K0F3E/16K0F3E	11K0F3E/16K0F3E	11K0F3E/16K0F3E
Frequency band:	150-174 MHz	400-512MHz	764-806(700M), 806-824 or 850-870(800M) 897-902 or 936-941 (900M)
Number of Channels:	1/14	1/14	1/14

## Specifications

<b>Transmitter:</b>	<b>VHF</b>	<b>UHF</b>	<b>700/800/900 MHz</b>
Frequency Range:	150-174MHz	405-425MHz (UA) <sup>1</sup> 450-470MHz (UD) 470-490MHz (UE) <sup>1</sup>	764-776, 794-806 (MC,MD) 806-824, 850-870 (MB,MA) 897-902, 936-941 (ME,MF)
Rf power out:	250mW - 2W	250mW - 2W	100mW - 600mW
Spurious emissions:	-50dBc	-50 dBc	-50dBc
Freq stability -30°~+60°C:	1.5 PPM	1.5 PPM	1.5 PPM
Modulation:	16K0F3E/11K0F3E	16K0F3E/11K0F3E	16K0F3E <sup>2</sup> /11K0F3E
Hum and Noise:	-40/-37dB(25/12.5kHz)	-40/-37dB(25/12.5kHz)	-40/-37dB(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-200VB	LRUSVR-200U	LRUSVR-200M
Industry Canada Approval:	2390 195458A	2390 212 113A	2390A-SVR200M

### Receiver:

Frequency Range:	150-174MHz	405-425MHz (UA) <sup>1</sup> 450-470MHz (UD) 470-490MHz (UE) <sup>1</sup>	764-776, 794-806 (MC,MD) 806-824, 850-870 (MB,MA) 897-902, 936-941 (ME,MF)
RF sensitivity:	.35μV	.35μV	.35μV
Squelch sensitivity:	.2μV to 2μV adjustable	.2μV to 2μV adjustable	.2μV to 2μV adjustable
Modulation acceptance:	±7.5/±3.75kHz	±7.5/±3.75kHz	±7.5 <sup>2</sup> /±3.75kHz
Selectivity:	60/57dB(25/12.5kHz)	60/57dB(25/12.5kHz)	50dB
Spurious/image rejection:	60db	60db	60db
IMD response:	60db	60db	60db
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	13.6VDC	13.6VDC	13.6VDC
Standby	170mA	170mA	170mA
Receive	250mA	250mA	250mA
Transmit	1 A @ 2W	1.5A @ 2W	700mA @ 600mW

### Physical:

Dimensions:	5.275"W x 6"L x 1.12"H
Weight:	18 oz.
Case:	One piece extruded aluminium

<sup>1</sup>405-425 and 470-490 available as special order Only

<sup>2</sup>16K0F3E & ±7.5kHz available on 806-824 and 850-870 MHz Only

## *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. The use of low power pre-selector cavities may be placed in line with the repeater antenna cable since it is simplex and low power.

### ***Important Note***

The SVR-200 operates on simplex frequencies; part of the multi-vehicle format dictates that all of the SVR-200s 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. 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.***

When the user leaves the vehicle, they activate the SVR-200 via their mobile radio front panel or a separate switch. When the mobile radio is receiving carrier and proper tone, the SVR-200 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. The SVR-200 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-200 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.

The SVR-200 has a fixed 3 minute time out timer for base-to-portable transmissions. If the mobile COR is active for more than 3 minutes (and the SVR-200 is the priority unit) it will send a double blip and cease transmission until the mobile COR is inactive. The 3 minute time-out is in affect regardless of whether the SVR-200 is programmed for priority sampling or not.

### ***Multi-vehicle operation***

When the SVR-200 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-200 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-200 will not transmit it's 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-200s 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-200s 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-200s unkeys to check for handheld activity, it will detect the presence of the other active SVR-200 and increment its priority counter and cease transmission. This is the self clearing mode to prevent radio collisions.

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-200 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-200 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 CTCSS (or a different CTCSS); the SVR-200 only responds to carrier and proper tone from the handhelds.

### ***Trunking operation***

When the SVR-200 is connected to a trunking mobile and the handheld operator wishes to access the system, they key their handheld briefly then release. The SVR-200 will attempt to acquire a voice channel on the trunking system by keying the mobile for 200mS 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-200 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-200 will transmit intercept tone to alert the handheld operator that the call attempt failed.

When the SVR-200 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 merely 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-200 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-200 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.

### ***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: Should be on steady during programming operations only. If OPT LED flashes at 10Hz rate, it is an indication that the PLL did not lock within the allotted 50mS and the unit should be serviced.

# Installation

Before installing the SVR-200, ensure that the RF and repeater sections are properly aligned per the tuning instructions on pages 8-14 of this manual. Additionally, ensure that the SVR-200 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 U1B will have an adjustment range of 0-100 mVPP. If J1 is removed, U1B 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-200 installation decreases local microphone audio at the mobile.
- J3 Used for testing the SVR-200 receiver and setting the lock tone deviation transmit level. If JP3 is shorted at power up, the SVR-200 receiver will be active all of the time and receiver audio will be heard at the speaker regardless of the repeater squelch setting or CTCSS tone decoded. Remove the jumper and turn the SVR-200 off to return to normal operation. If JP3 is shorted while power is applied, the SVR-200 will go into transmit mode and send lock tone for as long as the jumper is shorted. Remove the jumper to return to normal operation.
- J4 Used to internally tie the local mic input of the SVR-200 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-200 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)
- J11 Removing J11 adds 100K ohm resistor in series with SVR-200 mobile transmit audio path. Used for situations where mobile radio has noise on transmit audio.
- J12 Enables external speaker circuit.

***Make the connections between the mobile radio and the SVR-200 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 before pre-emphasis, ensure that the SVR-200 is programmed for de-emphasis (common data). If connected after pre-emphasis, ensure that the SVR-200 transmit audio path is programmed as flat. 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).  
*White*

- Pin 3:  
*Blue* Remote enable/disable. Connect to the radio's auxiliary output or a separate switch to remotely 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.
- 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 collector output rated at 100mA at 50VDC.
- Pin 5:  
*Red* 12 VDC input. Connect to the radios 12V switched supply or a point capable of supplying at least 1.5A 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 before de-emphasis, ensure that the SVR-200 receive path is programmed as flat (common data). If connected after de-emphasis, program the receive path for pre-emphasis. 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-200 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-200 uses a voltage comparator as a COR threshold detector. RV1 sets the mobile COR threshold level and should be set for half way between the mute and unmute levels at pin 7. Example: If Pin 7 is connected to a point that goes from 0VDC (mute) to 5VDC (unmute), set RV1 for 2.5VDC and program the mobile COR line as active high. If Pin 7 goes between 7.2VDC (mute) and 5.8VDC (unmute), set RV1 for 6.5VDC and program the mobile COR line as active low.
- Pin 8:  
*Brown* Local mic audio. If programmed for local mic repeat, the SVR-200 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-200 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.**

Install the SVR-200 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-200 mounts in the bracket using the four 8-32 x 1/4" machine screws. Do not use longer screws to mount the SVR-200 to the bracket or circuit damage may result.

## Alignment VHF

Before aligning the SVR-200, ensure that the mobile radio is aligned per the manufacturer's service procedure; Ensure that the SVR-200 is properly programmed and the jumpers are set per the previous section. In order to properly align the SVR-200, you will need two service monitors and the mobile radio that the repeater will be installed with. Refer to figure 1 for alignment points.

Dis-assemble the repeater by removing the two cap screws on the rear panel and the phillips screw on the bottom. Slide the main circuit board out of the housing with the rear panel attached. Connect one service monitor to the SVR-200 TNC jack and the other to the mobile antenna jack. Connect the cable from the mobile radio to the SVR-200 (See figure 4 on page 14). Turn on the mobile and activate the SVR-200.

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

### SVR-200 VHF Transmitter

1. **Transmitter Output:** Short J3 and adjust RV10 for maximum. Confirm the SVR-200 RF Power out is at least 2W. Adjust RV10 for 250 mW. The SVR-200 case is integral to the voltage regulator heat sink and the unit should not transmit at full power when removed from the case for extended periods.
2. **Transmitter frequency:** Adjust the TCXO on the RF board for the transmit frequency.
3. **Maximum deviation/lock tone deviation:** Adjust RV7 (lock tone deviation) for maximum. If the SVR-200 is programmed for sub-audible encode, adjust RV6 (CTCSS) for minimum. Adjust RV8 (repeater deviation) for 95% deviation. Adjust RV7 for 60% deviation. Remove J3.
4. **Mobile COR:** Measure the voltage at TP2 on the SVR-200 main PCB and record. 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. Turn the mobile service monitor off and adjust RV1 on the SVR-200 main board for the halfway point between the two voltage readings as read at pin 3 of U1.
5. **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-200 mobile COR and repeater PTT LED's are on. Adjust RV5 on the SVR-200 main board for 60% deviation as read on the service monitor connected to the SVR-200. If programmed for sub-audible encode, remove the 1kHz tone deviation from the mobile service monitor and adjust RV6 on the SVR-200 main board for 15% deviation. Turn the RF output from the mobile service monitor off and ensure that the SVR-200 mobile COR and repeater PTT LEDs are off.
6. **Local mic repeat:** If the SVR-200 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-200 repeater PTT LED is on; adjust RV2 for 60% deviation as read on the service monitor connected to the SVR-200. Unkey the mobile radio.
7. **RF power out:** Short J3 and adjust RV10 for the operating power output. Open J3.

**VHF Receiver**

1. **Receiver front end:** Connect a DC voltmeter to TP1 on the SVR-200 main board. Set the service monitor connected to the SVR-200 to the generate mode, receive frequency with a 1kHz tone and 60% deviation. Adjust the RF output of the monitor for a 1VDC reading at TP1. Adjust L1-L5 on the RF board for a maximum reading at TP1.
2. **Repeater squelch:** Adjust the service monitor RF output for .5μV. Adjust RV9 on the SVR-200 main board so the repeater COR LED is just on. Decrease the service monitor RF output to .3μV and ensure that the repeater COR LED is off.
3. **Transmit audio output:** Adjust the service monitor RF output for 1mV. Turn the CTCSS modulation on and set for 15% deviation. Confirm that the repeater COR, CTCSS and mobile PTT LED's are on. Adjust RV3 on the SVR-200 main board for 60% deviation as read on the service monitor connected to the mobile radio.
4. **Local Rx audio:** Connect an 8 ohm speaker to P4 and set RV4 for the desired listening level. Turn off the CTCSS modulation of the service monitor connected to the SVR-200. Confirm that the repeater CTCSS and mobile PTT LED's are off.
5. **Lock Tone Decode:** Change the 1kHz tone modulation to the lock tone frequency. Confirm that the PRI LED goes off after approximately .5 seconds.

