COMPOSITE STL TRANSMITTER

MODEL STL-20C

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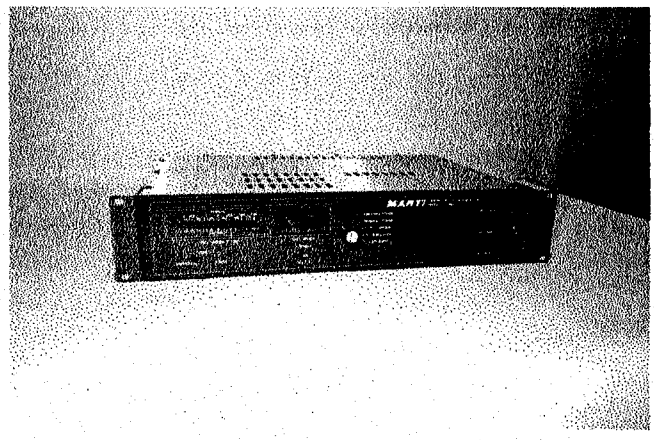
INTRODUCTION



The ***Marti*** **STL-20C Transmitter** with companion **R-15C Receiver**, form a high quality, frequency synthesized, point-to-point, line of sight, radio communications link. This system is available in the frequency band from 940 MHz to 965 MHz and will soon be available in all STL bands from 140 MHz and up. Depending upon available channel bandwidth, these systems can transmit one of the following:

- **Composite FM Stereo audio with two subcarriers***
- **Monophonic audio with two subcarriers**
- **Digital stereo audio (requires external modems)**
- **Multi-channel audio or data (requires external MUX)**
- **Digital data (requires external modems)**

Complex systems can be built from basic STL-20C transmitters and R-15C receivers having multiple relay (repeaters), bi-directional (full duplex), and automatic switching hot standby features.

The STL-20C offers new features not found in other 950 MHz STL's:

- **20 Watts output power - adjustable**
- **Frequency agile – 25 MHz wide – 25 KHz steps**
- **No tuning**
- **High speed embedded microcontroller**
- **Automatic level control of output power**
- **High VSWR and high temp protection**

WARNING

THIS EQUIPMENT *MUST* BE OPERATED WITH A 3-PRONG GROUNDED OUTLET RECEPTACLE. FAILURE TO USE A PROPERLY GROUNDED OUTLET MAY RESULT IN IMPROPER OPERATION OR SAFETY HAZARD!

LIMITED WARRANTY

The Seller warrants that, at the time of shipment, the products manufactured by the Seller are free from defects in material and workmanship. The Seller's obligation under this warranty is limited to replacement or repair of such products which are returned to Marti at its factory, transportation prepaid and properly insured, provided:

a. Notice of the claimed defect is given to Marti within one (1) year [two (2) years for STL systems] from date of original shipment and goods are returned in accordance with Marti instructions.

b. Equipment, accessories, tubes and batteries not manufactured by Marti are subject to only such adjustments as Marti may obtain from the supplier thereof.

c. This warranty does not apply to equipment which has been altered, improperly handled, or damaged in any way.

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This warranty is in lieu of all others, either expressed or implied. No representative is authorized to assume for the Seller any other liability in connection with Seller's products.

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PHONE NUMBERS:

Sales & Service (817) 645-9163
FAX (817) 641-3869

INSTALLATION

IMPORTANT NOTICE

This equipment must be operated in a well-ventilated rack cabinet.

Install rack-mounted equipment in a well-ventilated, well-grounded, and shielded rack cabinet. Do not locate solid-state equipment in a rack above tube-type equipment which produces high temperatures.

Problems can also be avoided by locating this unit away from other equipment which has transformers that produce strong magnetic fields. These fields can induce hum and noise into the Marti equipment thus *reducing performance*. Strong radio-frequency (RF) fields should be avoided where possible. Extensive shielding and filtering have been incorporated into this equipment to permit operation in moderate RF environments. All equipment racks, cabinets, etc., should be bonded together by wide copper grounding strap to ensure that all system elements are at RF ground potential.

