DANIELS™
ELECTRONICS LTD.

VHF ENHANCED RECEIVER INSTRUCTION MANUAL

Covers Models:

VR-3H035-SWA00

VR-3H045-SWA00

Module Manuals Included:

IM10-RX214

IM10-FE3H040

IM10-OS3AH

IM10-VR3H040CT

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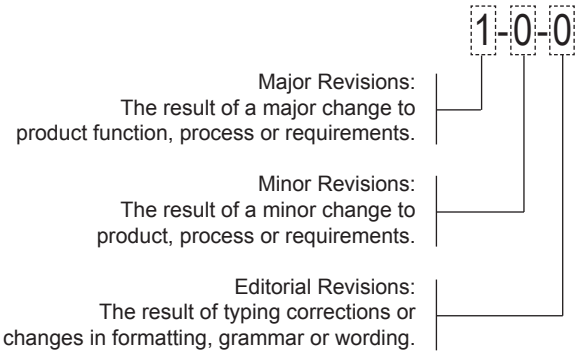
DOCUMENT CONTROL

This document has been produced, verified and controlled in accordance with Daniels Electronics' Quality Management System requirements.

Please report any errors or problems to Daniels Electronics' Customer Service Department.

DOCUMENT REVISION DEFINITION

Daniels Electronics Ltd. utilizes a three-level revision system. This system enables Daniels to identify the significance of a revision. Each element of the revision number signifies the scope of change as described in the diagram below.



Three-level revision numbers start at 1-0-0 for the first release. The appropriate element of the revision number is incremented by 1 for each subsequent revision, causing any digits to the right to be reset to 0.

For example:
If the current revision = 2-1-1 Then the next major revision = 3-0-0
If the current revision = 4-3-1 Then the next minor revision = 4-4-0
If the current revision = 3-2-2 Then the next editorial revision = 3-2-3

The complete revision history is provided at the back of the document.

NOTE

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

RF Exposure Warning

Exposure to radio frequency (RF) energy has been identified as a potential environmental factor that must be considered before a radio transmitter can be authorized or licensed. The FCC and IC have therefore developed maximum permissible exposure (MPE) limits for field strength and power density, listed in FCC 47 CFR § 1.1310 and IC RSS-102 Issue 2 Sect 4. The FCC has furthermore determined that determination of compliance with these exposure limits, and preparation of an Environmental Assessment (EA) if the limits are exceeded, is necessary only for facilities, operations and transmitters that fall into certain risk categories, listed in FCC 47 CFR § 1.1307 (b), Table 1. All other facilities, operations and transmitters are categorically excluded from making such studies or preparing an EA, except as indicated in FCC 47 CFR §§ 1.1307 (c) and (d).

Revised FCC OET Bulletin 65 (Edition 97-01) and IC RSS-102 Issue 2 provide assistance in determining whether a proposed or existing transmitting facility, operation or device complies with RF exposure limits. In accordance with OET Bulletin 65, FCC 47 CFR § 1.1307 (b) and RSS-102 Issue Sect 2.5, this Daniels Electronics Ltd. transmitter is categorically excluded from routine evaluation or preparing an EA for RF emissions and this exclusion is sufficient basis for assuming compliance with FCC/IC MPE limits. This exclusion is subject to the limits specified in FCC 47 CFR §§ 1.1307 (b), 1.1310 and IC RSS-102 Issue 2 Sect 4. Daniels Electronics Ltd. has no reason to believe that this excluded transmitter encompasses exceptional characteristics that could cause non-compliance.

Notes:

- The FCC and IC's exposure guidelines constitute exposure limits, not emission limits. They are relevant to locations that are accessible to workers or members of the public. Such access can be restricted or controlled by appropriate means (i.e. fences, warning signs, etc.).
- The FCC and IC's limits apply cumulatively to all sources of RF emissions affecting a given site. Sites exceeding these limits are subject to an EA and must provide test reports indicating compliance.

RF Safety Guidelines and Information

Base and Repeater radio transmitters are designed to generate and radiate RF energy by means of an external antenna, typically mounted at a significant height above ground to provide adequate signal coverage. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that permitted for successful communication. The following antenna installation guidelines are extracted from Appendix A from OET Bulletin 65 and must be adhered to in order to ensure RF exposure compliance:

Non-building-mounted Antennas:

Height above ground level to lowest point of antenna ≥ 10 m or
Power ≤ 1000 W ERP (1640 W EIRP)

Building-mounted Antennas:

Power ≤ 1000 W ERP (1640 W EIRP)

The following RF Safety Guidelines should be observed when working in or around transmitter sites:

- Do not work on or around any transmitting antenna while RF power is applied.
- Before working on an antenna, disable the appropriate transmitter and ensure a "DO NOT USE" or similar sign is placed on or near the PTT or key-up control.
- Assume all antennas are active unless specifically indicated otherwise.
- Never operate a transmitter with the cover removed.
- Ensure all personnel entering a transmitter site have electromagnetic energy awareness training.