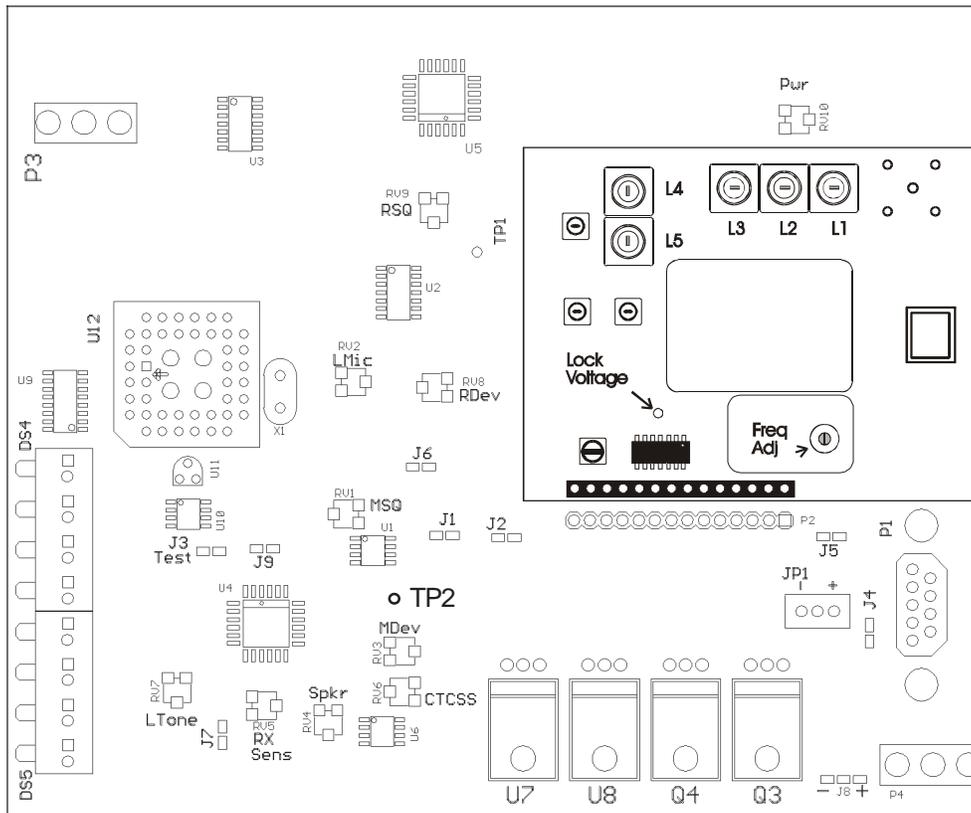


Figure 1

## *Alignment UHF*

Before aligning the SVR-200, ensure that the mobile radio is aligned per the manufacturer's service procedure; Ensure that the SVR-200 is properly programmed and the jumpers are set per the previous section. In order to properly align the SVR-200, you will need two service monitors and the mobile radio that the repeater will be installed with. Refer to figure 2 for alignment points.

Dis-assemble the repeater by removing the two cap screws on the rear panel and the phillips screw on the bottom. Slide the main circuit board out of the housing with the rear panel attached. Connect one service monitor to the SVR-200 TNC jack and the other to the mobile antenna jack. Connect the cable from the mobile radio to the SVR-200 (See figure 4 on page 14). Turn on the mobile and activate the SVR-200.

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

### *SVR-200 UHF Transmitter*

1. **Transmitter Output:** Short J3 and adjust RV10 for maximum. Confirm the SVR-200 RF Power out is at least 2W . Adjust RV10 for 250 mW. The SVR-200 case is integral to the voltage regulator heat sink and the unit should not transmit at full power when removed from the case for extended periods.
2. **Transmitter frequency:** Adjust the TCXO on the RF board for the transmit frequency.
3. **Maximum deviation/lock tone deviation:** Adjust RV7 (lock tone deviation) for maximum. If the SVR-200 is programmed for sub-audible encode, adjust RV6 (CTCSS) for minimum. Adjust RV8 (repeater deviation) for 95% deviation. Adjust RV7 for 60% deviation. Remove J3.
4. **Mobile COR:** Measure the voltage at TP2 on the SVR-200 main PCB and record. Set the mobile service monitor for the mobile receive frequency, 1mV RF output and CTCSS modulation of 15%. Measure the voltage again at TP2 and record. Turn the mobile service monitor off and adjust RV1 on the SVR-200 main board for the halfway point between the two voltage readings as read at pin 3 of U1.
5. **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-200 mobile COR and repeater PTT LED's are on. Adjust RV5 on the SVR-200 main board for 60% deviation as read on the service monitor connected to the SVR-200. If programmed for sub-audible encode, remove the 1kHz tone deviation from the mobile service monitor and adjust RV6 on the SVR-200 main board for 15% deviation. Turn the RF output from the mobile service monitor off and ensure that the SVR-200 mobile COR and repeater PTT LEDs are off.
6. **Local mic repeat:** If the SVR-200 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-200 repeater PTT LED is on; adjust RV2 for 60% deviation as read on the service monitor connected to the SVR-200. Unkey the mobile radio.
7. **RF power out:** Short J3 and adjust RV10 for the operating power output. Open J3.

**UHF Receiver**

1. **Receiver front end:** Connect a DC voltmeter to TP1 on the SVR-200 main board. Set the service monitor connected to the SVR-200 to the generate mode, receive frequency with a 1kHz tone and 60% deviation. Adjust the RF output of the monitor for a 1VDC reading at TP1. Adjust BPF1 and BPF2 on the RF board for a maximum reading at TP1.
2. **Repeater squelch:** Adjust the service monitor RF output for  $.5\mu\text{V}$ . Adjust RV9 on the SVR-200 main board so the repeater COR LED is just on. Decrease the service monitor RF output to  $.35\mu\text{V}$  and ensure that the repeater COR LED is off.
3. **Transmit audio output:** Adjust the service monitor RF output for 1mV. Turn the CTCSS modulation on and set for 15% deviation. Confirm that the repeater COR, CTCSS and mobile PTT LED's are on. Adjust RV3 on the SVR-200 main board for 60% deviation as read on the service monitor connected to the mobile radio.
4. **Local Rx audio:** Connect an 8 ohm speaker to P4 and set RV4 for the desired listening level. Turn off the CTCSS modulation of the service monitor connected to the SVR-200. Confirm that the repeater CTCSS and mobile PTT LED's are off.
5. **Lock Tone Decode:** Change the 1kHz tone modulation to the lock tone frequency. Confirm that the PRI LED goes off after approximately .5 seconds.

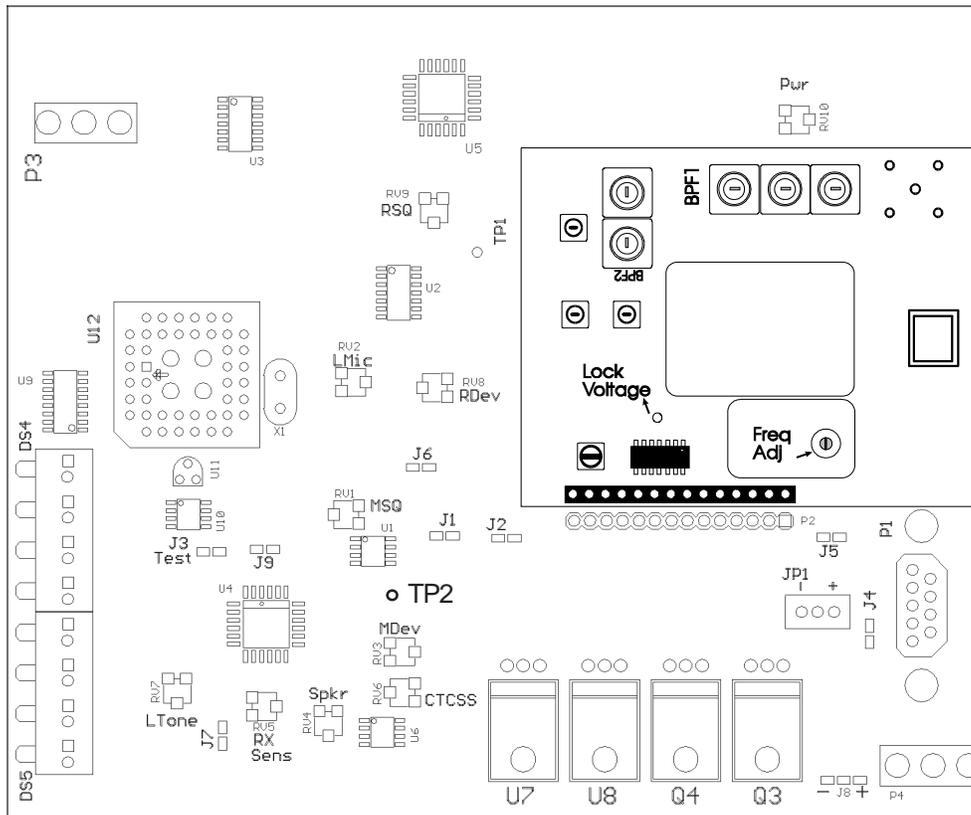


Figure 2

## *Alignment 700/800/900 MHz*

Before aligning the SVR-200, ensure that the mobile radio is aligned per the manufacturer's service procedure; Ensure that the SVR-200 is properly programmed and the jumpers are set per the previous section. In order to properly align the SVR-200, you will need two service monitors and the mobile radio that the repeater will be installed with. Refer to figure 3 for alignment points.

Dis-assemble the repeater by removing the two cap screws on the rear panel and the phillips screw on the bottom. Slide the main circuit board out of the housing with the rear panel attached. Connect one service monitor to the SVR-200 TNC jack and the other to the mobile antenna jack. Connect the cable from the mobile radio to the SVR-200 (See figure 4 on page 14). Turn on the mobile and activate the SVR-200.

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

### *SVR-200 700/800/900 MHz Transmitter*

1. **Transmitter Output:** Short J3 and adjust RV10 for maximum. Confirm the power out is at least 600mW. Adjust RV10 for 100 mW. The SVR-200 case is integral to the voltage regulator heat sink and the unit should not transmit at full power when removed from the case for extended periods.
2. **Transmitter frequency:** Adjust the TCXO on the RF board for the transmit frequency  $\pm 100$  Hz.
3. **Maximum deviation/lock tone deviation:** Adjust RV7 (lock tone deviation) for maximum. If the SVR-200 is programmed for sub-audible encode, adjust RV6 (CTCSS) for minimum. Adjust RV8 (repeater deviation) for 95% deviation. Adjust RV7 for 60% deviation. Remove J3.
4. **Mobile COR:** Measure the voltage at TP2 on the SVR-200 main PCB and record. Set the mobile service monitor for the mobile receive frequency, 1mV RF output and CTCSS modulation of 15%. Measure the voltage again at TP2 and record. Turn the mobile service monitor off and adjust RV1 on the SVR-200 main board for the halfway point between the two voltage readings as read at pin 3 of U1.
5. **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-200 mobile COR and repeater PTT LED's are on. Adjust RV5 on the SVR-200 main board for 60% deviation as read on the service monitor connected to the SVR-200. If programmed for sub-audible encode, remove the 1kHz tone deviation from the mobile service monitor and adjust RV6 on the SVR-200 main board for 15% deviation. Turn the RF output from the mobile service monitor off and ensure that the SVR-200 mobile COR and repeater PTT LEDs are off.
6. **Local mic repeat:** If the SVR-200 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-200 repeater PTT LED is on; adjust RV2 for 60% deviation as read on the service monitor connected to the SVR-200. Unkey the mobile radio.
7. **RF power out:** Short J3 and adjust RV10 for the operating power output. Open J3.

