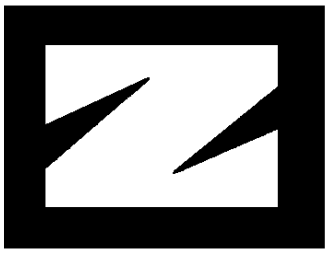


ZEPHYRUS
ELECTRONICS, LTD

300 SERIES
Satellite Radio & Data Products

ZEPHYRUS ELECTRONICS, Ltd

168 South 122 E Avenue, Tulsa, OK 74128-2405

Phone 918 437-3333 Fax 438-7322

http://www.zephyrus.us e-mail support@zephyrus.us

ZEPHYRUS

Thank you for using our equipment. **We will do our best to earn your continuing confidence in Zephyrus and our products. Any time you need information or help, give us a call at 918-437-3333 (US).**

It's a good idea to look the equipment over for any shipping damage as soon as it is received. If damage is discovered, contact and file a claim with the freight company. They are responsible to you.

We hope it doesn't happen, but if you ever have a problem that requires you to send equipment back to us for repair or replacement, ***Please pack a note in with the device. Give us as much information as possible;--*** what the problem is and anything you can tell us that might help solve it. Customer feedback is the last line and a very vital part of our overall quality control.

It will also help both of us if you will get an RMA number from the service technician you are talking with. We will certainly accept products for service without a number, but any notes that the tech makes in his phone calls with you might not get tied to your unit when it gets here.

Our Limited Warranty is as follows:

We will fix or replace any product that is defective within One year (Australia) after you receive it. We won't cover damage from accident or misuse. Warranty is FOB the factory or our servicing distributor. Our responsibility is limited to repair or replacement only and no other expenses or consequential damages. No other warranties apply.

Whether your warranty has expired or not, customer support and assistance is the backbone of our business. Our managment has a background in broadcasting, so we understand the seriousness of "equipment down." We'll do all we can. --Your referral to a friend might even be our next sale!

ZEPHYRUS 300 SERIES PRODUCTS

Table of Contents

A Typical System and Installation

Our "typical" system consists of a Dish, LNB, and a Zephyrus package for receiving a stereo network service. It has tone decoders for station automation control.

THE RECEIVER & DEMOD SYSTEM

The 304 Mainframe holds all the electronics of the system. It occupies only 1 3/4 inches of space in your rack. If at all possible, don't crowd it in between other pieces of gear that extend deeply into the rack. Give it a little room to breathe. If your 304 and boards were factory assembled, you should have to do nothing but hook the system up and turn it on. Cards are mounted in optimum positions so please don't move them. For a system with multiple sub-audible tone decoding, the boards (starting from the right side of **Fig. 1**) are:

- **Power Supply-** A green LED glows when power is available to your LNB. If this lamp doesn't light, *it indicates that you have a short in the coax to the LNB.* A "crowbar" circuit on the power supply shuts off voltage to the LNB whenever current exceeds an acceptable level. The crowbar circuit can be reset by disconnecting the coax cable from the 304 or by turning the power switch off for a few seconds.
- **Satellite Receiver-** The three hexadecimal switches on the right of the meter select the tuning of the receiver for your transponder. **A chart of switch settings is in the 391/392 Satellite receiver section of this manual.** As an example, if your signals are on transponder 13, your switches will be at "**4 E C".** The meter gives an indication of relative signal strength from the dish. The pot just to the left of the meter sets the meter range.
- **Dual Audio Demod-** This demodulates the left and right audio signals. In a system without tone decoders, line level audio is taken off the back of this board. In a system with tone decoders, it sends the audio signal to the tone decoder for further processing.
- **Sub-audible tone decoder-** This multifunction board decodes tones, contains the relays for each tone combination, removes the tones from the outgoing audio, provides a readout of the last tone decoded, and gives you a place to adjust your output audio level.

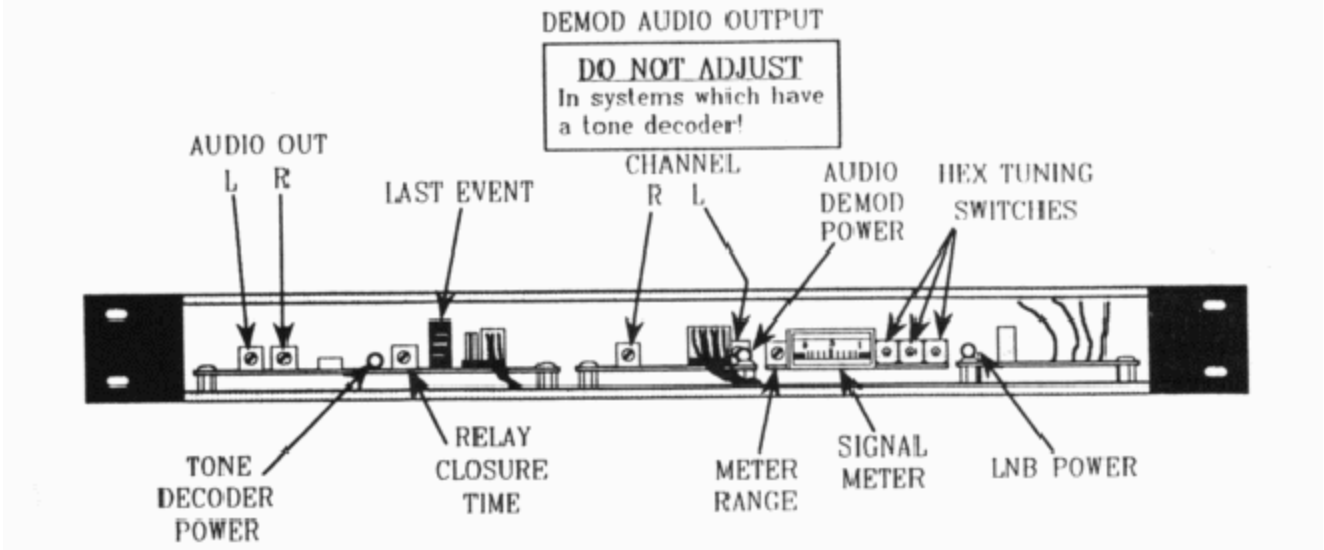


FIGURE 1

Typical Zephyrus 300 System for a Stereo Radio Service

DISH SETUP AND ALIGNMENT HINTS

We assume your dish has been mounted and installed correctly and that you know how to make polarization and position adjustments.