For more information on RF energy exposure and compliance, please refer to the following:

1. FCC Code of Regulations; 47 CFR §§ 1.1307 and 1.1310.
2. FCC OET Bulletin 65, Edition 97-01, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".
3. http://www.fcc.gov/oet/rfsafety/
4. IC RSS-102 Issue 2, "Radio Frequency Exposure Compliance of Radio Communication Apparatus"

Contents

GENERAL INFORMATION

INTRODUCTION

The VR-3H040 Enhanced Receiver family provides high performance synthesized FM reception in 12.5 kHz or 20 / 25 kHz channels in one of two frequency bands: 29 to 38 MHz or 38 to 50 MHz. A modular design allows each of the receiver's three internal modules; 21.4 MHz FM IF / Audio Mainboard, FE3H Enhanced Preselector, and OS-3H Synthesizer to be individually assembled and tested; this facilitates construction, tuning, and general receiver maintenance. The internal synthesizer module may be programmed with up to 16 channels for remote frequency control applications.

The VR-3H040 Receiver family combines state of the art performance in a compact modular enclosure for applications ranging from remote mountain top repeaters to congested urban radio environments. Each receiver module is characterized by dependable, low maintenance performance under the most severe environmental conditions.

The VR-3H040 modular receiver family is compatible with all Daniel's subrack and base station enclosures.

MANUAL ORGANIZATION

The organization of this document reflects the modular construction of the VR-3 family of products. Each product is fully described within its respective sub-manual. In general, each of these sub-manuals contain:

- A functional description and specification summary
- A detailed technical description (Theory of Operation)
- Assembly, setup and alignment procedures relevant to the particular module

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NOTE: Material presented in a sub-manual may include information related to other module versions not directly applicable to the VR-3H040-S receiver family.

The following sub-manuals are contained within this document cluster:

IM10-RX214 21.4 IF / Audio Mainboard Instruction Manual:
This manual provides complete information on the operation of the 21.4 MHz FM IF / Audio Mainboard. The bulk of the material relating to receiver operation and installation can be found within this manual. The majority of receiver options (including channel selection) are accessed through the FM IF / Audio Mainboard. In addition, most of the external receiver connections are made through the FM IF / Audio Mainboard.

IM10-FE3H040 Enhanced Front End Instruction Manual:
This manual provides information on alignment and operation of the FE3H Preselector Module. The Preselector Module provides filtered low level RF signal amplification and down conversion to the IF frequency of 21.4 MHz.

IM10-OS3AH Enhanced Synthesizer Instruction Manual:
This manual provides information on alignment and operation of the Enhanced Synthesizer Module. The Synthesizer Module provides the low-noise first local oscillator signal to the FE3H Preselector module.

IM10-VR3H040CT VHF Enhanced Receiver Channel Designation Tables:
This manual provides tabular frequency / channel number assignment.

VR-3H040-S RECEIVER FAMILY MODELS

Two distinct receiver models in the VR-3H040 Receiver family cover 29 to 38 MHz and 38 to 50 MHz bands respectively, while operating in 12.5 kHz or 20 / 25 kHz occupied channel bandwidths. The models are as follows:

VR-3H035-SW
synthesized, 29–38 MHz band, 20 / 25 kHz channels

VR-3H045-SW
synthesized, 38–50 MHz band, 20 / 25 kHz channels

The frequency band of operation is determined by jumper selection and tuning adjustment in the OS-3H Synthesizer and Preselector modules. Channel bandwidth is determined by IF crystal and ceramic filter selections made to the FM IF / Audio Mainboard.