**700/800/900 MHz Receiver**

1. **Receiver front end:** Connect a DC voltmeter to TP1 on the SVR-200 main board. Set the service monitor connected to the SVR-200 to the generate mode, receive frequency at  $.5\mu\text{V}$  RF output with a 1kHz tone and 60% deviation. Confirm a reading of  $1\text{VDC} \pm .2\text{VDC}$  at TP1.
2. **Repeater squelch:** Adjust the service monitor RF output for  $.5\mu\text{V}$ . Adjust RV9 on the SVR-200 main board so the repeater COR LED is just on. Decrease the service monitor RF output to  $.25\mu\text{V}$  and ensure that the repeater COR LED is off.
3. **Transmit audio output:** Adjust the service monitor RF output for 1mV. Turn the CTCSS modulation on and set for 15% deviation. Confirm that the repeater COR, CTCSS and mobile PTT LED's are on. Adjust RV3 on the SVR-200 main board for 60% deviation as read on the service monitor connected to the mobile radio.
4. **Local Rx audio:** Connect an 8 ohm speaker to P4 and set RV4 for the desired listening level. Turn off the CTCSS modulation of the service monitor connected to the SVR-200. Confirm that the repeater CTCSS and mobile PTT LED's are off.
5. **Lock Tone Decode:** Change the 1kHz tone modulation to the lock tone frequency. Confirm that the PRI LED goes off after approximately .5 seconds.

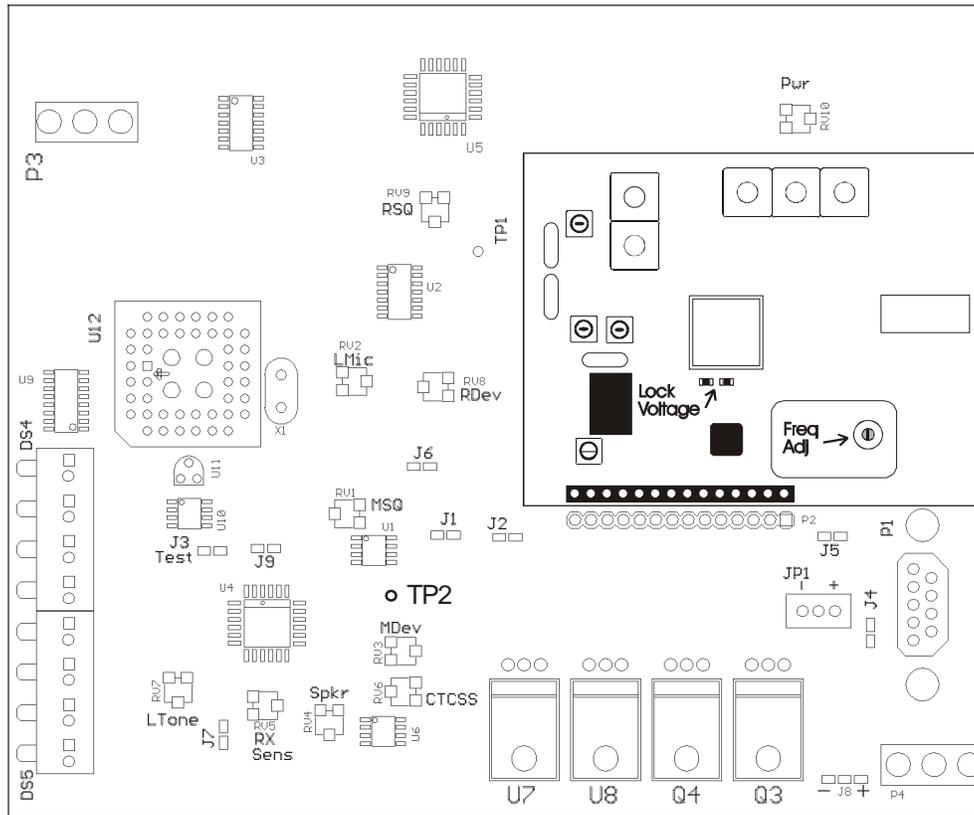


Figure 3

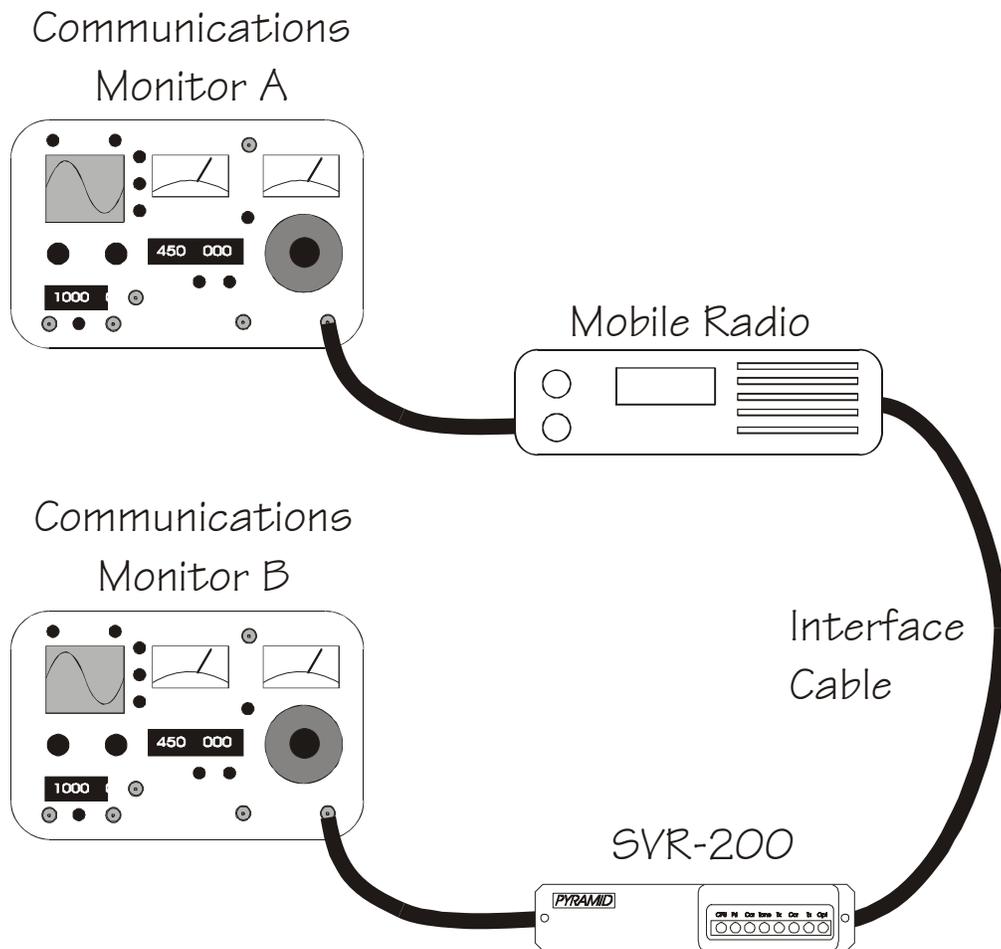


Figure4

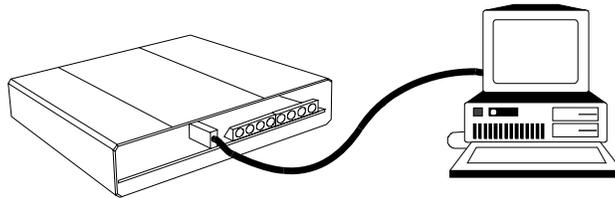
# Programming

## Using the Software

The SVRCPS personalization software is used to program the SVR-200 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-200 start the software and ensure the FY-1 programming cable is plugged into the correct serial port. The com port may be selected under the "Transfer" menu. Plug the FY-1 programming cable into P3 on the front of the SVR-200; the OPT LED on the SVR-200 front panel should be on continuously:



## 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 .VR2 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 .VR2 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.

### Data

**Frequencies:** Enter the transmit and receive frequencies and select the encode and decode sub-audio data. The program will automatically round off the frequencies to the nearest channel step if incorrect data is entered. To enter VHF offset frequencies (6.25kHz channel steps), go to common data and select the "VHF Offset" band. To disable sub-audio encode operation, select "-----"; sub-audio decode cannot be disabled.

**Common data:** Controls all of the options and input polarities of the SVR-200. Make sure all of the settings are correct for the type of mobile radio the repeater is connected to or improper operation may result.

**File name:** This data is stored in the E<sup>2</sup>PROM of the SVR-200 during downloads.

**Model:** Select either SVR-200 (single frequency) or SVR-214 (14 channel).

**Band:** Select the proper frequency band to correspond with the model SVR-200 you are programming. This selection is automatically set by reading the SVR-200. The IF frequency, injection side and channel step are displayed next to the band selection. Select VHF Offset band for 6.25kHz channel steps.

**Mobile COR polarity:** Determines if the COR signal from the mobile is active high or active low.

**Radio Type:** Select either conventional or trunking. If a trunking mobile is selected, the SVR-200 will go through the voice channel acquisition procedure during portable-to-base repeat mode.

**On-air polarity:** Select either active high or active low. This line is used to monitor the local mobile PTT for local mic repeat on conventional radios. On trunking radios, it is also used to determine if the mobile is actually transmitting.

**TX Audio:** If the mobile transmit audio output from the SVR-200 is connected after pre-emphasis in the mobile, select **Flat** response. If connected before pre-emphasis or to the mic input, select **De-Emp**.

**RX Audio:** If the receive audio coming from the mobile is connected to the discriminator or before de-emphasis, select **Flat** response. If connected after de-emphasis, select **Pre-Emp**.

**Lock Tone:** Select either 682.5, 832.5 or 847.5 Hz. All units in the system must have the same lock tone frequency.

**Local mic repeat:** Enables or disables the local mic repeat function; if enabled, ensure that the on-air polarity input is correctly configured.

