CONTENTS

FIGURES

1 THE REVIVE TRANSMITTER

The Revive transmitter is comprised of a Power Supply module, a Reject Load Assembly, 4, 5 or 6 MXi Amplifier Modules, Output Combiner, Main Control Chassis, and Front End (this could be a modulator, exciter or channel processor depending on the application).

The RF section of the Revive consists of 4, 5, or 6 identical amplifiers configured to operate in quadrature. Each amplifier is capable of delivering over 200 Watts of digital power. The outputs of these amplifiers are fed into a 4, 5, or 6-way combiner which has built in RF detectors which are used for protection and metering purposes.

The power supply chassis at the bottom of the cabinet contains the two 5,000W plug in switching supply modules that have their output combined to give the needed 10KW of power at +31VDC which supplies power to the amplifiers. A +12VDC power supply rated at 300W provides power to the controllers as well as the DC fans inside the Reject Load and RF Amplifiers.

Figure 1 Revive Series RXi5 Transmitter

2 MXi AMPLIFIER HEATSINK ASSEMBLY

Each amplifier assembly consists of a control board, a heatsink assembly that includes four cascaded broadband amplifier stages, a 4-way splitter, a 4-way combiner, and a fuse block. The final amplifier stage (PA) comprises four 200Wsp amplifiers configured in parallel. Figure 2 below shows the layout of this assembly.

Figure 2 MXi Amplifier Heatsink Assembly

Also mounted on the heatsink located near the output side of the combiner is a thermal switch that protects the amplifier from over temperature conditions. Cooling is achieved using multiple muffin fans located under the hood between the heatsink and the controller. This fan-array assembly is accessible from the bottom of the amplifier assembly, and can be serviced easily by removing 3 screws.

3 MXi AMPLIFIER CONTROLLER

The MXi amplifier control board (Assembly 31C1897) is a single-circuit assembly that provides all of the control functions required for the MXi series amplifier on a single circuit board. This board can be configured for a number of different amplifier types, power levels, transmission standards and options.

Figure 3 MXi Controller

The board implements status/telemetry for remote monitoring through a rear panel connector that will interface to a typical remote control systems (such as Moseley or Gentner). An RS232 serial port is also provided to allow communication with the main controller located inside the main control chassis. The MXi control board has RF detectors for forward and reflected power and all the circuitry to support AGC/VSWR/Cutback functions.

For complete documentation regarding the Amplifier Controller, see the publication *Amplifier Controller Board*.

4 REVIVE MAIN CONTROL CHASSIS

The main control chassis located above the RF Amplifiers contains the main control board, LCD touch screen and RF splitter.

The main control board (Assembly 31C1972) is a single-circuit assembly that provides all of the communications and controls to the MXi Amplifiers and +31VDC Power Supply on a single circuit board. The controller uses a RS-232 connection to communicate with the Amplifiers and a set of status and control lines for communication and control of the Main Power Supply. The board implements status/telemetry for remote monitoring through a rear panel connector that will interface to a typical remote control systems (such as Moseley or Gentner). An RS-232 serial port as well as a RJ45 Ethernet connection is also provided to allow remote monitoring using our In-SiNC Remote Monitoring Software. The MXi control board has RF detectors for forward and reflected power and all the circuitry to support AGC/VSWR/Cutback functions. For complete documentation regarding the Main Control Board, see the publication *Revive Main Transmitter Controller Board*.

Figure 4 Main Transmitter Controller

Mounted above the main transmitter control board is the RF splitter which takes the input from the front end and divides it into 4, 5, or 6 paths to supply the input needed for the RF Amplifiers. For complete documentation regarding the RF Splitter, see the publication *Revive RF Splitter*.

On the front panel is the LCD touchscreen. This provides status and telemetry readings for the transmitter. From the LCD you have the ability to raise or lower the power using AGC controls. You can also enable or disable the remote controls and setup your Ethernet address or serial stream communications.

5 AMPLIFIER INSTALLATION AND STARTUP

The MXi Amplifier was fully tested at LARCAN before it was delivered. Under normal circumstances, the transmitter can be fully operational with minimal setup when turned ON. However, a good practice is to take the "start from scratch" approach, which means that one should take precautionary measures before the amplifier is allowed to run at full rated power. These important steps will avoid any catastrophic failures at start-up. The procedure described is essentially the same approach taken at the factory with a new and untested transmitter. This also applies if there is a need to completely replace a major sub-assembly in the transmitter.

5.1 BEFORE APPLYING AC TO THE UNIT

Pay careful attention to items 1 to 3 before applying AC to the amplifier. These are initial steps that **must** be observed and followed for proper and safe operation of the amplifier.