Transmitter connections for Composite Stereo operation

(Refer to Drawing 702-096)

1. The composite signal output from a stereo generator is connected to the BNC jack labeled "**J2 COMPOSITE**". The input impedance is 5K ohms and the composite signal level should be 3 volts peak-to-peak or approximately 1 volt RMS. The final level adjustment is set for 100% peak modulation indication on the MODULATION bar graph meter on the STL-15C front panel.

2. A subcarrier generator or remote control (operating above 92 KHz) can be connected to "**J1** or **J3 SUBCARRIER**" jack. The ability of the STL-20C system to transmit subcarriers depends upon the channel bandwidth available. The R-15C receiver IF filter selectivity must be compatible with the available interference free channel bandwidth. Using 50 KHz deviation for 100% modulation, the approximate bandwidth required for various subcarriers follows:

Subcarrier Frequency	Receiver IF Bandwidth (3dB)
67 KHz	234 KHz
92 KHz	284 KHz
110 KHz	320 KHz
180 KHz	460 KHz

Actual bandwidth may require an additional 10% to 15% to allow for the modulation on the subcarrier itself. With the severe STL channel crowding with resulting interference prevalent around large markets, subcarriers above 110 KHz are not recommended.

3. The accessory connector has several uses such as remote control, automatic switching, and external DC power. Connection instructions are furnished with these accessories.

4. Connect STL transmitting antenna coax to "**J6 ANTENNA**". This requires a type N male connector. A short flexible jumper (20" max.) may be used between J6 and semi-flexible coax. **Marti Part No. 585-017** double shielded, low-loss RG 214/U jumper is recommended.

5. Turn transmitter off. Connect AC line receptacle on back of the transmitter to a 115 volt AC power source with special cord set supplied. **USE ONLY 3-PRONG GROUNDED OUTLET RECEPTACLES FOR SAFETY.**

WARNING

This equipment must be operated with a 3-prong, grounded, 115 volt, AC outlet receptacle! Failure to use a properly grounded outlet could result in a safety hazard or faulty equipment performance!

Transmitter connections for Monophonic operation

(Refer to Drawing 702-096)

1. Monophonic program audio output is connected to balanced audio input screw terminals. Use shielded wire. Program audio level required is +8 dBm, 600 ohms balanced and isolated from ground. For dual channel stereo repeat instructions at second transmitter. Audio processing requirements will be discussed in the "OPERATION" section of this manual.

2. Connect a remote control or subcarrier generator (modulator) to the jack marked, "**J1** or **J3 SUB IN**". The subcarrier source may be 50 to 5K ohms impedance, and the input level required is approximately one (1) volt RMS. Systems factory supplied with 250 KHz IF bandwidth will carry subcarriers up to 92 KHz. For other subcarrier frequencies or narrow IF bandwidth systems contact the factory. A second subcarrier generator can be connected to "**J3**". If a dual channel stereo STL is used connect one subcarrier generator to "**J1**" or "J3" on each channel's transmitter.

3. The accessory connector has several uses such as remote control, automatic switching, and external DC power. Connection instructions are furnished with these accessories.

4. Connect STL transmitting antenna coax to, **J6 ANTENNA**. This requires a type N male connector. A short flexible jumper (20" max.) may be used between **J6** and semi-flexible coax. Marti **Part No. 585-017** double shielded, low-loss RG-214/U jumper is recommended.

5. For dual channel stereo, use only Marti **Part No. 585-017** double shielded, low-loss RG-214/U jumpers, between **J6** of each transmitter and the indicated connectors of the HRC-10 Series Combiners. Use a third **Part No. 585-017** jumper between the **ANTENNA** connector of the HRC-10 and the semi-rigid coax. Refer to **Drawing 702-096.**

6. Turn transmitter off. Connect AC line receptacle on back of the transmitter to a 115 volt AC power source with special cord set supplied. **USE ONLY 3-PRONG GROUNDED OUTLET RECEPTACLES FOR SAFETY.**

WARNING

This equipment must be operated with a 3-prong, grounded, 115 volt, AC outlet receptacle! Failure to use a properly grounded outlet could result in a safety hazard or faulty equipment performance!