Your LNB contains a low noise amplifier and a Block Converter in one package. The LNB provides an "L" band output in the 950-1450 mHz range. Make sure the gasket is properly in place between the feedhorn and LNB. Use a connector sealer material, such as "Coax Seal", or putty type sealers sold by air conditioner supply stores, around the coax connector. Take care to do a good job as **moisture invading the LNB or cable is one of the most common causes of system failure.**

Pointing and optimizing the dish: If you don't have access to equipment other than your Zephyrus package, take the 304 out to the dish along with a speaker-amplifier and hook everything up and turn it on. If the dish is misaligned, you will hear white-noise on the speaker. As you zero in on the satellite and get the polarity optimized, you'll hear whatever is on the subcarrier, be it silence or program audio**.**

When you get to this point, use the meter on the satellite receiver to peak your adjustments. Reset the meter sensitivity pot, if necessary, to keep the meter in an operating range.

Using a video monitor: The baseband output of your Zephyrus 391 or 392 satellite receiver can be connected to a video monitor (not a television set) to hunt the satellite. If you are running on above-video subcarriers, the dish can be optimized by watching the picture and adjusting for minimum "sparklie" noise. The picture may have edge tear or flicker. This is because the baseband output is optimized for subcarriers, and doesn't have a video clamp.

Indication of weak signal: Misadjustment of the dish/polarity, LNB trouble, moisture in the cable connectors, or front end trouble in the satellite receiver can **all** cause a weak signal to the baseband demod in the receiver. Any of these can have the effect of causing "pops" in the program audio as the problem develops. As the problem worsens, the pops get more frequent, eventually turning to "static". The effect is much the same as driving out of range of an FM broadcast station with your car radio. This type of "front-end" trouble does not affect the tonal quality of the audio. Program audio that has no popping or static noise, but which is distorted (or is the wrong level) does not come from the above areas. Distortion problems come from audio processing circuits. This can be in the transmission processing, or the receiver demod and audio circuits.

Terrestrial Interference- can cause problems which vary from the same audible indications as a weak signal from the dish all the way to a signal which is blanked out. Telephone company microwave services operate in the same "C" band frequency range as satellite signals. However, carrier center frequencies are offset by 10 mHz from the satellite transponders. The effect of this is that if the baseband IF frequency of a satellite receiver is at 70 mHz, the "TI" carriers show up at 60 and/or 80 mHz.

This is particularly troublesome if you are running on subcarriers above video because your baseband receiver requires an IF bandwidth of over 30 mHz (or a bandpass of 55 to 85 mHz). The 60 and 80 mHz interfering carriers can come running through. The 391 receiver has provision to install 60 or 80 mHz "TI Traps".This can sometimes make a signal tolerable.---However, *a word of caution.*-- Traps remove a portion of the desired signal at the 60 and 80 mHz frequencies as well as the interference.

What this comes down to is that your audio quality is at the mercy of the underlying video signal that is being transmitted at any particular instant.-If low detail and contrast pictures are being transmitted, your audio can sound great, but as soon as a high contrast or color picture is transmitted you can hear sounds varying from a buzz to a frying sound.

Non-video systems operate with reduced bandwidths. TI is a problem only in extremely high signal levels because the IF bandpass is inside the 60 and 80 mHz trouble spots.

The best solution to TI is to try to keep it from getting into your LNB in the first place. This can often be done by mounting the dish in another location where hills or buildings can shadow the antenna from the signal source. The other is to experiment with screen wire shields in the area of the LNB or dish..

BACK INDOORS

When you install your 304 in the rack, the first thing you may notice is that the meter has a lower reading than it did outdoors. The reason for this is that the metering circuit is indicating the loss in your cable. Readjust the meter sensitivity to a center value and make a note of it. If the value drops in the future, look for dish movement, ice or snow in the dish, water in cables, etc.

Sun fades occur for periods of a few days in the spring and fall and last for a few minutes. You can verify if this is your signal loss by looking at the sun shadow in the dish. It will be dead center when this happens.

Notes on Cable: RG-59 cable is usually OK for runs up to 125 to 150 feet. Longer runs require a heavier cable such as RG-6, or preferably RG-11. The DC resistance of light duty cables eats up the supply voltage to the LNB on long runs. *Any cable you use must have substantial braid. Foil-only outer conductors are OK to run TV signals around your house, but not much else.* "L" Band line amplifiers can be used for long runs between the dish and receiver. We have gone as far as 700 feet in special cases.

If you use cables other than RG-59, it is a good idea to use short jumpers of RG-59 on the ends of the heavy cable. The "F" connectors that go on larger cables often have such a big inner conductor that they can stretch or damage the female connectors on your LNB or receiver.

In cases of extreme RF fields, particularly with data receivers, you may want to look at triple shield cable such as Belden 9060. You can probably get some from your nearest Cable TV company if you don't have a cable dealer nearby.

Audio and Relay Connections to your equipment is the same as other line-level audio and control equipment that you use on a day to day basis. Check the following sections on the individual 300 series modules for specific information on each unit.