1. Termination

   - Ensure that the amplifier is properly terminated with a suitable load. This can be into a dummy load or into the transmitter output system. A 50 Ohm, 1kW load with at least –20dB return loss (1.2 VSWR) is recommended. Preferably, directional couplers with known coupling levels at the frequency of interest should be connected at the input and output of the band-pass filter. These points are very useful in determining absolute power levels and losses, and also for use as an RF sample for monitoring purposes. See Figure 13 for a typical transmitter test equipment setup.

2. Interlocks

   Interlocks must be connected to the amplifier to avoid damage to the equipment and to the output section. The overall interlock is located on the rear panel of the Main Control chassis and it is labeled INT'K. If this interlock is open, the B+ to the amplifiers will shut down, including the cooling fans.

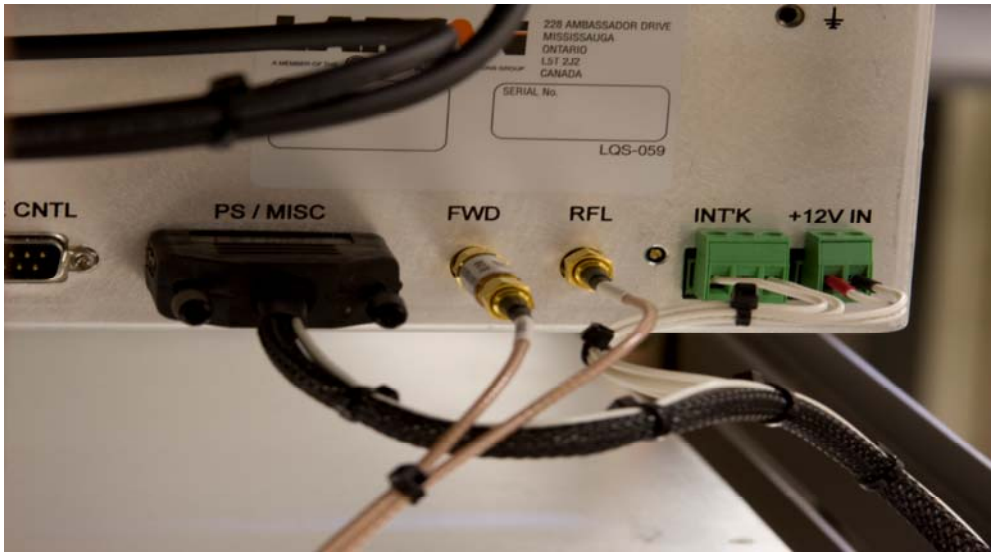

Figure 5 Rear Panel Showing Interlock Connector

3. Power At Minimum

   - Initially, the modulator's output should be at minimum level.

5.2 APPLYING AC TO THE UNIT

- Check that the AC going into Main AC Breaker ranges from 190-264VAC. If this is so, proceed to applying power, otherwise, investigate the source of the problem.
- Usually, once the AC is applied to the breakers and the breakers are in the on position, the Control Power Supply turns ON and applies +12V to the Main Controller and the controller in each amplifier. Also the fans for the +31VDC power supply will turn on.

- The Power-Up screen will be displayed on the LCD, followed immediately by the Main Menu.

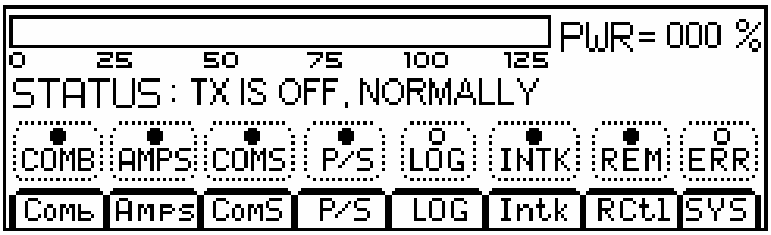

Figure 6 Main Menu

5.3 BEFORE TURNING THE AMPLIFIER ON

From the Main Menu, the status of the amplifier is displayed and shows if the amplifier is ready for operation. Status legends, when lit, such as the INTK (INTERLOCK), usually signify OK conditions and that the transmitter is ready to be switched ON.

Check that all of the following conditions are met:

1. Modulator and up-converter, or Channel Processor is ready.
   - Usually in the application of AC, the modulator goes through its warm-up sequence and may take a few seconds before it is ready.
2. POWER METERING is at Zero.
   - On the LCD (see Main Menu display in Figure 6), the PWR should be at 000% and the STATUS should be TX IS OFF, NORMALLY.
3. MAIN CONTROLLER is ready.
   - If there were prior faults, clear them by pushing the RESET button on the power supply chassis front panel.
4. INTERLOCKS are closed or OK.
   - Interlocks and Status are OK.