**Courtesy Blip:** (Firmware version 3.02 & above) Enables or disables the courtesy tone at the end of each portable-to-base transmission. The tone verifies the handheld is within range of the repeater and transmission was successful. It also serves to notify other handheld users that the channel is clear for use.

**Pri-sampling:** Enables or disables the pri-sampling feature of the SVR-200. **If used in multi-vehicle applications, this must be enabled for proper operation.** During base-to-portable repeat mode, the SVR-200 transmitter will switch to receive mode to check for other repeaters or handheld activity. If another repeater is detected (carrier without/wrong tone) the repeater will cease activity to prevent radio “collisions”. If handheld activity is detected (carrier & correct tone) the SVR-200 will switch to portable-to-base repeat mode.

**Sampling rate:** If pri-sampling is enabled, this selects the sampling interval. The range is 0.25 seconds to 2.5 seconds in .25 second increments. The higher this setting, the longer the handheld operator must wait before speaking after pressing PTT during base-to-portable repeat mode, since the repeater may still be in transmit mode (there is no delay if the repeater is idle). If the interval is too short, some users may complain about the “chop” that is heard in the handhelds.

## **Transfer**

**Send:** Downloads the current configuration to the repeater. The program will prompt you to make the FY-1 connection before downloading. Download takes approximately 5 seconds.

**Receive:** Uploads the current data from the repeater. The program will prompt you to make the FY-1 connection before uploading. Upload takes approximately 4 seconds.

**Comm Port:** Selects the serial port to use for uploading and downloading between the PC and the SVR-200. Comm ports 1-4 are supported.

## **Help**

Help is available at any time by clicking the left mouse button on the HELP icon on the right side of the tool bar. The help is context sensitive and will depend upon where the cursor is located on particular menu displayed.

## Theory of Operation

### Receiver:

The receiver is a double-conversion superheterodyne type, designed for narrow band FM reception. The first local oscillator is derived from the frequency synthesizer. The second LO is crystal controlled.

**RF Stage:** The incoming RF signal from the antenna jack is directed to the first RF bandpass filter to improve selectivity and then to the input of the RF amplifier. The output of the RF amplifier is then presented to a second bandpass filter.

**First LO/Mixer:** The first LO signal is developed by the synthesizer and is mixed with the incoming signal to produce the first IF frequency (45 MHz). The IF frequency is filtered by FL1A and FL1B and amplified by the IF amplifier before being presented to the second LO/Mixer IC.

**Second LO/Mixer:** The first I.F. signal is presented to the second IF IC (MC3371) which performs the functions of second LO, second I.F. amp and mixer, FM discriminator and squelch. The second LO crystal (44.545 MHz) is mixed with the 45 MHz first I.F. signal to produce the second I.F. frequency of 455 kHz. A 6 pole ceramic filter provides selectivity for the 455 kHz signal.

**Detector/Squelch:** The MC3371 demodulates the 455 kHz signal via quadrature coil to produce the audio and noise components. The output of the MC3371 is the recovered audio and the RSSI voltage (receiver signal strength indicator) which is compared by the controller board with a threshold voltage level for squelch setting.

### VHF Transmitter

The output of VCO buffer U8 is input to the predriver transistor U7. The output of U7 drives the RF driver Q8. The collector of Q8 is fed by the transmit 9V line from Q10. The final amp Q13 is a class C power amplifier and drives the output lowpass and harmonic filter, C47-C50 and L20-L22. D3 is the transmit output switch and L19 is a  $\frac{1}{4}$  wave transmission line to isolate the receiver switching diode D2. RF output power is controlled by changing the bias on the gate of Q13 via the TX 9V line (pin 3) from the controller PCB.

### UHF Transmitter

The output of VCO buffer U6 is input to the predriver transistor U5. The output of U5 drives the RF driver transistor Q4. The collector of Q4 is fed by the transmit 9V line from Q5. The final amp Q3 is a class C power amplifier and drives the output lowpass and harmonic filter, C39-C42 and L26-L28. D3 is the transmit output switch and L14 is a  $\frac{1}{4}$  wave transmission line to isolate the receiver switching diode D2. RF output power is controlled by changing the bias on the gate of Q3 via the TX 9V line (pin 3) from the controller PCB.

### 700/800/900 MHz Transmitter

The output of the transmit VCO is buffered by U5 input to the driver transistor U1. The output of U1 drives the RF hybrid output amp U4 through lowpass filter FL3. The final amp U4 is a class C power amplifier and drives the output lowpass and harmonic filter FL4. U7 is the Tx/Rx antenna switch. RF output power is controlled by changing the voltage on pin 1 of U4 via the TX 9V line (pin 3) from the controller PCB.

### Control Board

**Power Supply:** DC power comes from the mobile radio via P1 pins 1 and 5. Fuse F1 and MOV VAR1 provide over current and voltage spike protection. Q3 is the remote enable/disable pass switch, controlled by Q1 and Q2 via P1 pin 3. Q3 output is switched 12VDC and is presented to audio amp U6, and voltage regulators U7 and U8. Bias voltage for the op-amp circuits is provided by voltage divider R68, R69 and buffer amp U2A.

**Transmit audio path:** Receiver audio from the mobile is input to the mic amp portion of U4; PC programming of the SVR-200 provides flat response or +6db/octave pre-emphasis. The output of the mic amp is internally connected to the limiter and lowpass filter. When a condition to repeat exists (base-to-portable) U4 audio is switched on and audio is presented to amplifier/limiter and lowpass filter to remove audio components above 3kHz. U4 provides -48db/octave of attenuation to out of band signals. Transmit audio is output on pin 22 of U4 and passes through the final lowpass filter U2C to remove any clock noise generated by U4's switched capacitive filters before being presented to the RF module on P2 pin 6.

**Receive audio path:** Receiver audio from the transceiver module is input on P2 pin 13 and presented to U5 pin 10 and pin 16. Pin 10 is the input of the receiver highpass filter to remove any sub-audible signals before being output on pin 11 and sent to U4 for receiver audio processing. Pin 16 is the input to the sub-audible tone decoder section of U5. Receive audio entering pin 7 of U4 is processed as flat, or -6db/octave depending upon PC programming. The receive audio then passes through the internal lowpass filters to remove unwanted noise and output on pin 21, where it is sent to the local receiver audio amp and mobile transmit audio output amp U1B. J1 selects either high sensitivity (open) or low sensitivity (shorted) and J2 selects the output impedance (600/2.2K Ohms).

**Sub-Audible tone signalling:** U5 processes the sub-audible signal from the receiver by comparing the incoming signal to previous samples in a noise correlator. If the signal is sufficiently coherent, the output of the comparator is counted by the internal circuitry and an interrupt is generated to the main microprocessor. U12 reads the data from U5 in 2 bytes: byte one contains the number of complete cycles detected within 122mS, and byte 2 contains the number of internal clock cycles elapsed for the remainder. U12 performs a comparison of minimum and maximum values allowed in a look up table and determines if the data is within the decode bandwidth for the programmed tone.

**In band tone signalling:** Audio from the transceiver is also fed to U3B where it is amplified and limited for input to the commutating switched capacitive filter made up by C23-C26 and P0.4-P0.7 of the microprocessor. The microprocessor outputs four identical signals with 90° phase difference on the respective port pins. The resultant wave form will be a function of the difference between the incoming signal frequency and the decode frequency output by the microprocessor. The signal is buffered by U3C and amplified by U3A before being rectified and filtered by D1 and C2. The resulting DC voltage is compared to the reference voltage by U3D. If the incoming signal is within the decode bandwidth, the output of U3D will be a logic 1 and read by the microprocessor.

**Logic and control:** U12 is an Atmel 89C52 microprocessor with flash E<sup>2</sup>PROM memory. The microprocessor provides all of the logic and control functions for the repeater including mobile/repeater PTT output, local mobile PTT sense, mobile transmitter activity sense, audio switching, in-band & CTCSS detect, and repeater status indications via DS4 and DS5 led arrays.

The 89C52 has four 8 bit ports that interface with the rest of the hardware on the controller board; a brief description of each port follows:

- P0.0-0.3 Channel Selector input; used only on SVR-214 version.
- P0.4-0.7 These four lines make up the input to the switched capacitive filter network of C23-C26. During receive mode, the lock tone frequency will be output on each of these lines with a 90° phase difference between them at any given time. During transmit mode, these lines are in active and open collector.
- P1.0-P1.2 LED data is output on P1.0 line every 10mSec. Data is loaded into shift register U9 8 bits at a time and is clocked by P1.1. P1.2 latches the data into U9 for display.
- P1.3 PLL latch enable output to the RF module. During transmit to receive and receive to transmit transitions, this line is used to latch the serial data into the PLL shift registers. The serial data and clock lines are shared with U10 (E<sup>2</sup>PROM) U4 (audio processor) and U5 (sub-audio processor).
- P1.4 E<sup>2</sup>PROM chip enable, active high. Data is output to the E<sup>2</sup>PROM on P1.6 and clocked by P1.5. Data is input from the E<sup>2</sup>PROM on P1.7. P1.4 will go active during read and write operations with U10. U10 is written to every time the unit is programmed. U10 is read only at power up.

- P1.5 Serial clock line output. Serial data that is sent to the PLL, the E<sup>2</sup>PROM and the audio processor chips are clocked by each low-high-low transition on this line.
- P1.6 Serial data output. Data sent to U10, U4 and U5 are output on this line and clocked by P1.5.
- P1.7 Data input to the microprocessor. Serial data is read from U10 (E<sup>2</sup>PROM) and U5 (sub-audio processor) on this line.
- P2.0 Lock tone output. Lock tone encode is generated by this pin at power up and during lock tone test mode. All of the queuing tones are also generated by this pin for trunking operation.
- P2.1 Lock tone decode input, active high. The output of lock tone decoder U3D is input on this line and checked during receiver activity. If lock tone is detected, the microprocessor increments its priority counter and ceases activity as priority unit.
- P2.2 Repeater Tx enable. This line is used to turn on the TX 9V signal to the RF PCB. The output drives buffers Q7 and Q6. The output of Q6 switches Q4 on during transmit for TX 9V. RV10 and APC circuit U13 are used to set the TX 9V level for RF power control.
- P2.3 Mobile PTT output, active low. This line is brought low to key the mobile radio during portable-to-base repeat operations.
- P2.4 Mobile COR input. U1A is a threshold detector for the mobile COR input on pin 7 of P1. The output of U1A is read by the microprocessor on this port to determine if the SVR-200 should repeat base to portable. Polarity of this input is determined by PC programming.
- P2.5 Repeater COR input, active low. RSSI output from the RF module is sent to threshold detector U2D for comparison with the squelch setting at RV9. R47 and R70 provide hysteresis to prevent chatter. Repeater COR is used to enable the CTCSS decoder circuitry; the microprocessor will not decode the signal from U5 unless repeater COR is also active.
- P2.6 Chip select output for U4 (audio processor), active low. Serial data is sent to U4 on P1.6 and clocked by P1.5. These lines are shared by U5, U10 and the PLL; data is ignored by U4 unless the chip select line is asserted during data write operations.
- P2.7 Chip select output for U5 (sub-audio processor), active low. Serial data is sent to U5 on P1.6 and clocked by P1.5. These lines are shared by U4, U10 and the PLL; data is ignored by U5 unless the chip select line is asserted during data read and write operations.
- INT0 External interrupt #0. This line monitors the PLL lock detector output. The line is active high to indicate the PLL is functioning on frequency during transmit-receive and receive to transmit changes. The output will go briefly unlocked, then revert back to a locked condition. If the PLL does not achieve lock within 50mS, the transmitter will be disabled and the OPT LED will flash rapidly to alert the user that the unit should be brought in for service.
- INT1 External interrupt #1 active low. This line is used by U5 to signal the microprocessor that it has completed a decode cycle and data can be read. During receiver activity, this line will go active approximately every 122 mS in the presence of sub-audio signalling. During transmit mode and receiver activity without sub-audio signalling, this line will be inactive.