ANTENNAS

The following suggestions are offered to help those responsible for antenna installations avoid costly errors in assembly and adjustment. Marti Electronics, Inc. assumes no responsibility for the installation and performance of antenna systems associated with its equipment. The following suggestions are not intended to be a complete step-by-step procedure, simply a listing of some of the most frequently reported errors in antenna system installation.

Antenna Assembly

Follow the manufacturer's instructions carefully. If no instructions were included with the antenna, call or write the antenna manufacturer for instructions. Errors are frequently made in assembly of the RF feed dipole elements which must be installed in the same plan as the reflector grids. In other words, if the reflector grid elements are horizontal, then the feed dipole elements must also be horizontal. Cross polarization of grid and feed dipole will result in total loss of antenna gain!.

Transmission Line Connector Assembly

Do not use RG-58 U or RG-8 U cable for STL station antennas! They have too much loss at VHF and UHF frequencies. Follow the instructions furnished by the manufacturer when cutting coaxial cable. Inspect the cable ends for small metal fragments which can short-circuit the line inside the connector assembly. Check the line for a short-circuit condition after each connector is installed by using an ohmmeter. Pressurized line should be checked for several days under pressure before installation on a tower to ensure that there are no leaks in the line or fittings

Moisture Proofing Coax Connectors and Fittings

Extreme care must be exercised with coaxial cable before and after connectors have been installed to ensure that moisture does not enter the line. Foam dielectric line can take on moisture absorption which is difficult to detect and remedy. Therefore, keep the line dry while in storage with ends tightly capped. Coaxial splices, connectors, and fittings, to be located outside should be made mechanically tight, then coated with a weather-proofing material over at least two layers of vinyl plastic electrical tape. Moisture problems in antenna systems are usually traced back to connectors which have NOT been properly taped. The Marti K-1 Grounding and Weatherproofing Kit is recommended for use in each new antenna installation.

Location and Grounding of Coaxial Cable

Keep the STL receiver coaxial cable as far from the broadcast transmitter and its coaxial cable as possible. ***DO NOT STRAP RECEIVER CABLE TO THE MAIN ANTENNA CABLE AT ANY POINT. PLACE THE RECEIVER ANTENNA COAXIAL CABLE ON THE OPPOSITE SIDE OF THE TOWER FROM THE MAIN ANTENNA CABLE.*** Maintain maximum separation between these cables at all points, including the distance from tower base to transmitter building as well as inside the building.

System Grounding

It is essential that the STL antenna system be properly grounded for safety and proper operation.

Antenna Installation and Adjustment

The polarization of the transmit and receive antennas of the STL system must be the same! This means that if the transmitting antenna is horizontal, the receiving antenna must also be horizontal. Each antenna should be attached to the tower to allow for final adjustment in azimuth heading and vertical tilt. After visual adjustment of the antennas, the transmitter and receiver can be used to make the final adjustments of the antennas. With the transmitter driving one antenna, the receiver antenna is adjusted for maximum signal (indicated on the receiver) in both horizontal and vertical directivity. **CAUTION:** Antennas have a "major" and several "minor" lobes in their directivity patterns. A common error is to peak the antenna on a minor lobe, resulting in a signal level of only a fraction of the major lobe signal. This error can be avoided only by swinging the antenna through a large angle so that all lobes are evaluated and the major lobe clearly determined. After one antenna is adjusted, the transmitter and receiver locations are reversed, to allow adjustment of the other antenna. If an RF wattmeter is available, each antenna and transmission line can be checked for VSWR when the

transmitter is supplying power to it. The VSWR should be less than 1.5 to 1 (1.5:1). **IF THE ANTENNA SYSTEM FAILS TO GIVE THE PREDICTED SIGNAL STRENGTH LEVEL, THE FOLLOWING ITEMS SHOULD BE CHECKED:**

1. Check for correct assembly of antenna.
2. Check that antennas have same polarity.
3. Check orientation of antennas in both horizontal and vertical directions.
4. Check VSWR of both transmit and receive antennas. VSWR should be less that 1.5:1.
5. Check Fresnel zone clearance along radio path.
6. Check for obstructions in the path such as trees and man-made structures. Do NOT depend on maps or aerial photographs.