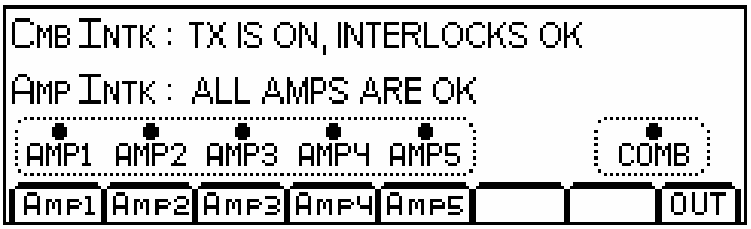

Figure 7 Interlocks Status

5. The Amplifier is in LOCAL mode.
   - Push the REM button so that it is NOT lit.
6. The TX is OFF.
   - Push the Front Panel ON/OFF button so that it is NOT pushed in.

5.4 AMPLIFIER ON SEQUENCE

Upon depressing the ON button, the fans start and at the same time the +31V power supply is enabled, thus applying B+ to the amplifies. Since the modulator/up-converter or Channel Processor are on hot standby (RF is always applied), the amplifiers will ramp up to 100% output power quickly. The reason there is a ramp up is incase there is a problem with the output system resulting in a large reflection of power. As the amplifier ramps

up it will see the reflection and start cutting back. For first time installations, it is recommended that the level of the modulator be set to minimum initially and then increase in steps until 100% power is attained. This is done so that catastrophic failure is avoided. Keep in mind that in a newly installed transmitter that loose or bad connections in the output, as an example, are possible particularly when the output system is not swept for proper matching or VSWR. Hence, as the power is increased, by observing the combined, single amplifier, reflected, and reject power metering one will be able to assess if everything is in proper order.

5.4.1 Turning ON the Revive Transmitter

1. Enable amplifier LOCAL operation by pressing the REM touch button such that the REM legend is NOT lit.
   - Push the front panel ON button.
   - The Revive Amplifier should now be ON (if you did not turn the output level of the modulator all the way down before turning the transmitter on that the unit will come up to 100% power. If the modulators output was reduced the output power will be 0 the status message will read “TX IS ON WITH NO RF DRIVE”)

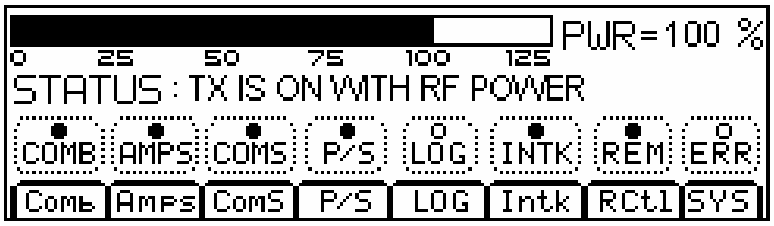

Figure 8 Transmitter ON with Full Drive

2. Monitor the +31V power supply voltage and currents on the LCD. Check that the power supplies are operating by pressing the P/S touch button. The voltage readings should be about 31V and the currents should be about 11.5 Amps per module (or 28.75 A per power supply module for an RXi5) under Static condition (no RF drive).

ALLOW THE AMPLIFIER SOME WARM-UP TIME!

Only after the transmitter has been ON for approximately 15 minutes should you perform the fine adjustments. The amplifiers must be allowed to reach their operating temperature for stable operation. The Power Amplifiers in the MXi transmitter are equipped with thermal compensation circuits, which reduce the output power when the temperature rises. Therefore, the operating temperature must be reached before adjusting the RF level to its proper level, i.e. 100%. The amplifiers are also equipped with Automatic Gain Control, primarily designed to prevent the transmitter from overpower or overdrive condition.

3. Increase the RF output by slowly turning the Modulator/Exciter or Channel Processor output level control.

   Stop at about 25% output power indicated on the LCD. At this level, the current should be around than 20 Amps per amplifier (or 50 Amps per power supply module). Current will vary with channel.

4. If the current is not drastically higher, increase the power to 50%. Again, make note of the PS current readings. The current should be around 26 Amps per amplifier (or 65 Amps per power supply module). Proceed to the next step if this condition is met.

5. Increase the RF output to 100%. The current should be about 40A-45A per amplifier normal video signal (or 100-115 Amps per power supply module).

6. AGC SETTING: The AGC is setup at the factory for each amplifier. You can raise and lower the AGC level on the touchscreen under the Comb (combined) submenu. When you select the button to raise or lower the AGC a command is sent to each amplifier to raise or lower the level the same amount.