PERFORMANCE SPECIFICATIONS

Type:	MT-3 Series Synthesized Receiver
Family:	VR-3H040
Compatibility:	MT-2 and MT-3 Series Radio Systems
Frequency Range:	29 to 38 MHz or 38 to 50 MHz
System Impedance:	50 Ω (Type-N connector)
Frequency Generation:	Synthesizer Module (Internal)
Channel Spacing:	20 / 25 kHz
Channel Selection:	In 5.0 or 6.25 kHz increments selected through four internal BCD rotary switches
Number of Channels:	Preset capability for 16 channel memory selectable through four external logic control lines
Channel Switching Range:	±1 MHz; (38–50 MHz, no tuning adjustment) ±0.5 MHz; (29–38 MHz, no tuning adjustment)
Emission Designation:	16K0F3E; 20 / 25 kHz channel
Reference Sensitivity:	-118 dBm (.280 µV) for 12 dB SINAD
Local Oscillator Frequency Stability:	±5 ppm; -30°C to +60°C. (Optional -40°C to +60°C) Provision for external 10.0 MHz reference input
First IF:	21.4 MHz, 8-pole crystal filter
Second IF:	455 kHz, 10-element ceramic filter
Adjacent Channel Selectivity:	90 dB; 20 kHz channel
Spurious Response Immunity:	95 dB; 20 kHz channel
Intermodulation Rejection:	85 dB (In Band per TIA/EIA-603); Greater than 100 dB wide band (>±10 MHz from receive channel)
Conducted Spurious Output Power:	Less than -95 dBm from 455 kHz to 1 GHz
Hum and Noise Ratio:	55 dB; 20 kHz channel
Signal Displacement Bandwidth:	Greater than ± 3.5 kHz, 20 / 25 kHz channel (Radio Frequency Displacement) (TIA/EIA-603)
Audio Output:	600 Ω balanced or unbalanced line output De-emphasis output; +3 dBm maximum level Flat response output; +3 dBm maximum level * 2-watt high level 8 Ω audio output * 3.5 watt high level 4 Ω audio output
Audio Distortion:	Less than 2.0% THD at +25°C; less than 3.0% THD, -30°C to +60°C
De-emphasized Audio Response:	+1, -3 dB; (300 Hz to 3 kHz)
Flat Audio Response:	+2, -3 dB; (100 Hz to 3 kHz, 1 kHz ref deviation)

* Provided by SM-3 System Regulator or SR-3 Subrack

Performance Specifications (Continued)

Received Signal Strength Indicator:	1.0 VDC to 5.0 VDC linear output over 60 dB input signal level change
Receiver Attack Time:	Less than 10 ms
Receiver Closing Time:	Less than 10 ms
Squelch Hysteresis:	Adjustable from 2 dB to 20 dB
Squelch Threshold:	Adjustable from -123 to -105 dBm
Squelch Operation:	Noise based (standard) or optionally configured RSSI controlled
Front Panel Controls:	Receiver power On (Norm) / Off Squelch Disable (Push button)
COR Interface:	2 amp, 50 V open drain power MOSFET 100 mA, 30 V opto-isolator (optional) 2 amp, form-C electro-mechanical relay (optional)
Operating Voltage:	* +9.5 VDC
Operating Current:	Normal programmed options less than 380 mA
Operating Temperature Range:	-30°C to +60°C Standard -40°C to +60°C Optional Environmental Testing
Operating Humidity:	95% RH (non-condensing) at +25°C
IC Approval:	Complies with Industry Canada specification RSS-119 Issue 5
FCC ID:	H4JVR-3H040-S Certified as complying with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

* Provided by SM-3 System Regulator or SR-3 Subrack

INTERNALLY SELECTABLE OPTIONS – STANDARD

Voice Band Filter:	A jumper selectable 7-pole active filter that may be inserted in the de-emphasis or flat audio path. The filter exhibits sharp roll-off below 300 Hz and finds primary use in the removal of low frequency CTCSS tones from the repeat audio path.
Subtone Filter:	A jumper selectable 4-pole, low pass active filter with a cutoff frequency of 250 Hz. This filter provides clean CTCSS output with higher frequency (voice modulation) components removed. Useful for driving certain external tone decoders.
RSSI Squelch:	Receiver squelch triggered by the received signal strength indicator (RSSI) output. Provides up to 60 dB of squelch threshold range for specialized receiver applications. This squelch operating mode is more temperature- and modulation-sensitive than the standard noise-based method.

PHYSICAL SPECIFICATIONS

Physical Dimensions:	Width: 7.1 cm (2.8 in)	Height: 12.8 cm (5.05 in)	Depth: 19 cm (7.5 in)
Module Weight:	1.0 kg (2.2 lbs)		
Corrosion Prevention:	Anodized aluminum construction. Stainless steel hardware. Selectively conformal coated glass epoxy 2- and 4-layer printed circuit boards. Gold plated module connectors.		
Module Design:	Compact Eurostandard modular design. Plug-in modules mate with Daniels' standard MT3 repeater subrack. Subracks / modules comply with IEEE 1101, DIN 41494 and IEC 297-3 (mechanical size / modular arrangement).		
External Connections:	RF Connection. Type-N connector located on the receiver module front panel. Motherboard connections (Audio, Power, and Control) are made through a 48-pin, gold-plated, Type-F connector on the rear of the transmitter module. User connection is made through the mated motherboard assembly of the repeater subrack. Type-F standard connector complies with DIN 41612 Level 2 (200 mating cycles, 4-day 10 ppm SO2 gas test with no functional impairment and no change in contact resistance).		
Handle Text Colour:	Orange		