CAUTION & WARNING

YOU CAN BE *KILLED* IF AN ANTENNA COMES IN CONTACT WITH ELECTRIC POWER LINES OR EXPOSED ELECTRICAL WIRING. FOR YOUR SAFETY USE EXTREME CAUTION WHEN INSTALLING ANTENNAS. KEEP AWAY FROM POWER LINES.

OPERATION

QUICK START

Simply plug in the STL-20C (there is no power switch). The front panel meter light will immediately come on. Within 5 seconds the AFC LOCK LED will begin flashing indicating that the synthesizer is in the process of locking on a frequency. Also, if the TRANSMIT switch is on, the red TRANSMIT LED will flash in unison with the AFC LOCK LED. During power up, the synthesizer will always lock on the frequency it was locked on when the STL-20C was last powered up.

Within seconds the synthesizer locks on frequency and the AFC LOCK LED will immediately stop flashing and stay on solid green. If the TRANSMIT switch is on, about 3 seconds later the TRANSMIT LED will stop flashing and stay on solid red, and then the STL-20C will begin transmitting RF power at whatever setting the POWER ADJUST pot is at. If the TRANSMIT switch is off the TRANSMIT LED will be off. When the operator turns the TRANSMIT switch on, the TRANSMIT LED will come on solid red and the STL-20C will begin transmitting.

If the operator is not sure what frequency the STL-20C will transmit on, before turning on the TRANSMIT switch, tweak the POWER ADJUST fully counter-clockwise for minimum power, then turn the TRANSMIT switch on. Observe the output frequency on a frequency counter. If the frequency counter is not detecting a strong enough signal, the operator may need to slowly tweak the POWER ADJUST pot for more power.

To change the frequency, refer to the **SENDING AN INSTRUCTION** section.

DETAILED OPERATION

Transmit-Off Switch

This toggle switch controls the RF output of the transmitter. The red light above this switch is a visual indication that the switch is in "**TRANSMIT**" position. The audio circuits, the 13.5 volt regulated power supply and the meter illumination lamps remain on when the TRANSMIT switch is "**OFF**".

Test Meter

The **TEST METER**, with its selector switch, allows monitoring of six important parameters within the transmitter as follows:

1. When switched to "**FORWARD POWER**", the meter indicates the RF power output of the STL-20C transmitter. The maximum power is 20 Watts (18 Watts nominal).

2. When switched to "**REFLECTED POWER**", the **TEST METER** indicates the amount of power returning on the coaxial line from the antenna. This is useful in determining the VSWR (Voltage Standing Wave Ratio) for the antenna system. The lower the VSWR for a given forward power, the better. Most antennas guarantee a VSWR of less than 1.5 to 1.

The table below gives VSWR for various reflected powers:

Forward Power	Reflected Power	VSWR
10 Watts (890-960 MHz)	0.3 watts	1.40
10 Watts (890-960 MHz)	0.4 watts	1.50
10 Watts (890-960 MHz)	0.5 watts	1.57
10 Watts (890-960 MHz)	0.7 watts	1.70
10 Watts (890-960 MHz)	1.0 watts	1.90
15 watts (140-480 MHz)	0.3 watts	1.35
15 watts (140-480 MHz)	0.4 watts	1.40
15 watts (140-480 MHz)	0.5 watts	1.45
15 watts (140-480 MHz)	0.7 watts	1.55
15 watts (140-480 MHz)	1.0 watts	1.70

3. "**SUB LEVEL**" - Indicates subcarrier injection. 0 VU is approximately 10% injection. Subcarrier voltage at J1 or J3 is approximately 0.5 Volt RMS (1.5 V, P-P) for 10%.