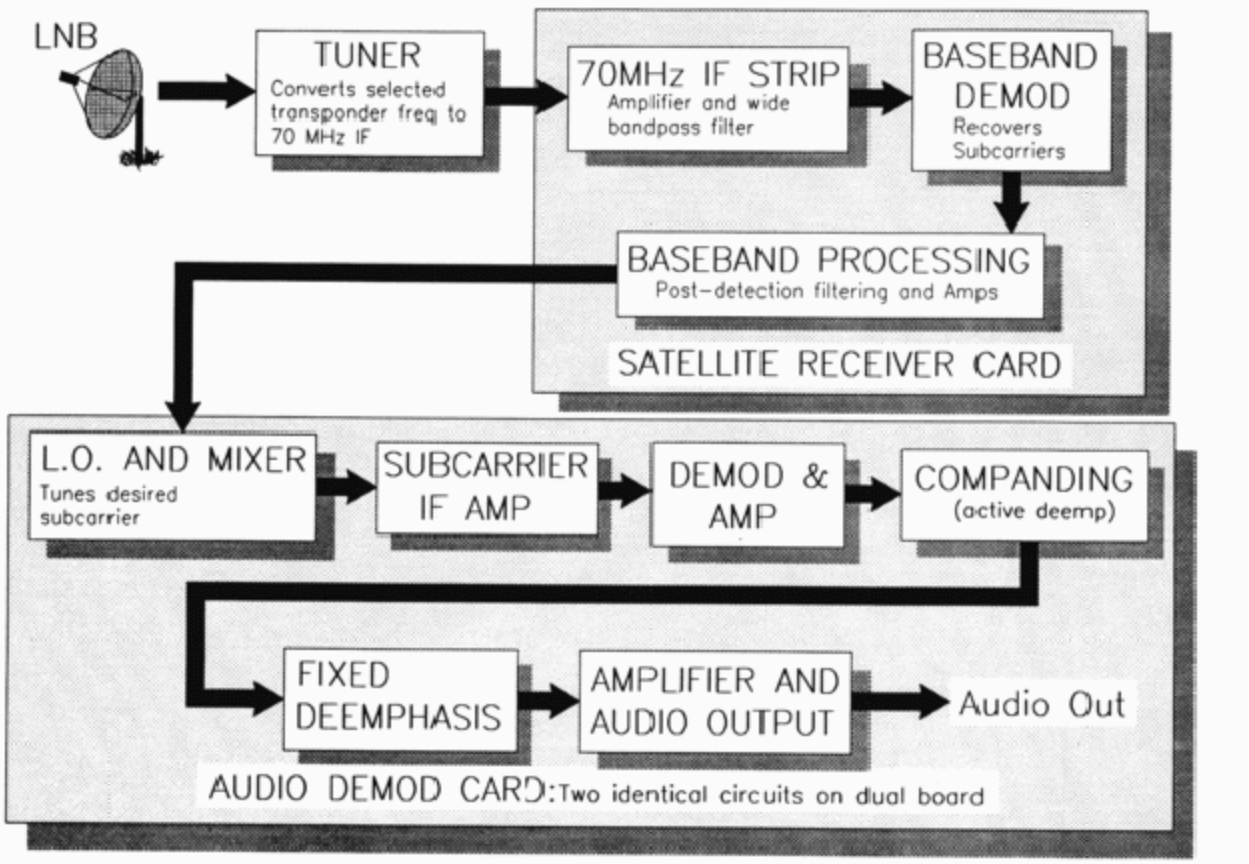


FIGURE 2.

Baseband Receiver and Audio Demodulators

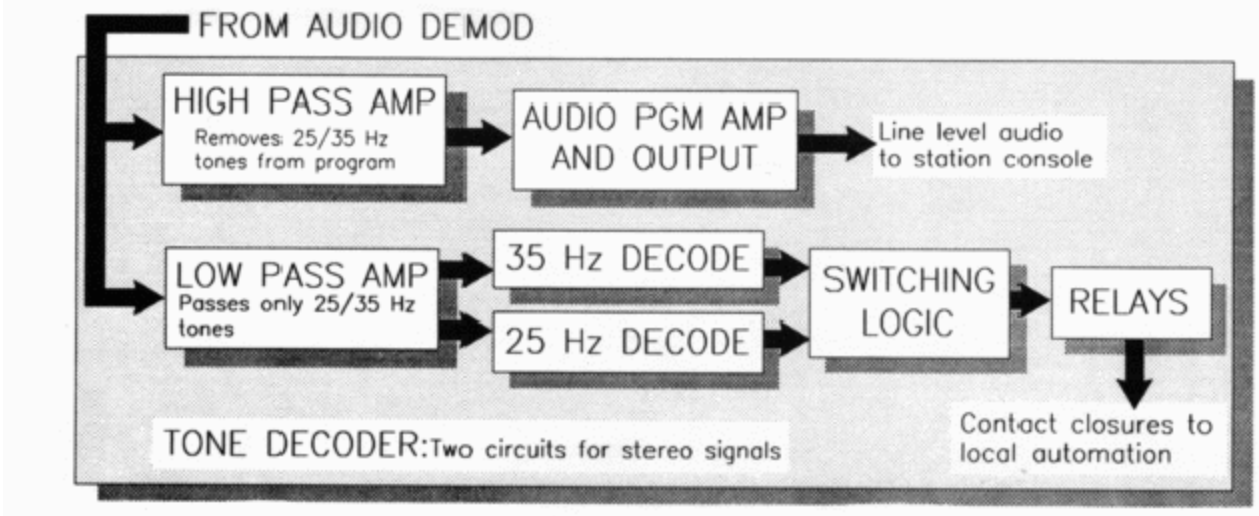


FIGURE 3

Tone Decoders, Audio Filters & Relay Logic

304 Mainframe

Refer to Figures 1 & 4

Physical: The 304 Mainframe occupies one 1 3/4" space in a standard 19" equipment rack. Total depth is 15 1/2". Additional depth needs to be provided to allow for cable bends. Weight is 10 pounds. A removable smoked transparent front panel permits access to the front of circuit cards.