SYSTEM OVERVIEW

RECEIVER OPERATION

A VR-3H040 Receiver family is constructed using three primary modules:

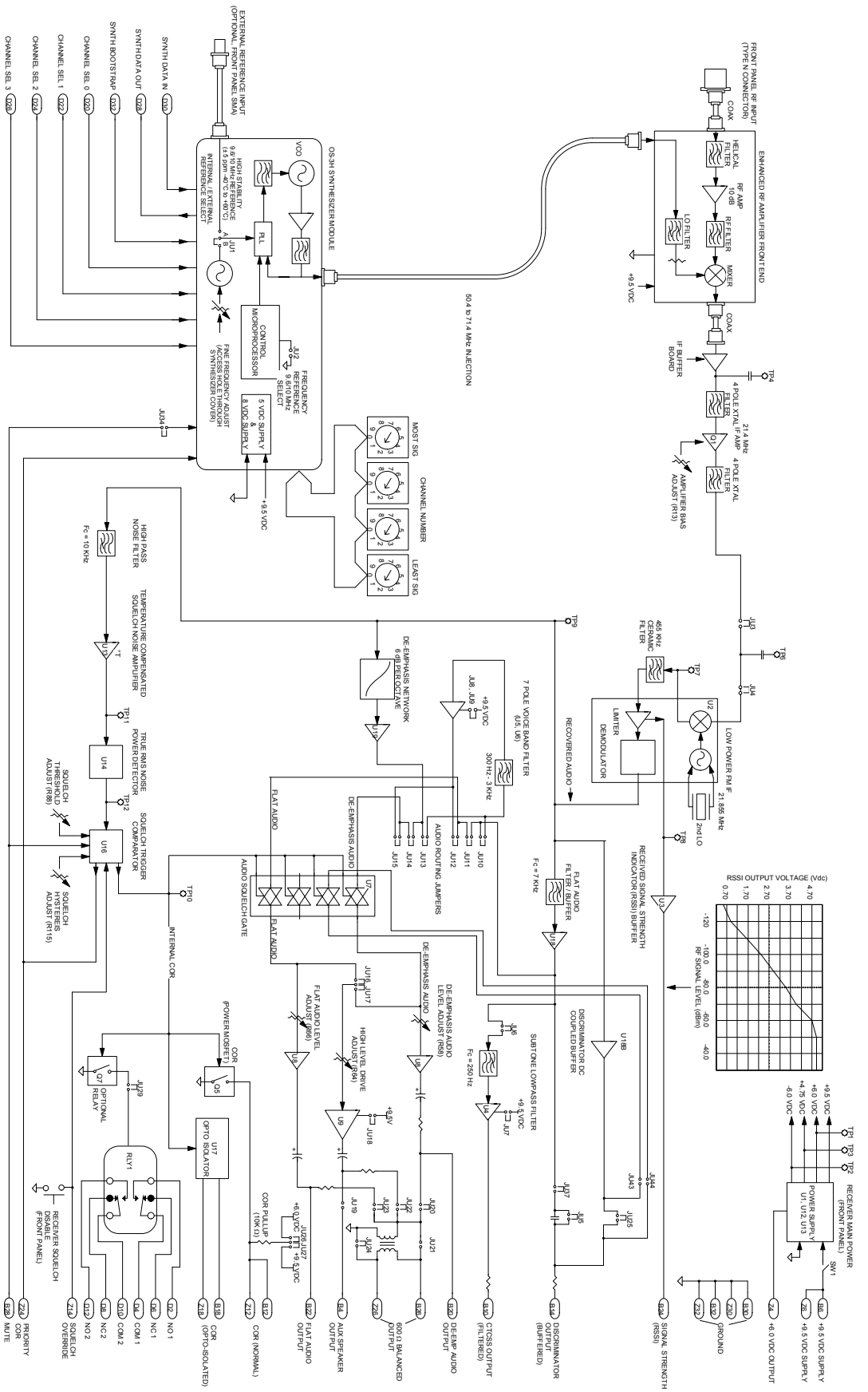
- FE3H Preselector module
- MT-3 Receiver FM IF / Audio Mainboard
- OSR-3H061 local oscillator synthesizer

All modules are integrated together by the FM IF / Audio Mainboard to provide a working receiver (see Figure 1: VR-3H040 Block Diagram).