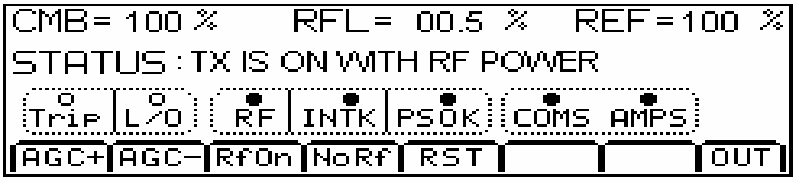

Figure 9 AGC Adjustment

The AGC setup of each amplifier should not be adjusted under normal operating conditions. It should only be change if you are changing channels. For instructions on AGC setup of the amplifiers see Section 6.1.5

7. With the amplifiers fully functional and adjusted to final settings, record keeping becomes very important. Record the current, voltage, power, etc. This data can be used as a very valuable troubleshooting tool later. Below is typical test data pertaining to the Revive amplifiers at 100% output power.

5.4.2 TYPICAL DATA read on the LCD

Combined

COMB	***100%***	***AMP1***	***100%***	***AMP2***	***100%***	***AMP3***	***100%***
RFL	***0.5%***	***AMP4***	***100%***	***AMP5***	***100%***		

Amplifier

FWD	***100%***	***RFL***	***1.0%***
AGC	***1.0V***	***CUTB***	***0.0V***

Power Supply

PS VOLTS	***31.0V***	***PS1 CURR***	***110A***
		PS2 CURR	***110A***

6 TEST AND TROUBLESHOOTING

6.1 BENCH TEST PROCEDURES

The following procedures are test instructions for the amplifier modules comprising the MXi amplifier.

6.1.1 Front-End Module, *21B1473*, Bench Test Procedure

- Connect a +31V power supply to E1.
- Apply a 0dBm (1mW) RF input to the amplifier.
- Turn RV2 fully clockwise. The front-end should have a gain of 9dB. Adjusting R25 from one extreme to the other should vary the gain by 4dB.
- RF Mute Check: Connect a variable supply to J3-2. Gradually increase the voltage until the gain drops by 30dB or more. The applied voltage should be approximately 2.5 volts.
- Reflected Power Cutback Check: Connect the variable supply to J4-9. Increase the voltage gradually until the gain drops by 30dB or more. The voltage should be approximately 4.0 Volts ±0.2V. This same voltage should also be present at J3-14. J3-6 should be 4.0 volts.
- Overdrive Cutback Check: Connect the variable supply to J3-7. Increase the voltage until the gain drops by 30dB or more. The voltage should be 7.0 volts ±0.5V. The voltage at J3-11 should be the same and the voltage at J3-7 should be 4.0 volts.
- Set an adjustable power supply to 2.0 volts. Connect this voltage to J4-1, J4-3 and J4-5 simultaneously. J2-6 and J3-5 should be high. Disconnecting any one or more of J4-1, 3 or 5 should cause both J2-6 and J3-5 to go low (0V).

6.1.2 IPA1, *21B1324*, Bench Test Procedure

This amplifier must be mounted on a properly sized heatsink for testing.

- Connect a suitable load to the output of the Front-End module.
- On the unit under test (IPA), set RV200 fully clockwise and set RV110 fully counter-clockwise.
- Set variable power supply to 31.0 volts and set its current limit to 1 ampere.
- Apply the +31V to the feed-through capacitor of the pre-amp shield box.
- Adjust RV3 to achieve 6.5 ±0.2 volts at the junction of R5 and RV100.
- Adjust RV200 to achieve total current draw of 500 ±20 mA.
- Check that the junction of R100 and CR100 measures between 3.5 and 5.5 volts.
- Adjust RV110 to raise total current draw to 1000 ±50 mA.
- Check that the junction of R110 and CR110 measures between 3.5 and 5.5 volts.
- Increase the power supply current limiting to 2.2 Amps.
- Increase RV3 clockwise slowly and check that the maximum current limits itself at 1.6 ±0.1 Amp but do not allow current to go above 2 amps while performing this test.
- Reset RV3 to achieve 6.5 ±0.2 volts measured at the junction of R5 and RV100.
- Check balance of the two transistors with a voltmeter connected between the hot sides of C105 and C115; the difference in voltage should be less than 3mV.
- Apply RF drive (max. +18 from a pre-amp) and adjust C101, C103, C111, and C113 for minimum frequency response ripple and flat response. Gain should be a minimum of 15dB with maximum variation less than 0.5dB over the frequency range 470MHz through 860MHz (**Note**: output will then be about +33dBm or 2 Watts for an input of +18dBm, so make sure you properly protect your test equipment).

- If roll off at the higher frequencies prevents meeting this gain-bandwidth specification, it may be necessary to replace either C103 or C113 or both with a higher value; use variable capacitor made by Johanson, part # 16E2320-2, which is 2.5 to 10pF.