Electrical: The 304 requires 117 V, 60 Hz AC power. It contains an unregulated positive and negative power supply for operation of up to four standard width 300 series circuit boards. A Crowbar power shuts down voltage to the LNB in the event of a short circuit in the coax line. *To restore power the load must be fully disconnected temporarily or the 304 power must be turned off for a few seconds.* **Replace the fuse with a 1/2 amp slow blow only.**

Circuit Boards: The 304 has spaces for four standard width boards. However, each 304 mainframe can hold only one 391 or 392 satellite baseband receiver. Other cards can be of any mix. The 383 tone decoder is a double-wide board and occupies two spaces.

Back Panels of the 304 vary with the circuit board requirements. Factory installed cards are labeled on the rear panel. Stickers are furnished for labeling of boards added in the field.

Interconnect Power Cables : Three different interconnect jumpers are used within the 304. They are as follows:

Application	**Color**	**Voltage**
Board	Red	+18 unreg
power	Brown	Gnd
interconnect.	Violet	- 18 unreg
LNB Power	Red	+18 unreg
Tuner Power	Orange	+12 regulated
Tuning Voltage	White	variable positive

(*Wires to Tuner. Red is from power supply board. Orange and White run from the satellite receiver card)*

Power to 391 or	Red	+18 unreg
392 Satellite	Yellow	+28 tuning voltage supply
Receiver card.	Brown	Gnd

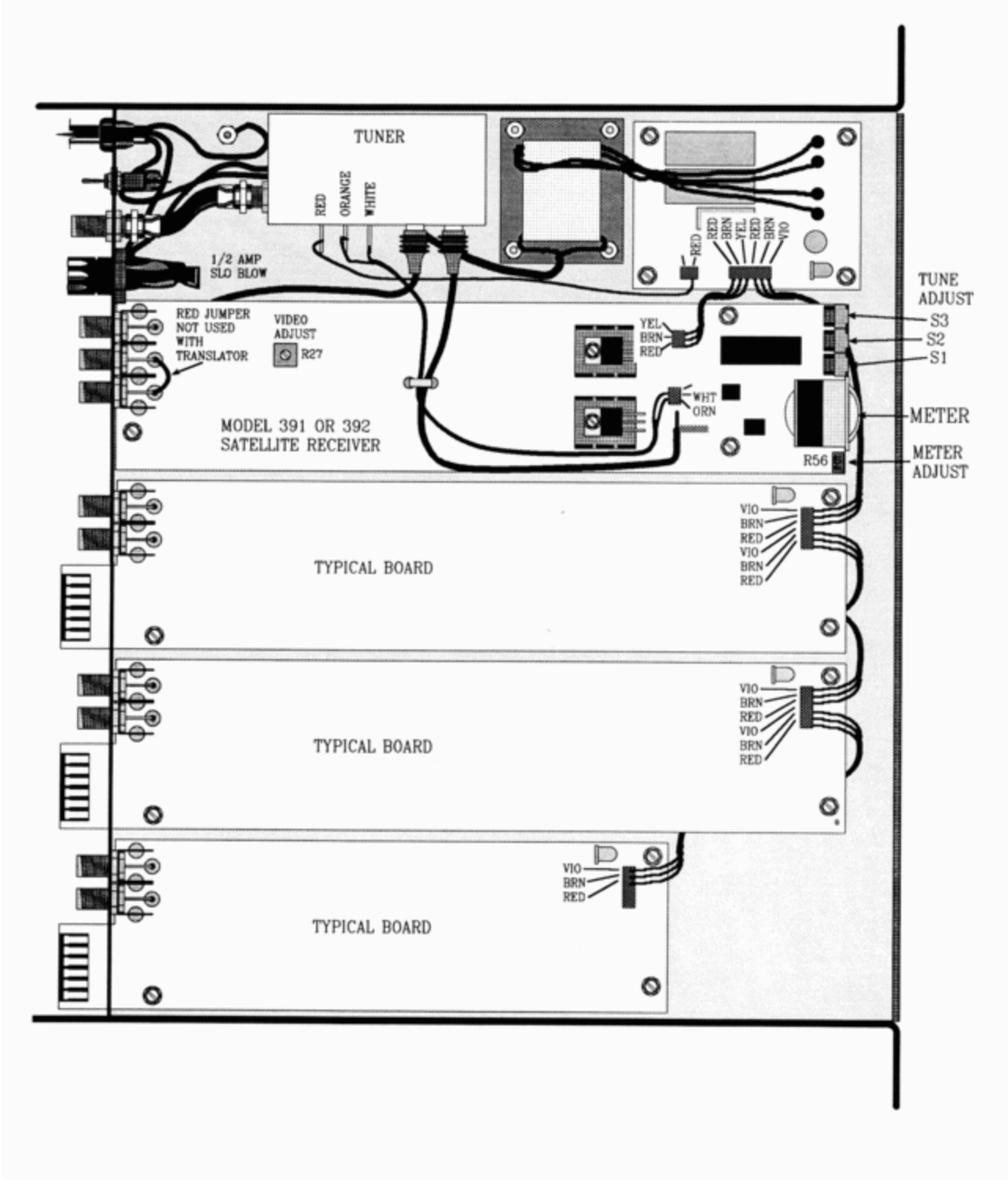


FIGURE 4.

Detail of 304 Mainframe and Interconnections

391 & 392 Satellite Baseband Receivers

General: The 391 & 392 Receivers consist of two parts: a circuit card and a tuner module. The card always mounts in the 304 slot next to the power supply. The tuner module mounts on the end of the mainframe. Interconnect wiring codes are listed in the **304 Mainframe** section and illustrated in Figure 4.

Baseband outputs may be used to drive video monitors (NOT TV sets) as an aid in locating the satellite. Flicker of video signals is normal as no video clamp is available. It is normal for the 392 to show some "tearing" on sharp picture edges or transitions because of the narrow IF bandwidth.