The FE3H Preselector combines a low-noise bipolar amplifier with a cascaded, multiple pole, high selectivity coupled resonator filter structure. A high intercept point active mixer is also located within this module. The module has inputs for the RF signal (front panel Type-N connector), local oscillator input signal, and an output for the 21.4 MHz IF signal which connects directly to the FM IF / Audio Mainboard. For front panel orientation, see Figure 2.

Interconnections are made using quick connect SMB style connectors. A high selectivity narrow bandwidth of approximately 5 MHz, combined with high ultimate out-of-band signal rejection, greatly improves receiver spurious response and wide band intermodulation attenuation. Two Preselector modules, FE3H035 and FE3H045 provide frequency coverage from 29–38 MHz and 38–50 MHz respectively. Tuning within each frequency band is provided through five ferrite core slug adjustment points.

FIGURE 1: VR-3H040 BLOCK DIAGRAM



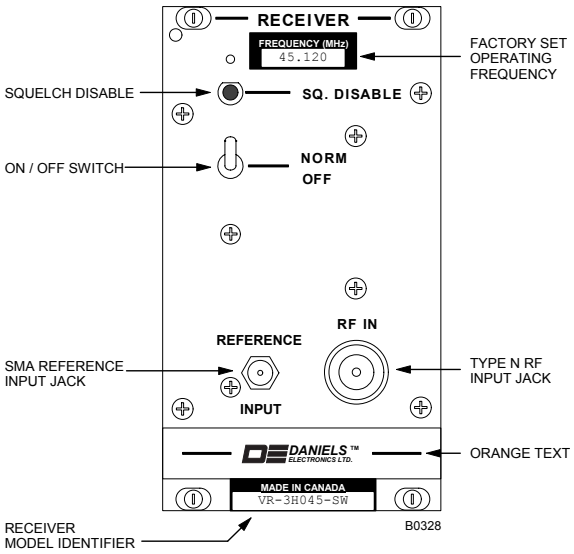


FIGURE 2: VR-3H040 Receiver Front Panel

The MT-3 Receiver FM IF / Audio Mainboard processes the low level 21.4 MHz RF signal from the FE3H Preselector. This processing includes:

- selective crystal filtering
- IF amplification
- second frequency conversion to 455 kHz
- final audio FM demodulation / amplification

The board provides a high degree of receiver flexibility by providing a number of different audio paths, audio levels and control interconnect options.

The OSR-3H061 Synthesizer Module produces a low-noise, high stability RF first local oscillator signal covering the frequency band of 50.4–71.4 MHz which translates to a receive frequency range of 29–50 MHz. It achieves a ±5 ppm frequency stability from -30°C to +60°C with its own internal TCXO reference, or it can be slaved to an external reference signal of desired stability.

FREQUENCY SELECTION

Receiver channel selection is achieved by setting a decimal number on four BCD frequency select switches, FSW1 through FSW4. These rotary switches are located on the FM IF / Audio Mainboard and are made accessible by removing the receiver's outer cover. The switch settings are scanned by the synthesizer module when the receiver is first powered up and the desired local oscillator frequency is generated.

To determine channel numbers and frequencies, refer to the following equations or, for simplified channel number and frequency information, see the Channel Designation Tables manual.

5 kHz Channel Increments

BCD switch settings from 0000 to 4999:

1. Multiply the switch setting by 5 kHz.
2. Add the result to the synthesizer base frequency.

Example: Base frequency is 29 MHz.
The selected channel number is 1590.
The frequency is:
((1590 x 5 kHz) + 29 MHz) = 36.9500 MHz

To determine the Channel Number for 36.9500 MHz:
(36.9500 MHz - 29 MHz) / 5 kHz = Chnl# 1590

6.25 kHz Channel Increments

BCD switch settings from 5000 to 9999:

1. Subtract 5000 from the switch setting.
2. Multiply the result by 6.25 kHz.
3. Add that result to the synthesizer base frequency.

Example: Base frequency is 29 MHz.
The selected channel number is 7528.
The frequency is:
(((7528-5000) x 6.25 kHz) + 29 MHz)
= 44.8000 MHz

To determine the Channel Number for 44.8000MHz:
((44.8000 MHz - 29 MHz) / 6.25 kHz) + 5000
= Chnl# 7528

A channel can be selected from a set of 15 (maximum possible) factory programmed channels by the four channel select lines available at the rear F-connector on the receiver mainboard. A single user-selectable channel is set by switches located on the receiver mainboard (see IM10-RX214 21.4 IF / Audio Mainboard Instruction Manual).