T0	<p>Test input, active low. Shorting J3 puts the microprocessor into test mode for alignment purposes. If shorted at power up, the receiver will operate open squelch mode and audio will be heard at the local speaker port regardless of carrier or tone input to the receiver. Although alignment is normally done with the RSSI output at TP1, a Sinad reading can be obtained using this mode of the test input. All other functions of the SVR-200 are disabled in this mode and power will have to be turned off then on to reset the unit.</p> <p>If J3 is shorted after power has been applied, the microprocessor will enter the lock tone test mode, key the repeater and send the programmed lock tone for as long as J3 is shorted. Remove the short from J3 to return to normal operation.</p>
T1	<p>On-air detect input. The on-air detect line (P1 pin 9) is used to detect local mic PTT from the mobile, and in trunking mode, this line is used to detect that the mobile transmitter is actually on the air. The input is buffered by Q10 and the polarity of the signal is determined by PC programming.</p>
WR	<p>Turns the Rx 5V line on or off to the RF PCB.</p>
RD	<p>Detects the version of RF PCB installed (UHF only).</p>
TXD	<p>Transmit data output for programming. Data is sent to the PC on this line at 300 baud, 8 data bits, 1 stop bit and no parity. This line is active only during programming mode.</p>
RXD	<p>Receive data input for programming. Data is received from the PC on this line at 300 baud, 8 data bits, 1 stop bit and no parity. This line is also used to sense when the programming cable is inserted. If RXD is grounded, the SVR-200 operates in the normal mode. If this line is high, programming mode is entered and the OPT LED is on continuously.</p>
Reset	<p>Active high input to reset the microprocessor. U11 provides a 350mSec delayed high signal to this pin during power up or if the 5V line falls below 4.5VDC.</p>
Xtal	<p>The microprocessor uses a 4.032MHz xtal for all of the timing and program execution clock cycles. The output of the on board oscillator also drives the xtal input to U5. The output of U5 xtal oscillator drives the input of U4.</p>

*Notes*

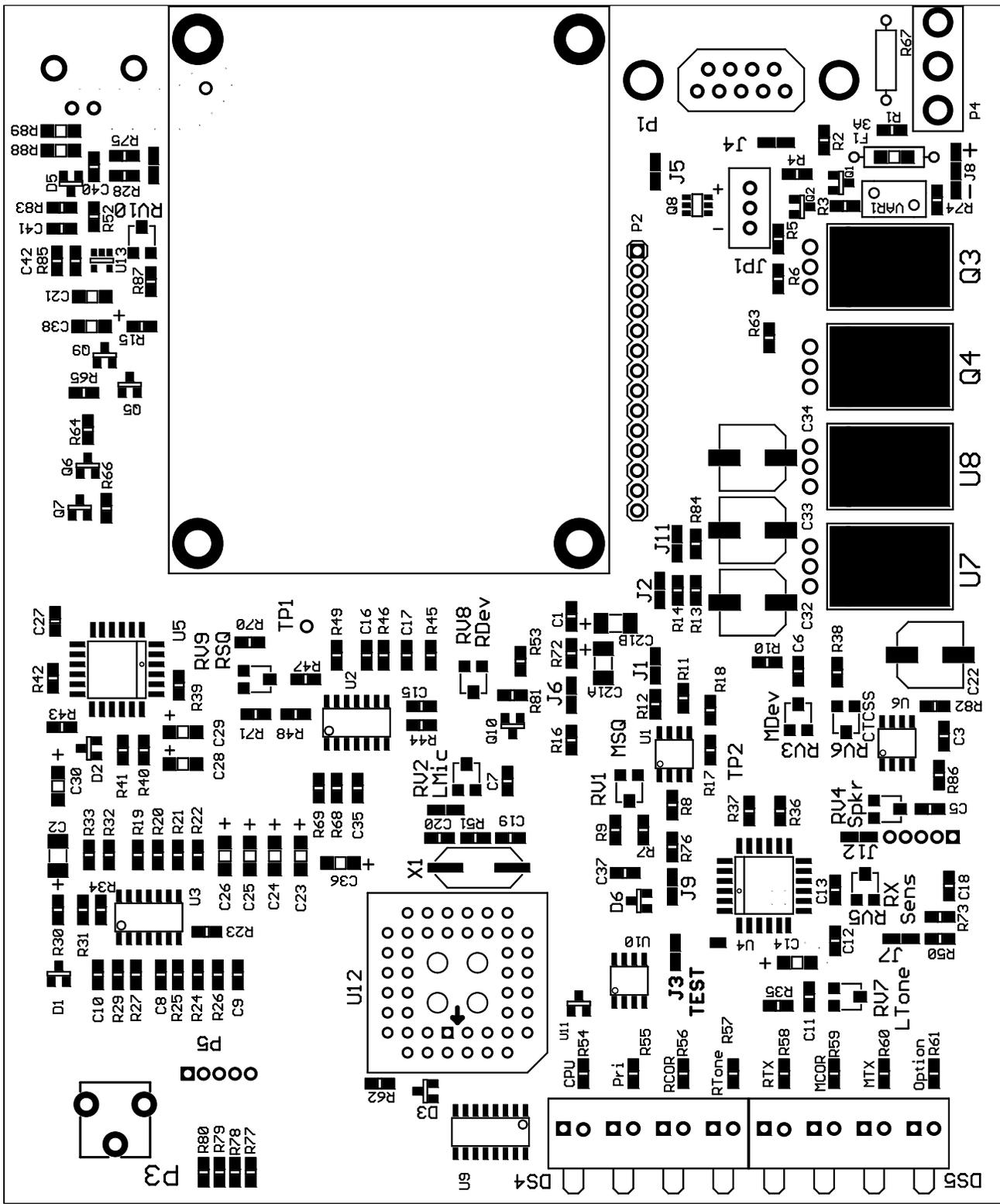
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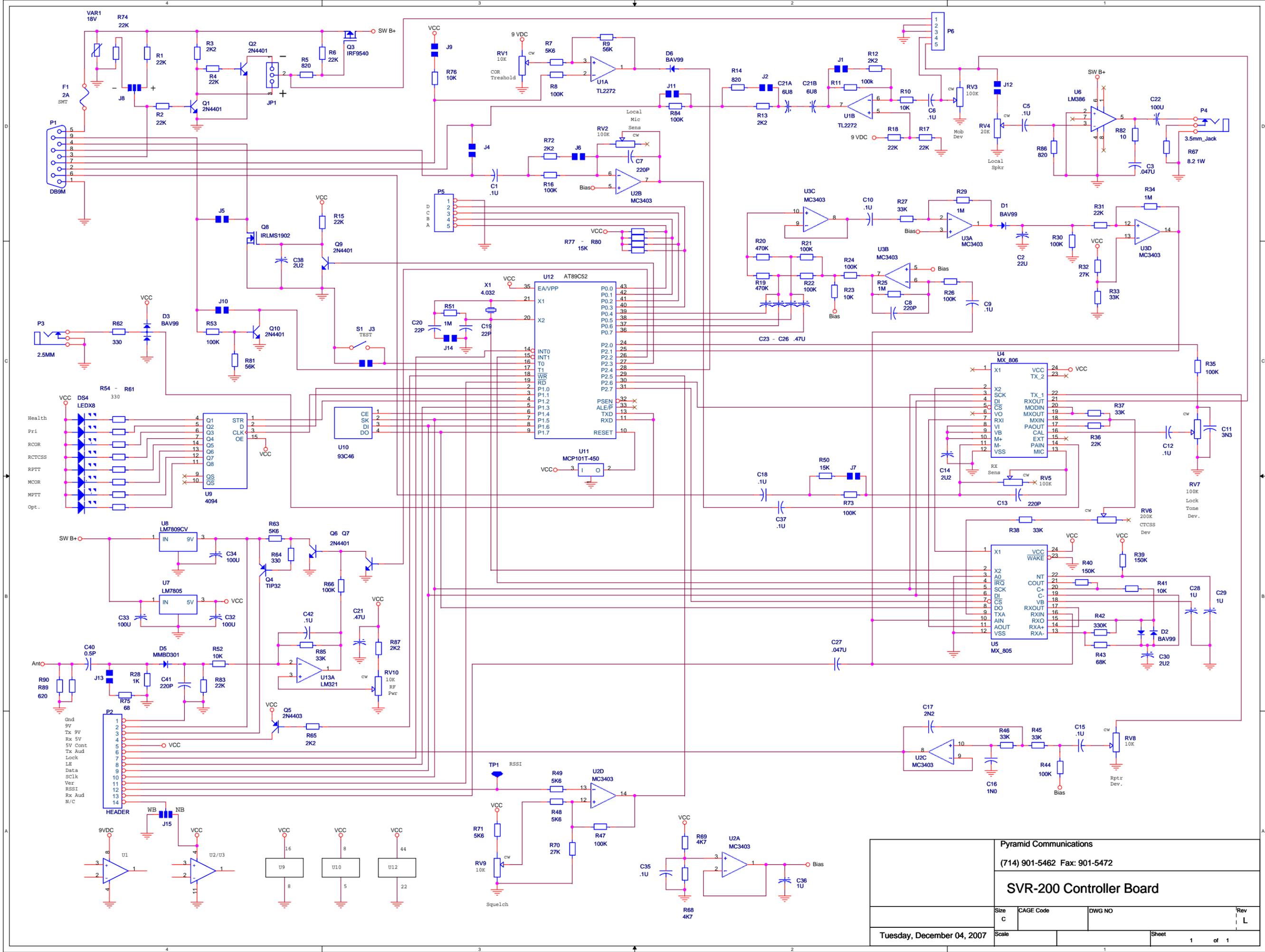
## Parts List