The meter provides an indication of relative signal strength. The range of the meter is set to the users preference with the control just to the left of the meter. The meter serves as an aid in dish aiming by optimizing for peak level. It functions as a system monitor in day to day operation. We recommend that you adjust the meter for center range when your installation is complete. Any drop thereafter indicates a loss of signal strength, usually caused by dish movement, or water in the cable connectors or LNB.

Transponder Tuning is done with the three Hexadecimal switches just to the right of the meter. Switch settings for "C" band transponders are:

Xponder	Sw	Xponder	Sw	Xponder	Sw
1	5DC	9	53C	17	49C
2	5C8	10	528	18	488
3	5B4	11	514	19	474
4	5A0	12	500	20	460
5	58C	13	4EC	21	44C
6	578	14	4D8	22	438
7	564	15	4C4	23	424
8	550	16	4B0	24	410

The left switch is the most significant digit and the right switch is the least. Each step of the right switch represents a one mHz step of tuning. Each switch has 16 positions. Therefore, one revolution of the right switch equals one click of the center switch, or 16 mHz of change. Fine tuning is accomplished by moving the right switch up or down from the standard setting.----If the right switch is moved through zero, the center switch must be moved one click in the same direction the right switch was rotated.

The tuning of the receiver is synthesized and referenced to a crystal. The reason fine tuning might need adjusting is to compensate for frequency error of the LNB oscillator. If you notice that the setting of the fine tuning varies with outdoor temperature, the LNB should be replaced. Tuning is optimized by finding the center setting between the points that the audio sounds "static-y".

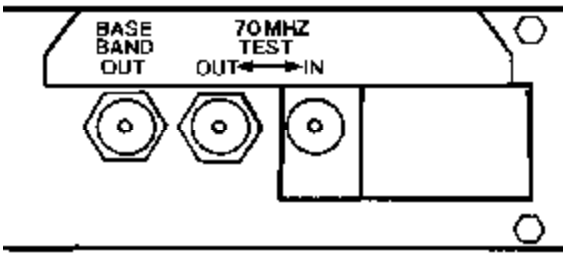
Operation on Ku band Satellites: The Ku satellites do not follow a nice neat industry standard of designation of transponder frequencies. Therefore, it is necessary to determine switch settings from the numerical transponder frequency in mHz. Steps are:

- Subtract the LNB local oscillator frequency to determine the "L" band frequency presented to the receiver tuner.
- Add 70 to the L band frequency (in mHz)
- Convert the result to HEX and enter the values on the switches.

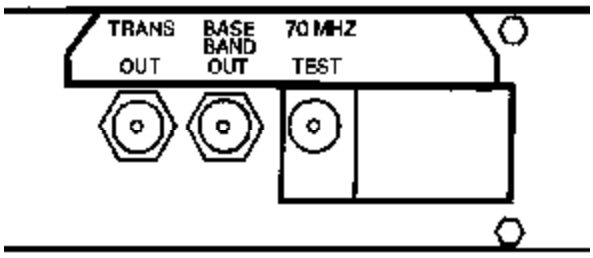
What all this amounts to is that the LO in the tuner runs 70 mHz above the tuned frequency. The synthesis logic operates in one mHz steps.

Calculation of switch settings for C band frequencies other than "standard" USA transponders:

- Determine satellite center frequency in MHz (this will be between 3700 and 4200).
- Subtract the result from 5220.
- Convert answer to a Hex number.



The 391 provides 70 mHz connections which may be used for T.I. Filters



The 392 Receiver has an output for a built-in Baseband Frequency Translator

FIGURE 5

Rear Panel F Connections of 391 & 392

321 & 322 WHISPER

Audio Demodulators

The Zephyrus Whisper audio demodulators are compatable with the narrow band, complex companded subcarrier (or " FM square") signals transmitted over satellite transponders. The 321 (single demod) or the 322 (dual demod) are single-width boards and occupy one of the four spaces in a 304 mainframe. Power is supplied by the 304.

7.5 or 15 kHz bandwidth must be factory set, as must the operating frequency. As shipped, units are adjusted for a nominal zero dbm audio level on program material.

SPECIFICATIONS ARE:

- Frequency Response +/- 1db from 50 to 7.5 or 15 kHz
- Distortion < 1%
- Subcarrier level 25 to 250 mv p-p
- Input impedance Hi-Z looping
- Output level +8 dbm max
- Stereo separation > 60 db

Audio output level adjustments are accessible from the front of the board (see Figure 1). They are located about 5 cm. back from the front of the board. A non-metallic tool is recommended for adjustment. All other controls are for factory adjustment only.

321-D WHISPER

Programmable Audio Demodulator

The Zephyrus 321-D Whisper audio demodulator is compatable with the narrow band, complex companded subcarrier signals transmitted over satellite transponders. The 321-D is frequency programmable in 5 kHz steps and has a defeatable squelch. Power is supplied by the 304.

7.5 or 15 kHz bandwidth must be factory set. Operation is automatic between FM-FM or above-video subcarriers as a high pass filter is switched in at the input anytime a subcarrier frequency above 5 MHz is selected. As shipped, units are adjusted for a nominal zero dbm audio level on program material.

USER SETTINGS AND ADJUSTMENTS

SQUELCH is enabled when the jumper at the left edge of the card is placed between the center and the outside pin. It is defeated when moved to the inside-center pins.

AUDIO LEVEL is adjustable with the mini-screwdriver pot located 2" back from the front of the card just to the right of the green power LED.

SUBCARRIER FREQUENCY (and the video filter) is programmable with the set of 12 DIP switches. The procedure to determine the switch settings is:

1. Add 10695 to the subcarrier frequency expressed *in kilohertz.*
2. Divide the result by 5 and convert the answer to a binary number.
3. Delete the most significant bit (always a "1"). You will be left with an 11 bit binary number.
4. Switch #2 is the remaining Most Signifant Bit and #12 is the Least Significant. For each binary "1" of your 11 bit number, turn the corresponding switch OFF. For each "0" turn the switch ON.
5. Turn switch #1 ON for FM-FM services and OFF for above-video subcarriers.