RECEIVER ASSEMBLY AND ADJUSTMENT

All modules and the front panel are mounted on the receiver mainboard, which then forms a single assembly. The FE3H Preselector is attached with two front panel screws and one screw through the rear Type-F connector. The synthesizer must be removed to access for tuning. An enclosure is formed by an extruded aluminum shell that slides over the receiver mainboard (see Figure 3: VR-3H040 Receiver Exploded View Diagram). The enclosure is completed by the installation of side and front panel screws.

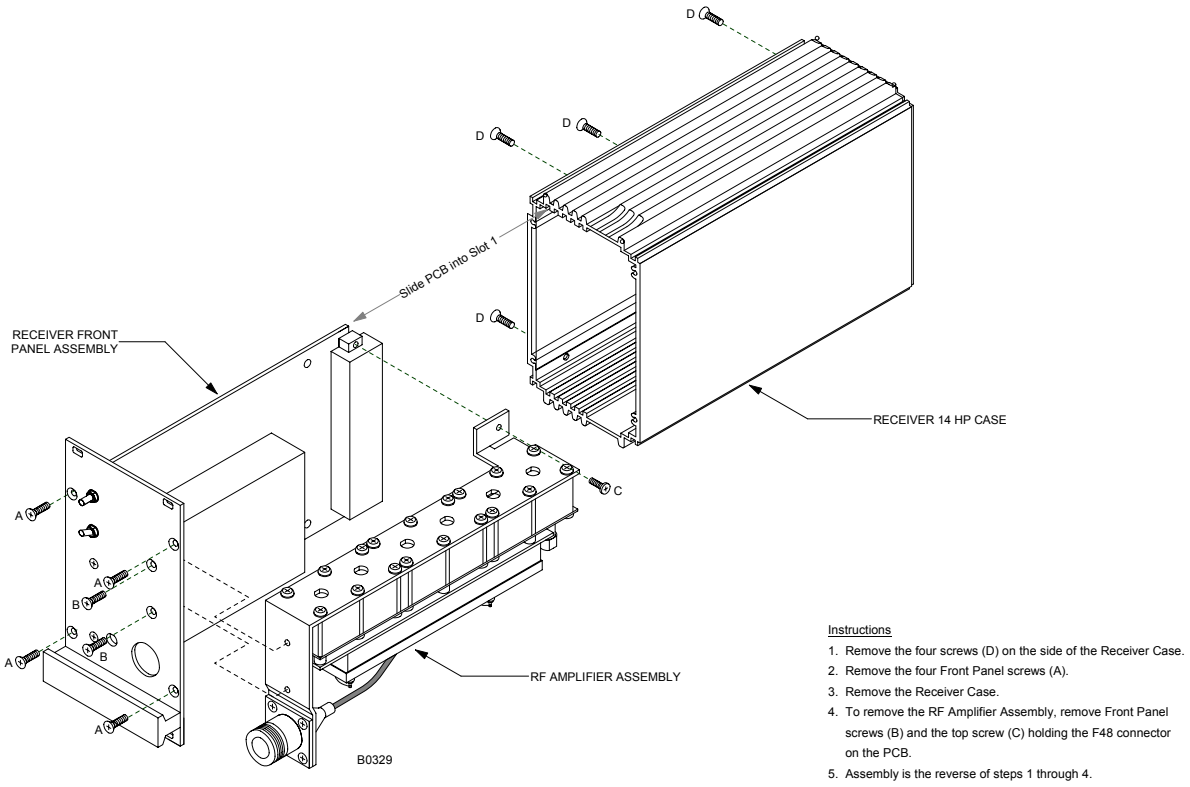


FIGURE 3: VR-3H040 Receiver Exploded View Diagram

Receiver alignment is performed on a module-by-module basis and detailed steps are provided in the respective manuals. Alignment is simplified by using an SR-3 Subrack, SM-3 System Regulator and RF extender cable to provide receiver power and signal interconnection. Alternatively, +9.5 VDC and +13.8 VDC, as well as any required test signals, may be applied directly to the individual modules. Refer to the corresponding manuals for details.

Throughout the alignment procedure, reference is made to a “standard signal”. This refers to an external generator signal source with FM modulation, 1 kHz tone and 60% system deviation (3.0 kHz) connected to the receiver RF input Type-N connector. If a carrier frequency is not given, it is presumed to be the selected receiver channel frequency.

Complete Receiver Alignment

A complete Receiver Alignment is performed at the factory and should not be required under normal circumstances. A large change in operating frequency, as discussed in the next section, may require a complete realignment operation. This operation requires that all the receiver modules be aligned on a per-module basis in the following order.