6.1.3 Driver Pallet, *21B1639*, Bench Test Procedure

- BIAS SETTING: Connect a 50-Ohm load to the output of the pallet.
  - Before applying +31V to the module, adjust R12 fully clockwise. Limit the power supply current to 3.0A.
  - Apply +31V to the B+ terminal. Monitor the current and adjust R12 counter clockwise (CCW) for a total current of about **2.0A ± 0.1A**.
  - Still monitoring the current, adjust R11 for the current to be at minimum, i.e. current dipping at 1.9A. This procedure balances the current drawn by the devices, therefore, R11 should not be adjusted again unless one or both transistors are replaced. Any bias adjustment required from here on should be done using the overall bias adjustment, R12.
  - Readjust R12 to 2.0A. This setting is an initial bias setting and may vary depending on the pallet's application. On analog transmitters, this adjustment is used to optimized the inter-modulation products as well as the system linearity.
  - Proceed to the next step if a network analyzer or similar equipment is available.
- RF SWEEP: Adjust C7 for best frequency response. With the bias set at 2.0A, the gain in the frequency range of 470MHz to 860MHz should be 14 to 16dB.

6.1.4 PA Pallet 11A2142G1 Bench Test Procedure

- BIAS SETTING: Connect a 50-Ohm load to the output of the pallet.
  - Before applying +31V to the module, adjust R11 fully counter-clockwise. Limit the power supply current to 3.0A.
  - Apply +31V to the B+ terminal. Monitor the current and adjust R11 clockwise (CW) for a total current of 2.0A + or – 0.2A.
  - Proceed to the next step if a network analyzer or similar equipment is available.
- RF SWEEP: Adjust C4 for best frequency response. The gain, in the range of 470MHz to 860MHz, should be between 15 to 16dB.

6.1.5 Amplifier AGC Setup

- Start With Amplifier OFF
- Remove the AGC jumper, E16, from the control board to disable the AGC
- Turn the Amplifier ON with the drive level from the Modulator and up-converter, or Channel Processor turned all the way down
- Increase the output power to 110%, using the output level control in the Exciter or Channel processor. Enable the AGC by inserting the AGC jumper, E16, on the control board. Use the LOWER button on the LCD to set the power to 100%

6.2 BASIC TROUBLESHOOTING TECHNIQUES

One of the best tools in troubleshooting is knowing what the nominal figures or typical values of the MXi amplifier are when it is at its normal performance. If a fault condition occurs, then you can compare the data taken previously with the present conditions and come up with a reasonable conclusion about what is at fault.

The following describes some fault conditions and possible solutions.

6.2.1 No RF Output

- Check for proper power supply voltage and current
- Check for the presence of a valid input stream to the modulator
- Check for potential connector problems causing either no drive to a module pallet (input connector) or VSWR (output connector) problems.
- Check the fuses on the driver stages.
- Check to insure each amplifiers interlock is closed.

6.2.2 Output Reduced by 35%

If the output is by approximately 35%, a possible cause is a total loss of power from one of the amplifier. A measurement of the current drawn by the amplifier will determine if this condition exists. The IPA usually draws 1A. If the current is 0.5, then this is the case. Similarly, the Driver or PA pallet draws 2.0A with no drive condition. If it reads 1.0A, then this is the case, also. If the amplifier has in fact failed check the power connections to insure the amplifier is receiving the necessary +12VDC and +31VDC supply voltages needed for operation. Next check that input and output cables are fully tightened. Than check the interlock connection to see that it is in fact being shorted by the main controller. A review of the Main Controllers touchscreen will also help trouble shot the problem by reviewing the logs as well as the amplifiers status screen.

7 MAINTENANCE

Equipment which is regularly and carefully maintained is far less likely to be subject to sudden failure than that which is operated without regard to basic maintenance requirements. A detailed preventive maintenance program should be established to ensure that the original efficiency and picture quality is maintained throughout the life of the equipment. Given reasonable care and attention, the transmitter will provide efficient and reliable service for many years.

Preventive maintenance techniques do not necessarily involve extensive dismantling of the various assemblies; on the contrary, this practice is to be discouraged unless a valid reason exists for doing so. Preventive maintenance is more directed at detailed physical inspection and the general observation of the equipment during and after operation, to detect the presence of any abnormality, which, if not corrected, might result in operational failure.

In preparing any maintenance program, the frequency and scope of the inspections must be determined and to a great degree will be influenced by site location and the station's market parameters and consequently its hours of operation, equipment configuration, and technical personnel deployment. For example, is the station on the air for 24 hours-a-day? Are there main/standby transmitters and are they attended or unattended?

In general, the following routines should form the basis of any maintenance program.