   EXAMPLE: For a subcarrier frequency of 6.3 MHz, add 6300 to 10695.
   Divide the sum by 5 to obtain 3399.
   The binary equivalent is 110101000111. Remove the leading
   "1" for a resulting number 10101000111.
   Switches 2,4,6,7,8 are turned ON and the others are OFF.
   6.3 MHz is an above-video subcarrier. Turn switch #1 OFF.

SPECIFICATIONS: Same as 321-322 on preceding page. However, the 321-D has a phono connector for an unbalanced connection in addition to the "flip" connectors.

327 Whisper™
Agile Demodulator

The 327 is a single channel audio card. Two cards are required for stereo. It tunes either FM-FM or above video signals. However, they must be ordered in the required audio bandwidth, either 7.5 or 15 kHz. The two bandwidth models are NOT interchangeable.

Two types of audio are available at the rear of the card. **Direct** audio output appears as a balanced signal and contains any 25 or 35 Hz cue tones transmitted with the audio signal. **Filtered** audio has passed through an active filter which effectively removes the cue tones, thus eliminating any resultant flutter noise. The filtered audio appears balanced at the flip connector terminals. An unbalanced filtered output is available at the phono type connector.

Tuning is accomplished by setting the rotary switches at the front right of the card directly to the frequency of the subcarrier such as 1.770, 6.345etc. *If the demod is to be used with the optional remote control, all the switches on the demod card must be set to the letter "F" to enable operation at the remote control.*

There are three lamps at the front of the card. The red lamp indicates a noisy or missing subcarrier signal (squelch). The left and right green lamps indicate the presence of - and + 12V power respectively.

The control between the two green lamps is the output level adjustment of the filtered audio output. The demod (direct) audio level may be adjusted with the control which is just to the left of the frequency adjust switches *and recessed back about 2½ inches from the front of the board.* This adjusts **all** audio output levels. It was recessed to prevent its accidental adjustment. -(The usual use of the unfiltered output is to feed cue tone decoders which are very sensitive to incorrect levels.)

The 327 has circuitry which listens for noise and optionally squelches the audio output. Squelch is enabled by placing the shorting plug on the left two pins at the front left of the card. It is disabled by moving it to the right two pins.

SPECIFICATIONS

Power	Plus and minus unregulated 16 volts, supplied by 304
Subcarrier Frequencies	100 kHz to 8.5 mHz (from receiver direct baseband out)
Input Impedance	Hi-Z looping
Subcarrier Level	25 to 250 mv p-p
C/N Threshold	11 dB click. Recommended minimum is 14 dB
Output level	+16 dBm max at balanced output
Output types	600 ohm balanced, filtered and unfiltered. Unbalanced filtered
Frequency Response	within 1 dB from 50 Hz to max (15 kHz or 7.5 kHz)
Distortion	<1%

Accessories and Optional Configurations

327Optional Remote Control is a package of thumbwheel switches that control two 327 audio demodulators and one Zephyrus 391 satellite baseband receiver. With the receiver and two demods a pair of stereo subcarriers on any transponder may be tuned remotely.

383 "Sub-Audible" Stereo Channel

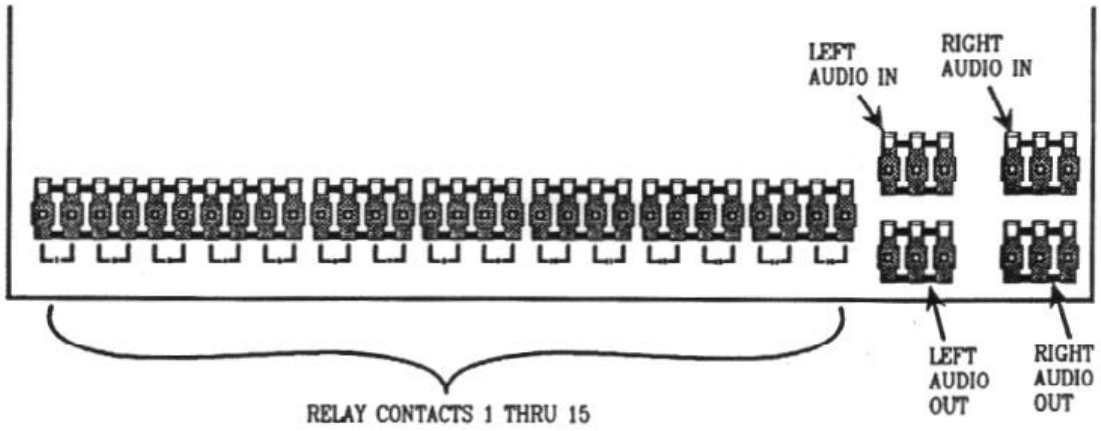
TONE DECODER

General: The 383 tone decoder is a "double-wide" board which occupies two spaces of a Zephyrus 304 mainframe. The frame requires a special back panel to accomodate a 383. The 383 is mounted to the left end of the frame (*see figure 1*).

Nunber of Functions: Two versions of the 383 are manufactured; a six-function unit (the 383-6) and a fifteen function (383-15) The device you need depends on your network service. **Note-** *The 15 function board is not the same as the 6 function with more relays. The encoding schemes are different.*

FIGURE 6.

Rear Panel Connections of 383 Tone Decoder



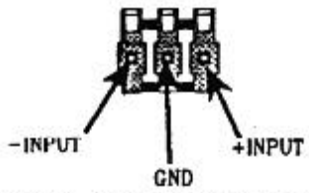
Control Function Outputs: (See Figure 6,above for rear panel connections)

- Each output is driven by a pair of Normally-Open relay contacts.
- All output contacts are independent.- There is no "common" wired within the circuit board. You may create a "common" connection externally, if you wish.
- The relays are miniature types and are to be used for control level signals **only**.
- Relay closure is factory adjusted for about one-second. You may vary this with the Relay-closure-time control. Contact us if you need range that exceeds the control.