4. "**+13 VOLT SUPPLY**" - Indicates regulated voltage supply operation. +1.5 VU is approximately 13.5 VDC.

5. "**P.A. CURRENT**" - The current of the final amplifier and its driver is calibrated to read "**0**

VU" on the meter corresponding to a maximum rated power output.

LED Indicators (front panel)

1. **AFC LOCK** light – A solid green LED light is illuminated when the synthesizer VCO is locked on the desired output frequency. If unlocked, or in the process of being locked the *AFC LOCK* LED flashes green. RF power output is inhibited until AFC Lock is achieved. Initial power-up of the transmitter may require several seconds to achieve AFC Lock.

2. **TRANSMIT** light – A solid red LED light is illuminated when the STL transmitter is transmitting output power. If the TRANSMIT switch is on and the STL transmitter is *not* transmitting output power due to AFC unlock, frequency change or very high temperature fault, the TRANSMIT LED flashes red. If the TRANSMIT switch is off the TRANSMIT LED will also be off.

3. **HIGH VSWR** light – When the STL is operating at a detected VSWR of less than 2, the HIGH VSWR LED is off and the transmitter can operate up to a maximum power of 20 Watts. If the STL internal controller detects a VSWR measured between 2 and 4, the HIGH VSWR LED flashes red at a slow rate of approximately once a second. When this happens, the controller will limit the output power to 10 Watts. If the STL internal controller detects a measured VSWR of greater than 4, the HIGH VSWR LED flashes red at a fast rate of approximately twice a second. When this happens, the controller will limit the output power to 5 Watts.

4. **HIGH TEMP** light – When the STL's PA is operating at a temperature of less than 65 degrees C the HIGH TEMP LED will be off. When the internal controller detects a PA temperature between 65 and 80 derees C, the HIGH TEMP LED will flash red at a slow rate of approximately once a second. When the internal controller detects a PA temperature of greater than 80 degrees C, the HIGH TEMP LED will flash red at a fast rate of approximately twice a second. When this happens the controller will shut down the output power. The output power will remain shut down and the HIGH TEMP LED will flash red twice a second until the temperature falls to less than 65 degrees C, upon which the STL will resume transmitting to it previously set power.

5. **MODE-COMPOSITE/MONO** - Amber colored LED lights indicate the selected mode of operation. Jumper plug "**JP4**" on **800-285 Audio Processing Board** turns on the **MONO** light; "**JP3**" turns on the **COMPOSITE** light.

Peak Modulation Meter

A **"peak hold"** twelve segment **bar graph display** is included on the STL-20C transmitter for setting and monitoring peak STL modulation (composite or mono mode). The five highest LED's (100% to 250%) have a "peak hold" feature which will display an instantaneous peak value for one second. This is a valuable feature when dealing with pre-emphasized program audio. The procedure for setting peak modulation is to adjust the (mono or composite) input level into the STL-20C until the 100% bar is flashing on audio peaks. The 110% thru 250% bars indicate over-modulation and require a reduction in input level to obtain a 100% peak indication.

Pre-Emphasis Selection (Mono Operation only)

Two progammable jumper plugs, **JP5** and **JP6**, on **800-285 Audio Processing Board**, enable the user to select 0 µs, 25 µs, 50 µs, or 75 µs pre-emphasis characteristics. The selection of one of these options in the transmitter requires a corresponding selection of JP9 and JP10 on the receiver **(R-15C) Audio Processing Board, 800-294**. Refer to **Drawing 800-285** and **Drawing 800-294** for the location of these plugs. The plugs as shown in the diagrams, are positioned for 75 µs at the factory. 75 µs pre-emphasis and de-emphasis produces the best threshold noise performance in an FM system.