Sequence	Module	Manual
1.	Preselector	Preselector Manual (IM10-FE3H040)
2.	Synthesizer	Synthesizer Manual (IM10-OS3AH)
3.	Receiver Mainboard	Frequency Change section of this manual.

Complete and detailed alignment of each receiver module is provided in each associated sub-manual provided within this document package. The receiver Preselector, FM IF / Audio Mainboard, and Synthesizer modules may be aligned independently (preferred method) with final reconnection forming a tuned and working receiver.

Frequency Change

The receiver is initially aligned at the factory for the frequency stamped on the “Factory Set Operating Frequency” label. This label should list the frequency at which the last complete receiver alignment was performed. For a small frequency change, a simple channel change may be all that is required. A larger frequency change may involve the realignment of other modules. The frequency change in question is the accumulated frequency change in relation to the frequency stamped on the label.

For example, if the frequency is changed by 0.5 MHz from that stamped on the label, then a second frequency change of 1 MHz in the same direction would result in a total change of 1.5 MHz. The action taken would be on the basis of the 1.5 MHz value.

Failure to perform a realignment after a large frequency change could result in unreliable receiver operation or operation that does not conform to the published specifications.

NOTE: It is advisable to confirm these frequency ranges with the individual module manuals, notably the preselector and synthesizer, as they are subject to change with updated versions. The values in the module manuals take precedent over those listed here.

Size of Frequency Change:	**Modules to be Aligned:**
less than ± 0.5 MHz, 29–39 MHz (minor)	Receiver Mainboard (channel change)
less than ± 1.0 MHz 38–50 MHz (minor)	Receiver Mainboard (channel change)
greater than ± 0.5 MHz, 29–39 MHz (major)	Complete alignment
greater than ± 1.0 MHz 38–50 MHz (major)	Complete alignment

Minor Frequency Change

Changes less than ± 0.5 MHz (29–38 MHz) or ± 1 MHz (38–50 MHz) from a previously tuned working receive frequency will generally not require any adjustment. Otherwise, change the channel frequency select switches and inject a standard signal at the new channel frequency. Verify that the receiver sensitivity is ≈ -118 dBm for 12 dB SINAD. Slight adjustment of the Preselector's five tuning slugs may be performed to maximize sensitivity at the new frequency. Be aware that the preferred Preselector tuning procedure (see sub-manual IM10-FE3H040) requires swept frequency response measurement of the Preselector filter in order to provide a maximally flat response over a range of input frequencies, with the primary channel frequency centred in the filter passband (5 MHz wide). This alignment approach is not mandatory for single channel operation.

The OSR-3H061 Synthesizer Module PLL lock range limits multi-channel operation to ≈ ± 0.5 MHz (29–38 MHz) or ± 1 MHz (38–50 MHz) from a tuned centre frequency. A quick check of the Synthesizer module PLL control voltage at TP4, accessible through the synthesizer top cover, is advisable at all programmed frequencies. The voltage at TP4 should range between +2.5 VDC and +7.0 VDC at all programmed frequencies. Measured voltages outside this range indicate a possible "out-of-lock" condition and should be avoided.

The Preselector module must be removed (but left connected) from the main receiver chassis in order to access TP4. The synthesizer top cover foil label may also have to be cut in order to access TP4. Fine Frequency Tune adjust trimmer capacitor C24 may then be adjusted to position the PLL loop voltage (TP4) as close as possible to the nominal +4.5 VDC for all programmed frequencies. For single channel operation, TP4 should be set to +4.5 VDC.

Major Frequency Change

Changes greater than ± 0.5 MHz (29–38 MHz) or ± 1 MHz (38–50 MHz) from a previously tuned working receive frequency will require complete FE3H Preselector and OSR-3H061 Synthesizer alignment as per the sub-manual documents. Changing a high band receiver (VR-3H045-S) to a low band receiver (VR-3H035-S) or vice-versa requires a complete change out and alignment of the Preselector module (FE3H035 or FE3H045) in addition to OSR-3H061 alignment.

Squelch and Audio Level Adjustment

Remove the receiver's outer cover to expose the FM IF / Audio Mainboard adjustment potentiometers. See Figure 4 for control locations.

Adjust the Squelch Threshold Adjustment potentiometer R88 for the desired trigger point. Vary the RF generator level to confirm desired squelch operation. Complete squelch alignment, including Squelch Hysteresis adjustment is provided in the IM10-RX214 21.4 IF / Audio Mainboard sub-manual. Inject a standard signal at a -47 dBm level.