7.1 DAILY

At an attended site, the operator is afforded the opportunity to make frequent checks on the equipment and thereby increase his/her familiarity with its operation. The transmitter log entries made during these checks would include all meter readings, also any irregularity in performance or in picture quality, for later analysis. An unattended site where equipment is operated by remote control and monitored by telemetry and a high quality off-air receiver or demodulator can also be continuously checked for performance by studio technical personnel.

7.2 MONTHLY

In addition to the normal operational tests, thorough physical inspection of every piece of equipment should be made, with all power turned off. All surfaces should be dusted off or wiped down, terminal boards checked for loose connections, and all components examined for any evidence of overheating. Air filter media should be inspected and replaced if necessary. High-pressure air, not over 20psi, can be used with discretion to dislodge dust from inaccessible places.

7.3 SEMI-ANNUALLY AND ANNUALLY

Check all external RF connections for tightness, looking specifically for any discoloration, which might indicate a loose inner connector, flange or sleeve coupling. Test the passive RF system with a transmission test set or network analyzer, if one is available, to identify any potential problems with the antenna or line. Inspect and clean contacts on all switches and contactors; carefully redress contact surfaces if pitted.

Check the operation of all interlocks including patch panel, dummy load, air and thermal switches and emergency interlocks (if applicable).

7.4 TRANSMITTER COOLING SYSTEM

All cooling fans in the transmitter are fitted with sealed bearings requiring no lubrication during the lifetime of the motor. Access to the fan assembly is via the bottom of the amplifiers.

8 SERVICE

The MXi contains few user-serviceable parts; the modular surface-mount design makes module replacement and/or factory repair the most efficient repair method.

The service most likely to be performed by users is the replacement of the fan array.

8.1 REMOVING THE FAN ARRAY

The MXi fan array consists of four 4" muffin-type fans which are attached to the mounting plate. The mounting plate is secured to the bottom of the MXi chassis with three Phillips head screws.