It does, however, present problems in modulation control. Some users, therefore, may wish to use 50 µs, 25 µs, or flat processing. AM stations will find flat processing desirable since the STL can be treated as a pair of wires in proof-of-performance tests without possible overmodulation of the link at high audio frequencies. With 75 µs pre-emphasis, audio input levels to the transmitter should be reduced 20 dB

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JOB # : 250U1
EXHIBIT # : 6B

below 100% modulation when running frequency response tests to prevent overmodulation at the higher audio frequencies. With a full-quieting RF signal into the receiver, flat pre-emphasis will produce a system signal-to-noise ratio approximately 6 dB less than 75 µs pre-emphasis. Received signal levels less than full quieting may produce a difference of as much as 13 dB between flat and 75 µs pre-emphasis.

Power Adjust Pot

Rotating the POWER ADJUST pot clockwise will increase the output power. Rotating it counter-clockwise will decrease the output power.

Frequency Measurement

The RF output frequency of this transmitter should be measured and adjusted as often as necessary to insure on-frequency operation and to comply with regulations. This procedure is covered in the **TUNE UP and ADJUSTMENT** section.

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EXHIBIT # : 6C

RF EXPOSURE WARNING

This studio to transmitter ling unit (STL) contains a radio frequency (RF) transmitter. During normal operation it sends out radio frequency (RF) signals. In August 1996, the Federal Communications Commission (FCC) adopted RF exposure guidelines with safety levels for wireless devices.

CAUTION: To maintain compliance with the FCC's RF exposure guidelines, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 2 meters from all persons during normal operation and must not be co-located or operating in conjunction with any other antenna or transmitter.

Unauthorized antennas, modifications, or attachments could damage the transmitter and may violate FCC regulations.

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JOB : 250U1
EXHIBIT # : 7D

SYSTEM PERFORMANCE TESTS

The STL-20C transmitter, R-15C receiver with the associated antenna system can be tested and compared with factory test data included in this manual. The following procedures should be followed in order to obtain reliable and accurate results.

Before audio tests or subcarrier tests are begun check the receiver "SIG. LEVEL" METER for required minimum signal. A conversion from VU to *microvolts is given* under **OPERATION** *in the* R-15 receiver manual. For a 950 MHz. system using 50 KHz FM deviation, typical noise levels in *Composite Mode* are:

10 μv for 50 dB S/N ratio
63 μv for 60 dB S/N ratio
80 μv for ultimate S/N ratio

(Demodulated left or right channel de-emphasized and low-pass filtered.)

For the above system with 20% subcarrier injection, the following noise level on the subcarrier (Marti SCG-10 - SCD-10 System) was measured: (no modulation main or sub)

10 μv for 40 dB Subcarrier S/N ratio
20 μv for 47 dB Subcarrier S/N ratio
30 μv for 50 dB Subcarrier S/N ratio
150 μv for ultimate Subcarrier S/N ratio

With ultimate S/N ratio, main to sub crosstalk should be -40 to -45 dB (using Marti SCG-10 - SCD-10 Subcarrier System).

NOISE (monophonic mode)

Noise measurements should be made first, since high noise levels will influence distortion readings. *Also ground loops in the audio oscillator to* transmitter connections and distortion analyzer to receiver connections must be resolved before testing begins. The influence of high RF fields upon the test equipment must be determined and corrected before accurate measurements can be made. NOTE: NOISE AND DISTORTION MEASUREMENTS ARE MADE WITH SUBCARRIER AND REMOTE CONTROL INPUT SIGNALS REMOVED. System signal to noise ratio is determined while modulating the transmitter 100% at 400 Hz. A level of +8 dBm across the balanced audio input terminals of TB-1 will produce a reading of 100% modulation on the "PEAK MODULATION" indicator. Set Receiver "MONO LEVEL" pot for +10 dBm output into the distortion analyzer. If the distortion analyzer has a high impedance input, add a 600 ohm load resistor to match the receiver. Establish +10 dBm on the audio voltmeter of the analyzer as the reference level for 100% modulation. Next, remove the audio signal from the transmitter input and measure noise level below reference (100% modulation). This reading should compare with that published under **SYSTEM SPECIFICATIONS** in this manual.