Operation: Audio outputs from the 322 audio demod board must be adjusted for Zero dbm peak program level loaded into 600 Ohms. Audio is connected between the 322 audio out and the 383 audio input on the back panel (see Figure 6). Program Audio Output to your system is picked up at the Audio Out of the 383. Output level adjustment from the 300 system is done with the controls on the 383 board.

Any tweaking of the program levels on the 322 board will upset operation of the tone decoder circuits. Audio filtering in the audio amplifier section of the 383 effectively removes the 25 and 35 Hz tones from the output audio.

When a tone or combination of tones are decoded, the Numerical Readout at the front panel indicates the function number of the tones. The appropriate relay closes. The readout will continue to display the last function sensed.



TYPICAL AUDIO CONNECTIONS
FOR INPUTS AND OUTPUTS

381 "Sub-Audible" Single Channel

TONE DECODER

General: The 381 tone decoder is on a single width board which mounts in a Zephyrus 304 Mainframe. It is usually mounted to the left of its audio demod source. The 381 is similar in circuitry to a 383 tone decoder described elsewhere except the 381 is for mono audio services. The 381 has three control outputs, triggered by tones of 25 Hz, 35 Hz and 25 + 35 Hz.

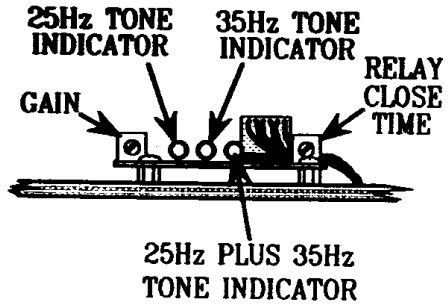


FIGURE 7.

Front View of 381

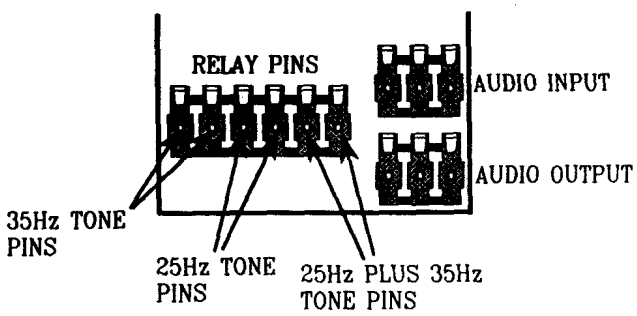


FIGURE 8.

381 Back Panel Connections

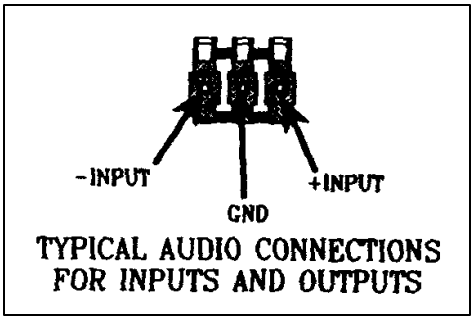
Control Function Outputs:

- Each output is driven by a pair of Normally-Open Contacts.
- All output contacts are from individual relays. You may wire a "common" externally, if you wish.
- The relays are miniature types and are for control level signals only.
- Relay closure is factory adjusted for about one second. You may vary this with the front panel control. Contact us if you need range that exceeds the control.

Operation: Audio output from your 321 or 322 audio demod board must be adjusted for Zero Line Level peak program level loaded into 600 ohms. Audio is connected between the demod board output and the 381 audio input on the back panel (see Figure 8). Program Audio output to your system is picked up at the Audio Out of the 381. Output level adjustment from the 300 system is done with the controls on the 381 board.

Any different adjustment of the audio output level on the audio demod board will upset operation of the tone decoder circuits. Audio filtering in the audio amplifier section of the 381 effectively removes the 25 and 35 Hz tones from the output audio.

When a tone or combination of tones are decoded, the LED's on the front panel illuminate during the time that the tones are being sensed.



TYPICAL AUDIO CONNECTIONS
FOR INPUTS AND OUTPUTS

331 (mono) and 332 (stereo) FM MODULATORS

Installation and Operation

The 331 or 332 Modulators are synthesized for frequency agility in 200 kHz steps to standard FM Broadcast frequency assignments. Refer to the Operating Frequency Chart for Tune Switch settings. Special frequencies outside the standard FM band are available on special order. Modulator outputs are very free from spurious emissions and are designed to operate with cable TV head-end gear.

Refer to Figure 332-1 for location of key circuit board connections and controls. Input audio levels are adjusted with VR-7 (left or mono) and VR-8 (right channel). They are factory set for full deviation with an input audio level of Zero dbm. Audio input is unbalanced. Watch phasing if using "half" of a balanced audio line in stereo units.

Adjustments should not be attempted without proper instrumentation.

Do not operate the 331/332 without the lid in place.