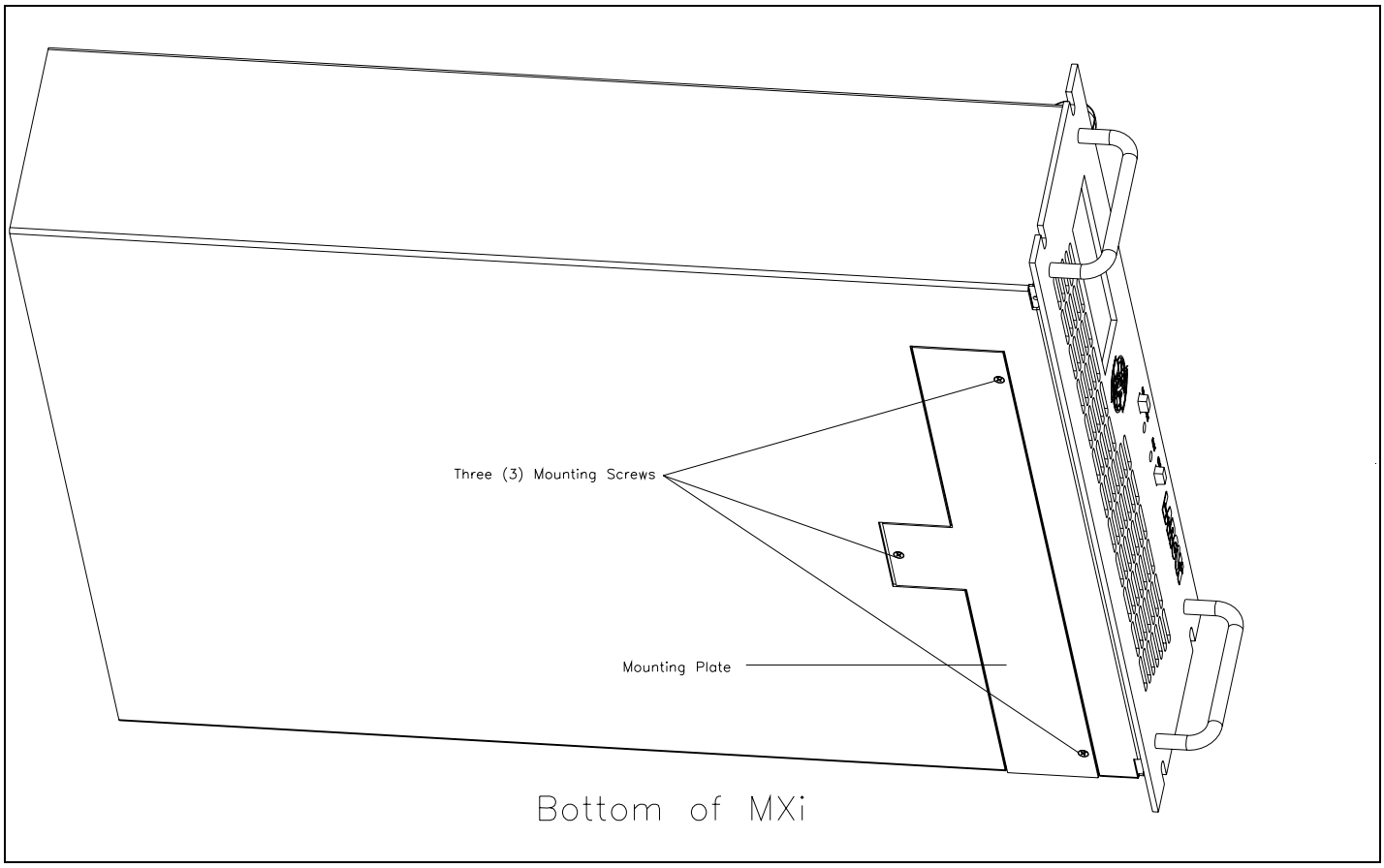

Figure 10 Bottom View of MXi

1. Turn the MXi OFF.
2. Disconnect the AC power from the MXi.
3. Slide the MXi partially out from the mounting rack. **Important**: Ensure that the weight of the MXi is fully supported.
4. With a Phillips screwdriver, remove the three mounting screws on the underside of the MXi. When removing the last screw, be sure to hold the mounting plate in place.
5. Remove the mounting plate. The fan array is attached to the mounting plate and comes out with the plate.

Figure 11 Fan Array

8.2 Replacing the Entire Fan Array

In the event of a fan failure, LARCAN recommends replacing the entire array, as all fans have a similar lifespan.

1. Remove the fan array as described in Section 8.1.
2. Slide the new fan array into the MXi. The power connection is aligned so that it connects when the mounting plate is fully in place.
3. Insert and tighten the three mounting screws. **Note**: Screws only need to be snug; do not overtighten.

8.3 Replacing a Single Fan

1. Remove the fan array as described in Section 8.1.
2. Each of the four fans is attached to the mounting plate via two screw-and-nut assemblies. Remove the screws and nuts and set aside.

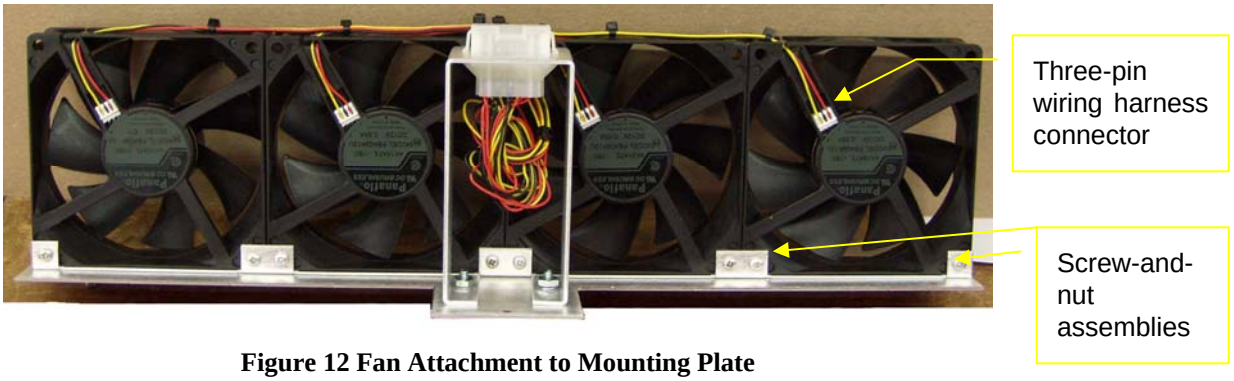

Figure 12 Fan Attachment to Mounting Plate

3. Disconnect the three-pin wiring harness connection by *gently* sliding it back with a fingernail or small plastic tool.
4. If necessary, carefully cut and remove the zip tie holding the wires to the fan frame.
5. Remove the defective fan and replace with a known good fan of *exactly* the same dimensions and specifications.
6. Re-connect the three-pin wiring harness connection.
7. Re-fasten the two screw-and-nut assemblies holding the fan to the mounting plate.
8. If necessary, replace the zip tie holding the wires to the fan frame.
9. Replace fan array into MXi as described in Section 8.1.