Reference	Description	Part #
C1,C5,C6,C9,C10,C12,C15,C18,C35,C37	1 $\mu$ Fd chip capacitor	1010-03-5104
C2	22 $\mu$ Fd 16V tantalum chip capacitor	1610-25-6226
C3,C27	.047 $\mu$ Fd chip capacitor	1010-03-5473
C7,C8,C13,C41	220pFd chip capacitor	1010-03-5221
C11	.0033 $\mu$ Fd chip capacitor	1010-03-5332
C16	1000pFd chip capacitor	1010-03-5102
C17	.0022 $\mu$ Fd chip capacitor	1010-03-5222
C19,C20	22pFd chip capacitor	1010-03-5220
C40	0.5pFd chip capacitor	1010-03-5050
C21A,C21B	6.8 $\mu$ Fd tantalum chip capacitor	1610-05-6685
C22,C32,C33,C34	100 $\mu$ Fd electrolytic cap	1400-08-7107
C21,C23,C24,C25,C26	0.47 $\mu$ Fd tantalum chip capacitor	1610-04-6474
C28,C29,C36	1.0 $\mu$ Fd tantalum chip capacitor	1610-04-6105
C14,C30,C38	2.2 $\mu$ Fd tantalum chip capacitor	1610-04-6225
D1,D2,D3,D6	BAV99 dual diode SOT23	3110-01-0099
D4,D5	Schotkey diode SOT23	3110-01-0301
DS4/DS5	8 position multi-color LED	4003-08-0200
F1	2A SMT Pica fuse	2610-04-0020
JP1	0.1" 3 position vertical header	7300-53-0103
P1	DB-9 M right angle PCB	7400-00-0011
P2	0.1" 14 position vertical header	7300-83-0114
P3	2.5mm RA programming jack	7401-02-0250
P4	3.5mm RA speaker jack	7401-02-0051
Q1,Q2,Q6,Q7,Q9,Q10	2N4401 NPN transistor SOT23	3010-01-4401
Q3	IRF-9540 P Ch MOSFET TO220	3300-08-9540
Q4	TIP 32 PNP transistor TO220	3000-08-0032
Q5	2N4403 PNP transistor SOT23	3010-01-4403
Q8	NPN Darlington SOT23	3010-01-0038
RV1,RV8,RV9,RV10	10K 3mm SMT pot	2030-08-8103
RV2,RV3,RV5,RV7	100K 3mm SMT pot	2030-08-8104
RV4	20K 3mm SMT pot	2030-08-8203
RV6	200K 3mm SMT pot	2030-08-8204
R82	10 Ohm chip resistor	2010-03-5100
R10,R23,R41,R52,R76	10K chip resistor	2010-03-5103
R8,R11,R16,R21,R22,R24,R26,R30,R35,R44, R47,R53,R66,R73	100K chip resistor	2010-03-5104
R1,R2,R4,R6,R15,R17,R18,R31,R36,R74,R83	22K chip resistor	2010-03-5223
R3,R12,R13,R65,R72,R87	2.2K chip resistor	2010-03-5222
R5,R14,R86	820 Ohm chip resistor	2010-03-5821
R7,R48,R49,R63,R71	5.6K chip resistor	2010-03-5562
R9,R81	56K chip resistor	2010-03-5563
R19,R20	470K chip resistor	2010-03-5474
R25,R29,R34,R51	1.0M chip resistor	2010-03-5105
R27,R33,R37,R38,R45,R46,R85	33K chip resistor	2010-03-5333
R32,R70	27K chip resistor	2010-03-5273
R39,R40	150K chip resistor	2010-03-5154
R42	330K chip resistor	2010-03-5334

**SVR-200 Service Manual**

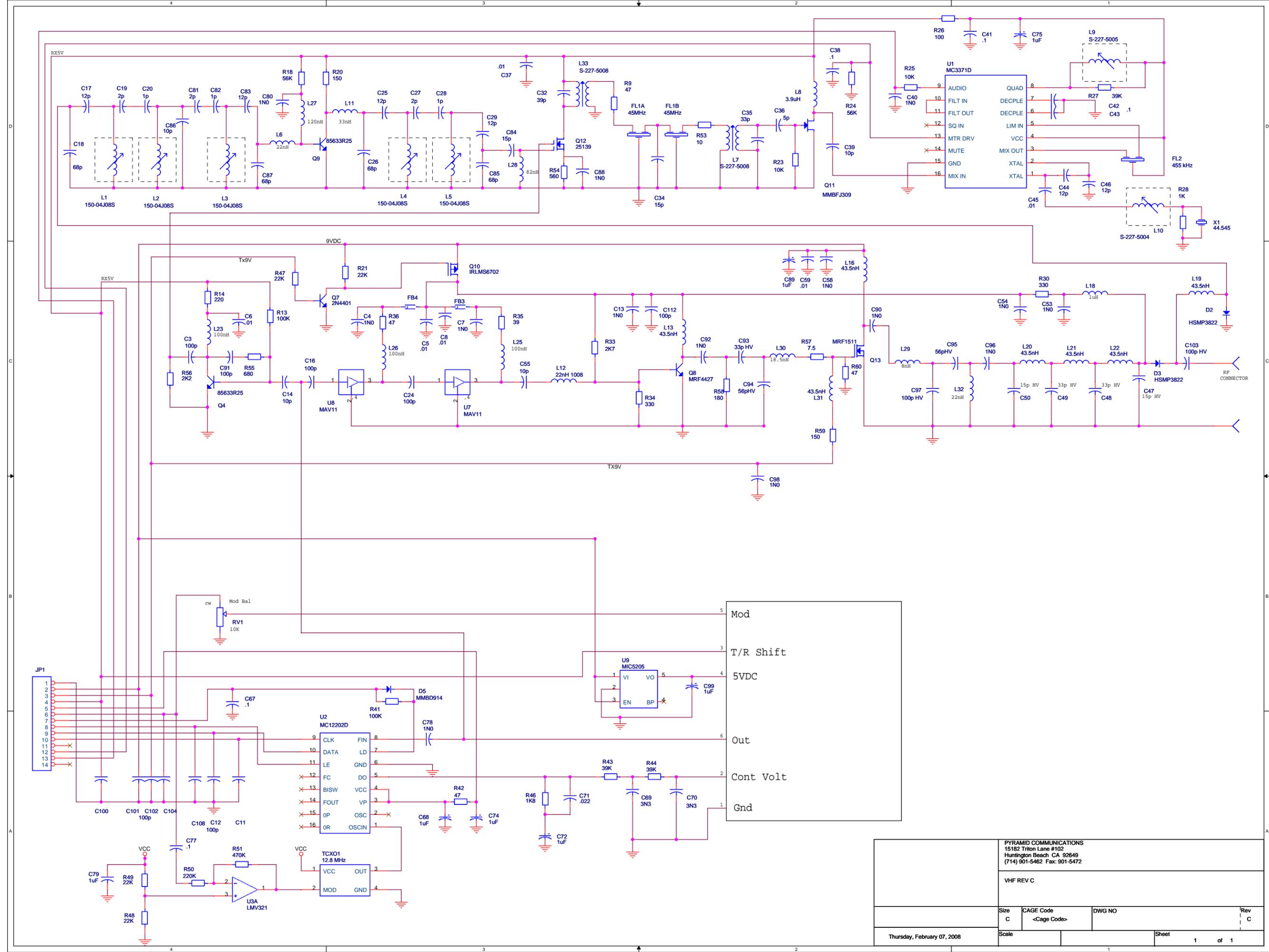
R50,R77-R80 .....	15K chip resistor .....	2010-03-5153
R54-R62,R64 .....	330 Ohm chip resistor .....	2010-03-5331
R68,R69 .....	4.7K chip resistor .....	2010-03-5472
R43 .....	68K chip resistor .....	2010-03-5683
R67 .....	8.2 Ohm 1W resistor .....	2000-10-5829
U1 .....	TS922 dual op-amp .....	3410-01-0922
U2,U3 .....	MC3403 quad op-amp .....	3410-01-3403
U4 .....	MX-806ALH audio processor .....	3710-02-0806
U5 .....	MX-805ALH sub-audio processor .....	3710-02-0805
U6 .....	LM386 audio amp .....	3410-01-0386
U7 .....	LM7805 1A regulator .....	3400-08-7805
U8 .....	LM7809CV 1.5A regulator .....	3400-08-7809
U9 .....	CD4094 shift register .....	3410-01-4094
U10 .....	93C46 1Kbit Serial E <sup>2</sup> PROM .....	3610-01-9346
U11 .....	MCP101-450 reset controller .....	3410-11-0450
U12 .....	AT89C52-12JC Microprocessor .....	3610-02-8952
U13 .....	LM321 opamp .....	3410-12-0321
X1 .....	4.032 MHz HC18/U .....	6000-07-4032
VAR1 .....	18V MOV .....	2580-02-0018
	Extruded aluminium case .....	8100-01-5010
	Aluminium end panel .....	8200-04-5010
	ABS Plastic front panel .....	8200-03-2502
	TNC PCB mount RA connector .....	7401-02-0007
	10ft. radio cable with DB-9F conn. ....	7500-10-1001
	Shorting block for JP1 .....	7200-03-0102
	TP1, RF Ant connection .....	7300-13-0101
	Mounting bracket .....	9600-05-0001
	RF interconnect board .....	9100-00-0001
	4-40 SS jack screw .....	8000-42-4404
	8-32 x 1/4" SS philips .....	8000-24-8324
	4-40 x 3/8" SS cap screw .....	8000-34-4406
	4-40 SS nut .....	8000-54-4400
	4-40 x 1/4" SS philips .....	8000-24-4404
	2-56 x 3/16" SS philips .....	8000-24-2563
	4-40 x 3/16" SS philips .....	8000-24-4403
	2-56 x 1/8" aluminium spacer .....	8000-65-2562
	Aluminium heat sink (U7 & U8) .....	8400-05-0001
	Right Angle heat sink (RF module) ....	8400-05-0007