SPECIFICATIONS-STEREO (and mono where applicable)

100% Deviation	+/- 75 kHz includes 10% deviation of 19 kHz pilot
Freq Response	20-15000 Hz within 1 db
Pre emphasis	75 microseconds
Distortion	<1%
Stereo Separation	>30 db
Signal to Noise	>63 db\
Audio input level	-10 to +18 dbm adjustable
Input impedance	10k ohms, unbalanced
Stereo Format	Standard Stereo Multiplex with 19 kHz pilot
RF output	88.1 to 107.9 mHz agile in 200 kHz steps
RF level	+20 to +50 dbmv adjustable into 75 ohms
Spurious and Harmonics	>60 db below +50 dbmv
Power Requirement	+15 vdc (supplied by 304 mainframe)

Operating Frequency Chart

S1 Switch Settings 1=ON 0=OFF

FREQUENCY IN MHZ	S1 SETTINGS #10 #1	FREQUENCY IN MHZ	S1 SETTINGS #10 #1	FREQUENCY IN MHZ	S1 SETTINGS #10 #1
88.1	1001000111	94.7	1000100110	101.3	1000000101
88.3	1001000110	94.9	1000100101	101.5	1000000100
88.5	1001000101	95.1	1000100100	101.7	1000000011
88.7	1001000100	95.3	1000100011	101.9	1000000010
88.9	1001000011	95.5	1000100010	102.1	1000000001
89.1	1001000010	95.7	1000100001	102.3	1000000000
89.3	1001000001	95.9	1000100000	102.5	0111111111
89.5	1001000000	96.1	1000011111	102.7	0111111110
89.7	1000111111	96.3	1000011110	102.9	0111111101
89.9	1000111110	96.5	1000011101	103.1	0111111100
90.1	1000111101	96.7	1000011100	103.3	0111111011
90.3	1000111100	96.9	1000011011	103.5	0111111010
90.5	1000111011	97.1	1000011010	103.7	0111111001
90.7	1000111010	97.3	1000011001	103.9	0111111000
90.9	1000111001	97.5	1000011000	104.1	0111110111
91.1	1000111000	97.7	1000010111	104.3	0111110110
91.3	1000110111	97.9	1000010110	104.5	0111110101
91.5	1000110110	98.1	1000010101	104.7	0111110100
91.7	1000110101	98.3	1000000100	104.9	0111110011
91.9	1000110100	98.5	1000010011	105.1	0111110010
92.1	1000110011	98.7	1000010010	105.3	0111110001
92.3	1000110010	98.9	1000010001	105.5	0111110000
92.5	1000110001	99.1	1000010000	105.7	0111101111
92.7	1000110000	99.3	1000001111	105.9	0111101110
92.9	1000101111	99.5	1000001110	106.1	0111101101
93.1	1000101110	99.7	1000001101	106.3	0111101100
93.3	1000101101	99.9	1000001100	106.5	0111101011
93.5	1000101100	100.1	1000001011	106.7	0111101010
93.7	1000101011	100.3	1000001010	106.9	0111101001
93.9	1000101010	100.5	1000001001	107.1	0111101000
94.1	1000101001	100.7	1000001000	107.3	0111100111
94.3	1000101000	100.9	1000000111	107.5	0111100110
94.5	1000100111	101.1	1000001000	107.7	0111100101

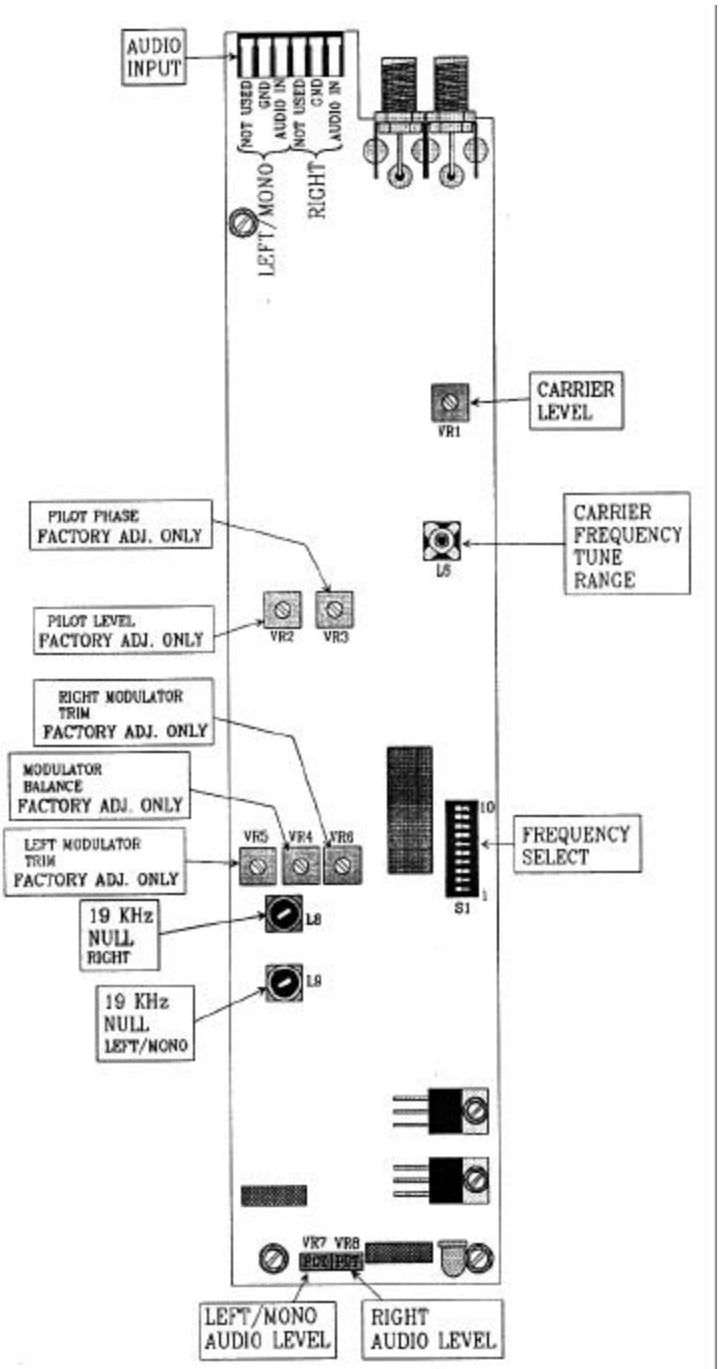


FIGURE 332-1

FIGURE 332-1