

## SECTION XXXI

### 1, 5, 10 MHz SINE AND TTL (86-391 AND 86-391-1)

#### **31-1 1, 5, 10 MHz SINE (86-391)**

##### INTRODUCTION

The 1, 5, 10 MHz Output Option provides the user with three frequency-stable sine wave outputs phase locked to the host receiver's reference oscillator.

##### OPTION SPECIFICATIONS

###### 1 MHz Output

Amplitude:	1 vrms into 50 ohms
Harmonic Distortion:	-50 dBc
Accuracy:	The accuracy of the host's reference oscillator.
Connector:	Female, BNC

###### 5 MHz Output

Amplitude:	1 vrms into 50 ohms
Harmonic Distortion:	-50 dBc
Accuracy:	The accuracy of the host's reference oscillator.
Connector:	Female, BNC

###### 10 MHz Output

Amplitude:	1 vrms into 50 ohms
Harmonic Distortion:	-40 dBc
Accuracy:	The accuracy of the host's reference oscillator
Connector:	Female, BNC

###### Environmental

Operating Temperature:	0°C to +50°C (+32°F to 122°F)
Storage Temperature:	-55°C to +85°C (-67°F to +185°F)
Humidity:	95%, non-condensing

#### **31-2 INSTALLATION FOR 86-391**

##### INTRODUCTION

No installation is required when this option is purchased at the same time as the receiver. It is factory-installed. The following installation instructions apply only to an option acquired after the initial purchase of the receiver.

## FIELD INSTALLATION

Supplied with the 1, 5, 10 MHz Option are the following items:

1. Assembly 86-391
2. Mounting hardware

**WARNING:** Only a qualified technician should attempt installation of this option. Dangerous voltages are present which can cause electric shock that could result in severe injury or even death. Disconnect all power before disassembling the unit!

The only equipment required for installation is a Phillips screwdriver.

If the receiver is rack-mounted, first remove it from the rack as described in SECTION II of this manual. Installation requires inserting 86-391 Assembly into an empty option slot.

Remove the top lid and retain the screws. Remove the cover plate of an empty option slot and save the four screws. Slide the option assembly into the guides on the side rails of the slot and firmly press the assembly connector into the Bus Backplane Assembly connector. Secure the option to the chassis with the previously saved screws. Replace the lid and secure with the previously saved screws. Remount the receiver in the rack if desired.

Fabricate any coaxial cables required.

### **31-3 OPERATION**

#### INTRODUCTION

The 1, 5, 10 MHz Option provides frequency-stable sine to the rear panel.

#### GENERAL OPERATION

These outputs are automatically enabled upon power-up and output continuously. No keyboard selection or configuration is required.

### **31-4 THEORY OF OPERATION**

#### INTRODUCTION

The 1, 5, 10 MHz Options connect directly to the Backplane Bus Assembly. A frequency-stable 10 MHz provides the basis for all of the outputs produced by these options. Refer to the schematic and assembly diagram of Assembly 86-391.

#### SINE WAVE OUTPUTS

1, 5, and 10 MPPS signals from flip-flop U2:B drive FETs Q1, Q2, and Q3, respectively, which control the AGC. Coil L1 and capacitor C13 comprise a tunable low pass filter as do L3, C35, L5, and C57. These filters select the desired sine component from the square waves. Wide band op amps U4, U8, and U11 provide gain. Coil L2 and capacitor C21 comprise a second tunable low pass filter as do L4, C43, L6, and C65. Pots R18, R40, and R62 set the amplitude of the 1, 5, and 10 MHz, respectively. Op Amps U5, U9, and U12 buffer and provide drive for the outputs at J2, J3, and J4.

## **31-5 MAINTENANCE AND TROUBLESHOOTING**

### **INTRODUCTION**

This option has been designed to provide maintenance-free operation. Under normal use, it will require no calibration or adjustment. Adjustment procedures are provided for uses only after repair. This section contains troubleshooting techniques and adjustment procedures.

### **TROUBLESHOOTING**

**WARNING:** Only a qualified electronics technician should attempt repairs. Exercise caution while working on or near power supply assemblies.

The following are only general troubleshooting procedures. Since an apparent problem may be the result of operator error, the technician will need a thorough understanding of the normal operation of this option. Refer to SECTION XVII-III, OPERATION for a description of normal operation. Use the following paragraphs to isolate the problem to a specific assembly. Use the assembly drawing and schematic in SECTION XVII-VI and the detailed circuit descriptions in SECTION XVII-IV to troubleshoot the individual assemblies.

### **EQUIPMENT REQUIRED**

The following test equipment is required for troubleshooting and adjustments:

1. Oscilloscope (100 MHz bandwidth)
2. Frequency Counter (10 MHz  $\pm$ 1 Hz)
3. AC Voltmeter
4. Spectrum Analyzer
5. Phillips-Head Screwdriver
6. Small Slot-Hear Screwdriver
7. Small Nonmetallic Coil Adjustment Screwdriver

Symptoms of a malfunction fall into three broad categories:

1. No Output or Outputs
2. Noisy Outputs
3. Incorrect Frequencies

The possible causes for these symptoms are discussed by the following:

#### **No Output Or Outputs**

Before assuming a clock malfunction, first check that the instrument using the output is functioning properly. Verify that all connectors are secure and coax cables are good.

If at least one output is functioning, the problem may be a bad option assembly.

If all outputs have failed, the problem may be a bad option assembly, a bad Backplane Bus Assembly, a bad Processor Assembly, or bad connections between these assemblies.

#### **Noisy Outputs**

If the outputs are noisy or intermittent, the problem may be a bad option assembly, a bad Processor Assembly, a bad backplane Bus Assembly, or bad connections between these assemblies.

### Incorrect Frequencies

If the frequency is out of specification, the clock may have lost lock with the satellite signal for a long period of time or the problem may be incorrect software installed on the Processor Assembly.

### Adjustment Procedures

#### A. Harmonic Distortion

Adjust coils L1 through L6 on Assembly 86-391 for maximum output while viewing the output on an oscilloscope. Adjustments must be done in short, quick turns to see the effect before the AGC readjusts the amplitude. Alternately, connect a spectrum analyzer to the output and adjust for minimum harmonic distortion.

#### B. Sine Wave Amplitude

Set the amplitude of the 1, 5, and 10 MHz outputs to 1 Vrms with pots R18, R41, and R62, respectively, on Assembly 86-391.

### **31-6 1, 5, 10 MPPS OPTION (86-391-1)**

This unit provides 1, 5, and 10 MPPS signals. These signals are 50% duty cycle and will supply a TTL level signal into a 50 ohm load.