DISTORTION (monophonic mode)

Harmonic distortion is usually measured at 100% modulation and at several frequencies. If pre-emphasis processing is used in the transmitter with corresponding de-emphasis in the receiver, it is normal for available audio level at the receiver to drop with increasing frequency according to the de-emphasis curve selected. At 15 KHz, there is sufficient level to operate most modern distortion analyzers. Distortion levels should be within specifications. If distortion is out of specs, check system noise, check for test equipment ground loops, RFI, and transmitter/receiver operating frequency. If either unit is off frequency, the FM modulation sidebands are not centered within the IF filter bandpass, which can cause audio distortion.

FREQUENCY RESPONSE (monophonic mode)

If the STL-20C System is switched to flat processing, frequency response can be measured as if the signal were being sent over straight wires. If pre-emphasis processing is used (especially 75 μs) allowance must be made in the transmitter audio input level to prevent over-modulation at test frequencies above 400 Hz. The simplest and fastest method is to set the transmitter audio input level for

100% modulation at 400 Hz., then attenuate this level 20 dB. Set receiver output level to -10 dBm as the reference, then sweep the audio band for response. Response should be within the limits listed in **SYSTEM SPECIFICATIONS**.

COMPOSITE (STEREO) SEPARATION, NOISE, DISTORTION AND FREQUENCY RESPONSE. (composite mode)

This procedure consists of feeding a stereo encoder (generator) capable of more than 60 dB separation (50 Hz - 15 KHz) into the composite input of the STL-20C transmitter and connecting a stereo decoder (monitor) to the composite output of the R-15C receiver. The actual test procedure may vary with different decoders (monitors). Therefore the procedure prescribed in the decoder (monitor) instruction manual should be followed.

SENDING AN INSTRUCTION

Refer to drawing 597-6020-2.

This section outlines how to send an instruction to the T/R SYNTHESIZER. The controls for sending an instruction all reside on the SYNTHESIZER CONTROL BOARD (800-377). These controls consist of three 8-pin dip switches labeled S1, S2, and S3, and one pushbutton switch labeled S4. For the STL-20C the only instructions that are needed are as follows:

1. Frequency Change
2. Forward Power Calibration
3. Reverse Power Calibration
4. Normal Operation
5. Power Control = Max
6. *Store Raw Power Into Cal Position # (where # represents a number from 0 to 8)*

Following are the steps for sending an instruction:

1. Set the dip switches of S1, S2, and S3 according to the instruction format. A "1" indicates that the dip switch is placed in the **OFF** position. A "0" indicates that the dip switch is placed in the **ON** position. An "x" indicates that it does not matter what position the switch is in.
2. Push the S4 pushbutton switch down and then release.

INSTRUCTION FORMAT

Frequency Change:

Refer to the FREQUENCY DIP-SWITCH SETTINGS section.

Forward Power Calibration:

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 0 0 0 0 1 x	x x x x x x x x	0 0 0 0 1 x x x

Reverse Power Calibration:

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 0 0 0 0 1 x	x x x x x x x x	0 0 0 1 0 x x x

Normal Operation:

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 0 0 0 0 1 x	x x x x x x x x	0 1 0 0 0 x x x

Power Control = Max:

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 0 x	0 x x x x x x x	x 1 1 1 1 1 1 1

Store Raw Power Into Cal Position # (where # represents a number from 0 to 8):

Position 0

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 0 0 0	x x x x x x x x

Position 1

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 0 0 1	x x x x x x x x

Position 2

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 0 1 0	x x x x x x x x

Position 3

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 0 1 1	x x x x x x x x

Position 4

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 1 0 0	x x x x x x x x

Position 5

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 1 0 1	x x x x x x x x

Position 6

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 1 1 0	x x x x x x x x

Position 7

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 0 1 1 1	x x x x x x x x

Position 8

S1	S2	S3
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1 0 1 1 0 0 1 x	x x x x 1 0 0 0	x x x x x x x x