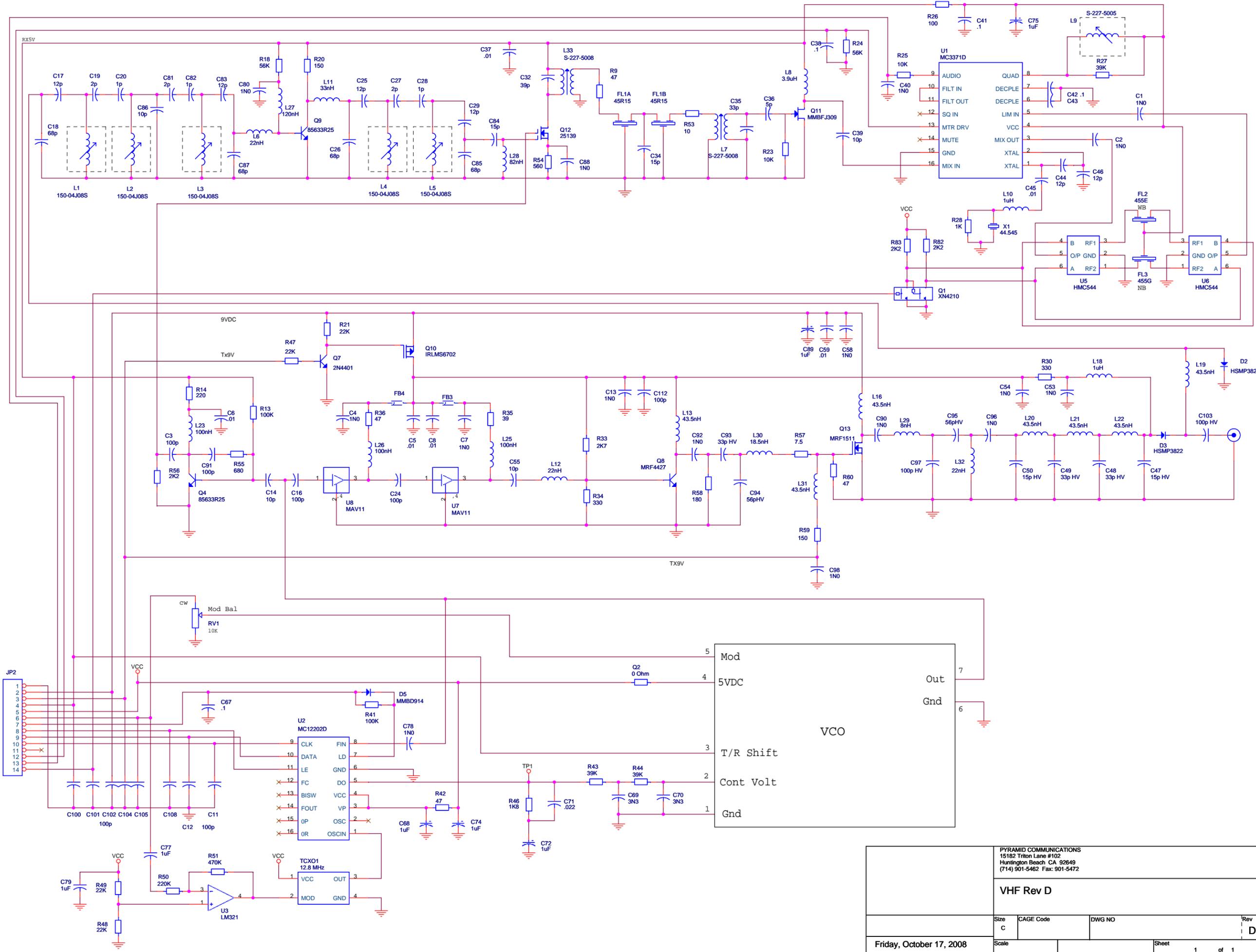


Pyramid Communications			
(714) 901-5462 Fax: 901-5472			
<b>SVR-200 Controller Board</b>			
Size C	CAGE Code	DWG NO	Rev L
Scale		Sheet 1 of 1	

Tuesday, December 04, 2007

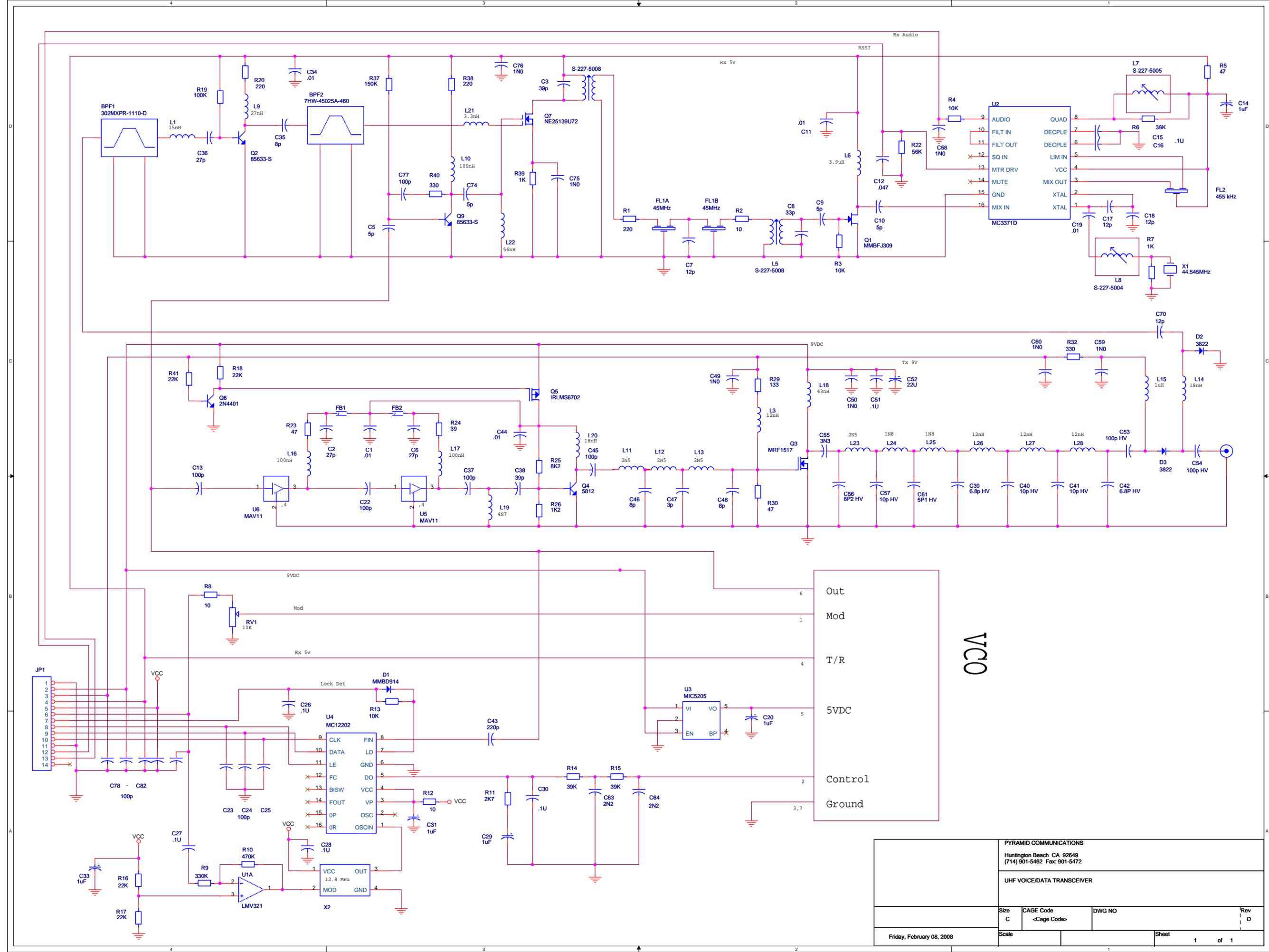


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VHF REV C	
Size C	CAGE Code <Cage Code>
Scale	DWG NO
Thursday, February 07, 2008	Sheet 1 of 1



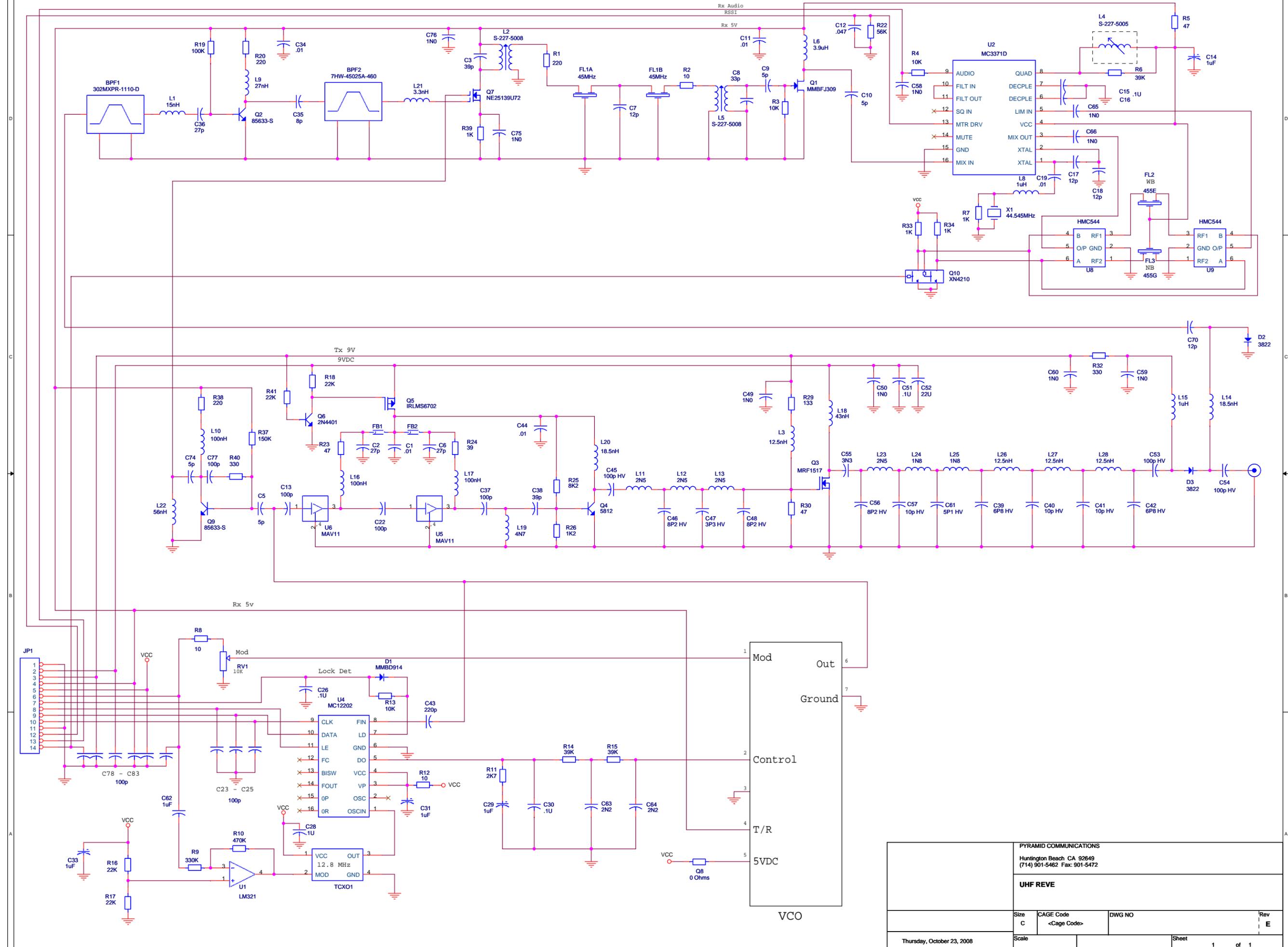
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<b>VHF Rev D</b>			
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Friday, October 17, 2008