9 TEST EQUIPMENT SETUP

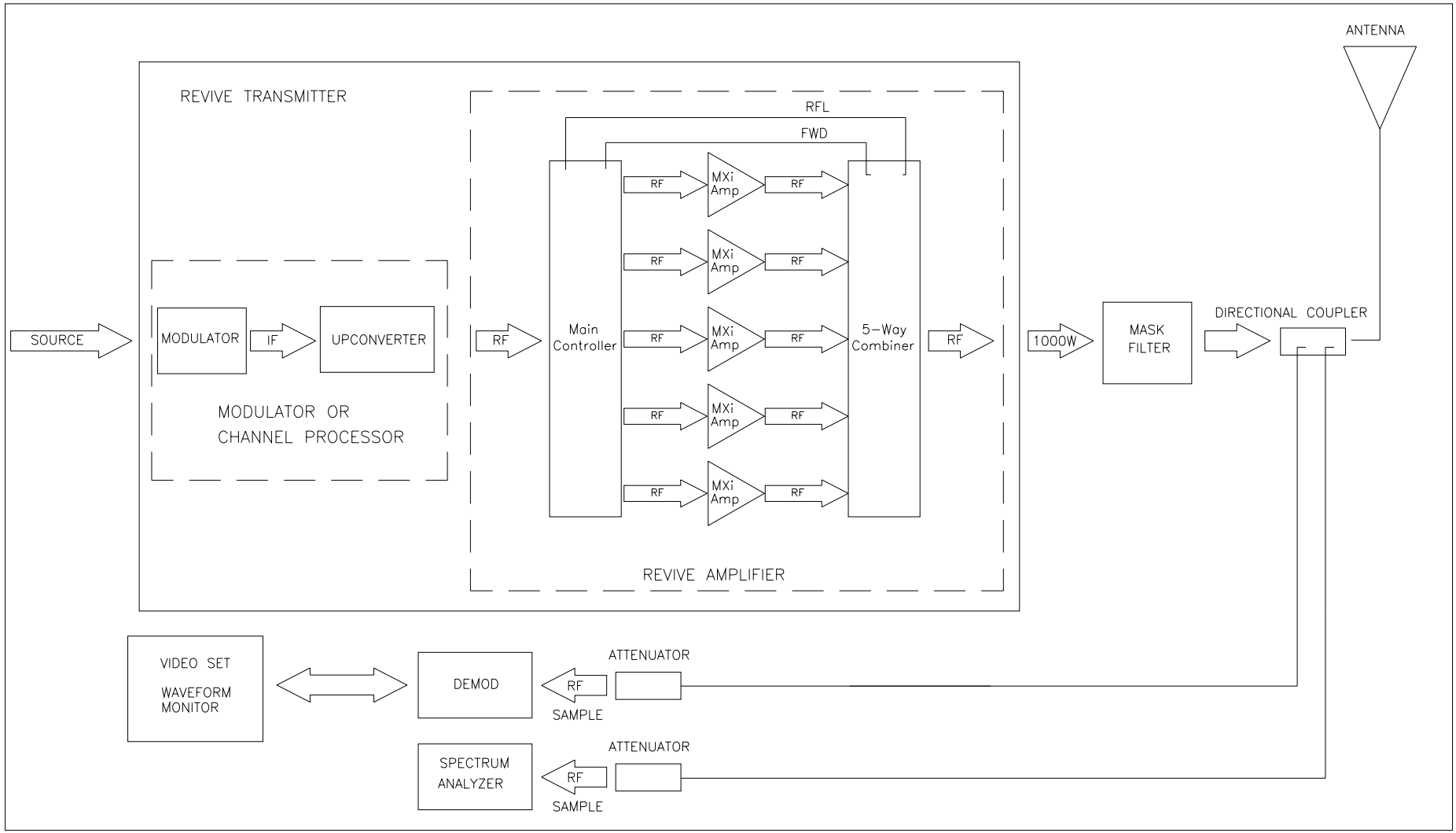

Figure 13 Test Equipment Setup

10 SPECIFICATIONS

Specifications are subject to change without notice.

10.1 ELECTRICAL

AC Line Input .....208 to 240VAC, 50 to 60Hz

Power Requirements ..... 7.5kVA (typical)

10.2 OUTPUT

Frequency 470-860MHz

Output Connector .....1-5/8 EIA Unflanged

10.3 ENVIRONMENTAL

Ambient Temperature .....0°C to +45°C (0°F to 113°F)

Humidity ..... 0% to 95%

Altitude .....10,000 ft AMSL

10.4 COOLING

Four 4” muffin fans per amplifier push air through the heatsinks and through the rear panel perforations.

10.5 DIMENSIONS

The Dimensions provided are of the cabinet and exclude any output filter.

Height ..... 53.75”

Width..... 22.25”

Depth ..... 36.75”

10.6 SHIPPING WEIGHT

Weight is just of the cabinet and its contents, does not include weight of output filter.

Total Weight ……. .....Approximately 550lbs

NOTES