Adjust the High Level Drive Adjust potentiometer R64 to obtain the desired balanced 600 Ω audio output. The factory standard level is -8 dBm with a 1.0 kHz tone at 3.0 kHz deviation. The FM IF / Audio Mainboard provides varied audio output options. Complete demodulation / audio adjustment, including Flat and Filtered audio options, is detailed in the IM10-RX214 21.4 IF / Audio Mainboard sub-manual.

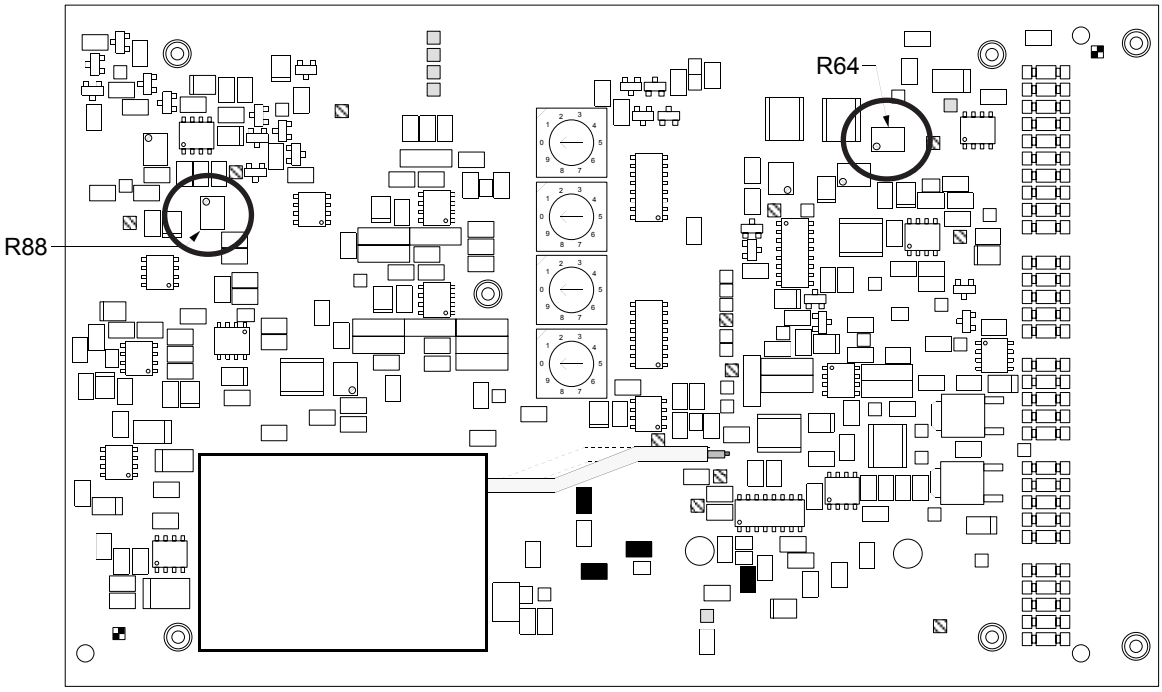


FIGURE 4: Squelch and Audio Level Adjustment Locations

REPAIR NOTE

The VR-3H040 Receiver family employs a high percentage of surface mount components which should not be removed or replaced using an ordinary soldering iron. Removal and replacement of surface mount components should be performed only with specifically designed surface mount rework and repair stations complete with Electrostatic Discharge (ESD) protection.

When removing Surface Mount Solder Jumpers, it is recommended to use solder wick braid in place of vacuum type desoldering tools. This will help prevent damage to the circuit boards.

RECOMMENDED TEST EQUIPMENT

Alignment of the receiver requires the following test equipment or its equivalent.

Power supply:	Regulated +9.5 VDC at 2 A. Phillips PM 2811
Oscilloscope / Multimeter:	Fluke 97 Scopemeter
Radio Communications Test Set:	Marconi Instruments 2965A
Alignment Tool:	Johanson 8764
Alignment Tool:	Johanson 8766
Alignment Tool:	Johanson 4192
Alignment Tool:	Coilcraft 37-1409

It is recommended that the radio communications test set be frequency locked to an external reference so that the high stability local oscillator may be accurately set.

REVISION HISTORY

Revision	Date	Action #	Description
1	July 1997	---	First Issue
2-0-0	Dec 2003	---	• Converted document to new format • Corrected document number • Corrected errors in block diagram
3-0-0	Mar 10	6459	New Rakon VCTCXO for use in Low Band Receiver Analog Board (A64-OR3H061-ANA)
		---	Updated logos and applied Daniels' style guide.