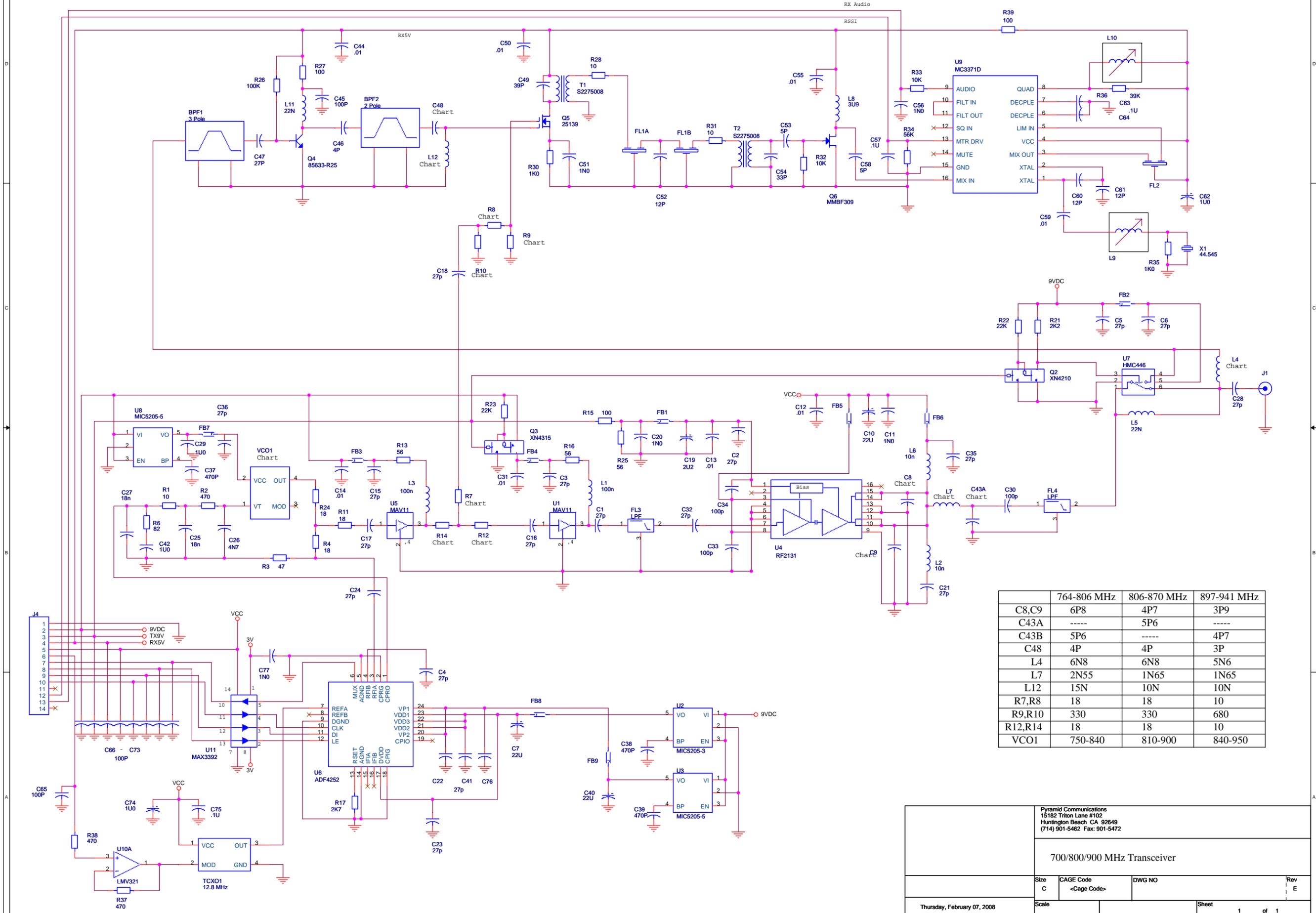


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UHF VOICE/DATA TRANSCEIVER			
Size C	CAGE Code <Cage Code>	DWG NO	Rev D
Scale		Sheet 1	of 1

Friday, February 08, 2008



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<b>UHF REVE</b>	
Size C	CAGE Code <Cage Code>
Scale	DWG NO
Thursday, October 23, 2008	Rev E
Sheet 1	of 1



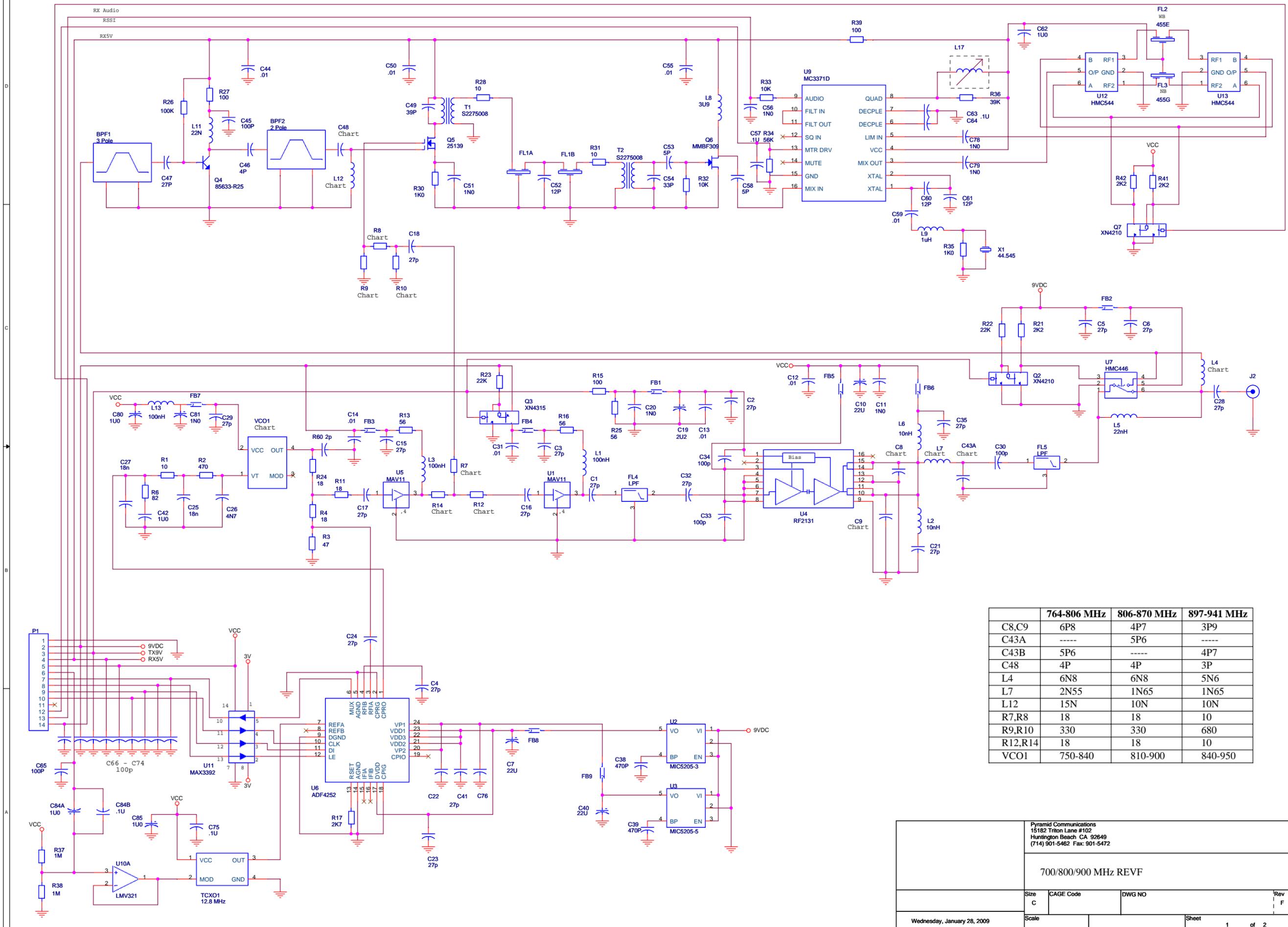
	764-806 MHz	806-870 MHz	897-941 MHz
C8,C9	6P8	4P7	3P9
C43A	-----	5P6	-----
C43B	5P6	-----	4P7
C48	4P	4P	3P
L4	6N8	6N8	5N6
L7	2N55	1N65	1N65
L12	15N	10N	10N
R7,R8	18	18	10
R9,R10	330	330	680
R12,R14	18	18	10
VCO1	750-840	810-900	840-950

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 Huntington Beach CA 92649  
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**700/800/900 MHz Transceiver**

Size C	CAGE Code <Cage Code>	DWG NO	Rev E
Scale		Sheet 1	of 1

Thursday, February 07, 2008



	764-806 MHz	806-870 MHz	897-941 MHz
C8,C9	6P8	4P7	3P9
C43A	-----	5P6	-----
C43B	5P6	-----	4P7
C48	4P	4P	3P
L4	6N8	6N8	5N6
L7	2N55	1N65	1N65
L12	15N	10N	10N
R7,R8	18	18	10
R9,R10	330	330	680
R12,R14	18	18	10
VCO1	750-840	810-900	840-950

Pyramid Communications  
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 Huntington Beach CA 92649  
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**700/800/900 MHz REV F**

Size C	CAGE Code	DWG NO	Rev F
Scale		Sheet 1	of 2

Wednesday, January 28, 2009

## State of West Virginia

# VENDOR PREFERENCE CERTIFICATE

Certification and application\* is hereby made for Preference in accordance with *West Virginia Code*, §5A-3-37. (Does not apply to construction contracts). *West Virginia Code*, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the *West Virginia Code*. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Vendor Preference, if applicable.

1.  **Application is made for 2.5% vendor preference for the reason checked:**  
 Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or**,  
 Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or** 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or**,  
 Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or**,
2.  **Application is made for 2.5% vendor preference for the reason checked:**  
 Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or**,
3.  **Application is made for 2.5% vendor preference for the reason checked:**  
 Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or**,
4.  **Application is made for 5% vendor preference for the reason checked:**  
 Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or**,
5.  **Application is made for 3.5% vendor preference who is a veteran for the reason checked:**  
 Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or**,
6.  **Application is made for 3.5% vendor preference who is a veteran for the reason checked:**  
 Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.
7.  **Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with *West Virginia Code* §5A-3-5B and *West Virginia Code of State Rules*.**  
 Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

**Under penalty of law for false swearing (*West Virginia Code*, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.**

Bidder: A.V. Loustomus Comm

Signed: Paul D. Joubert

Date: 3-1-16

Title: President