



TM-200 Broadcast Modulator

OPERATING MANUAL

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1.0 SAFEGUARDS

General Safeguards

This section is written as a general guide for those having previous knowledge and experience with these kinds of equipment. It is not intended to contain a complete statement of all safety precautions, which should be observed by personnel using this or other electronic equipment.

To reduce the risk of fire or electric shock, do not expose this equipment to rain or moisture. Do not open the cabinet. Refer servicing to qualified personnel.

1. **READ INSTRUCTIONS** - All safety, installation, and operating instructions should be read before the equipment is operated.
2. **RETAIN INSTRUCTIONS** - The safety and operating instructions should be retained for future reference.
3. **FOLLOW INSTRUCTIONS** - All safety, installation, and operating instructions should be followed.
4. **GROUNDING AND POLARIZATION** - The TM-200 Modulator is equipped with a three prong grounded power plug. Do not remove the ground prong from the plug. Do not use an AC receptacle where the plug blades cannot be fully inserted.
5. **SERVICING** - Do not attempt to service this equipment yourself as opening or removing covers may expose you to dangerous voltage or other hazards and will void the warranty. Refer all servicing to qualified service personnel.
6. **DAMAGE REQUIRING SERVICE** - Unplug this equipment and refer servicing to qualified service personnel under the following conditions:
 - if the power cord or plug is damaged.
 - if liquid has been spilled or objects have fallen into the equipment.
 - if the equipment has been exposed to rain or water.
 - if the equipment does not operate normally by following the operating instructions. Adjust only those controls covered by the operating instructions. An improper adjustment may result in damage and will often require extensive work by a qualified technician to restore the equipment to its normal operation.
 - if the equipment has been dropped or the cabinet has been damaged.
 - if the equipment exhibits a distinct change in performance.

Safety and First Aid

Personnel engaged in the installation, operation, maintenance, or servicing of electronic equipment are exposed to the hazard of high voltage. It is imperative that all safety regulations and precautions are consistently observed. Knowledge of first aid procedures is recommended. The following information is presented as a reference only.

- At all times, avoid placing any part of the body in series between ground and circuit points, whether power is on or off.
- Dangerous voltage may be present in equipment even though power is off. Do not open the cabinet. Refer servicing to qualified service personnel.
- It is the duty of all personnel to be prepared to give adequate emergency first aid treatment and thereby prevent avoidable loss of life.
- There are three principle degrees of burns, recognizable as follows:
 - a first-degree burn reddens the skin.
 - a second-degree burn blisters the skin.
 - a third degree burn chars the flesh and frequently places the victim in a state of shock accompanied by respiratory paralysis.
- Respiratory paralysis can cause death by suffocation within seconds. It is imperative that the approved methods of artificial respiration are initiated immediately and continue until the victim's breathing is normal.
- A muscular spasm of unconsciousness may render the victim unable to break free of the electric power. If this is the case, turn the power off immediately.

DO NOT TOUCH THE VICTIM OR YOU MAY SHARE THE SAME PREDICAMENT.

- If the power cannot be turned off immediately, very carefully loop a dry rope, article of clothing, length of strong cloth or a rolled-up newspaper around the victim and pull the victim free of the power source. Carefully avoid touching the victim or clothing.
- Once free of the power source, the victim must be placed in a reclining position and covered with a blanket or newspapers to keep warm. At the first opportunity, enlist help in summoning a doctor. If a doctor cannot be summoned, transport the victim to the doctor or a hospital. Be sure the victim is kept well covered and warm while awaiting professional treatment.

2.0 WARRANTY

Technalogix Ltd. products have been completely tested and found to meet specifications and be in proper operating condition. They are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment.

Technalogix Ltd. will not be liable for damages of whatever nature arising out of or in connection with the equipment or its use thereof. Technalogix does not assume responsibility for injury or damage resulting from the practices of untrained or unqualified personnel in the handling of this equipment.

Technalogix Ltd. warranty does not include:

- misuse, neglect or accident.
- incorrect wiring and /or improper installation.
- unauthorized repairs, modifications or use in violation of instructions issued by Technalogix.
- incidental or consequential damages as a result of any defect.
- reshipment cost or insurance of the unit or replacement units or parts.
- acts of God.

Technalogix agrees, at our option, to remedy warranted defects or furnish a new part in exchange for any part of a unit which, under normal installation, use and service, becomes defective. The user will pay for transportation costs to and from the repair center.

To claim your rights under this warranty:

- Contact Technalogix and describe the problem in as much detail as possible. See troubleshooting section in this manual. If a solution cannot be found at this time, it may be determined that the unit will have to be returned to Technalogix for repair.
- Package equipment carefully for prepaid shipment to Technalogix. Include a written description of the problem experienced and a copy of the original invoice establishing warranty status.

Technalogix reserves the right to make revisions in current production of the equipment and assumes no obligation to incorporate these changes in earlier models.

3.0 DESCRIPTION AND SPECIFICATIONS

General Description

The TM-200 is a high output modulator that eliminates the need for preamplifiers prior to the power amplifier system. The modulator first processes baseband audio and video information to provide an IF output consisting of a visual IF carrier at 45.75 MHz, using amplitude modulation, and an aural IF carrier at 41.25 MHz, using frequency modulation. Pre-correction is implemented at IF frequencies with a Signal Conditioning Board. Frequency conversion circuitry then translates the modulator's IF carriers to VHF and UHF television frequencies. All operating controls are located on the front panel, and will be discussed in later section, while input and output interfaces are on the back plate. An aural loop through is provided to properly set transmitter power.

Standard Features

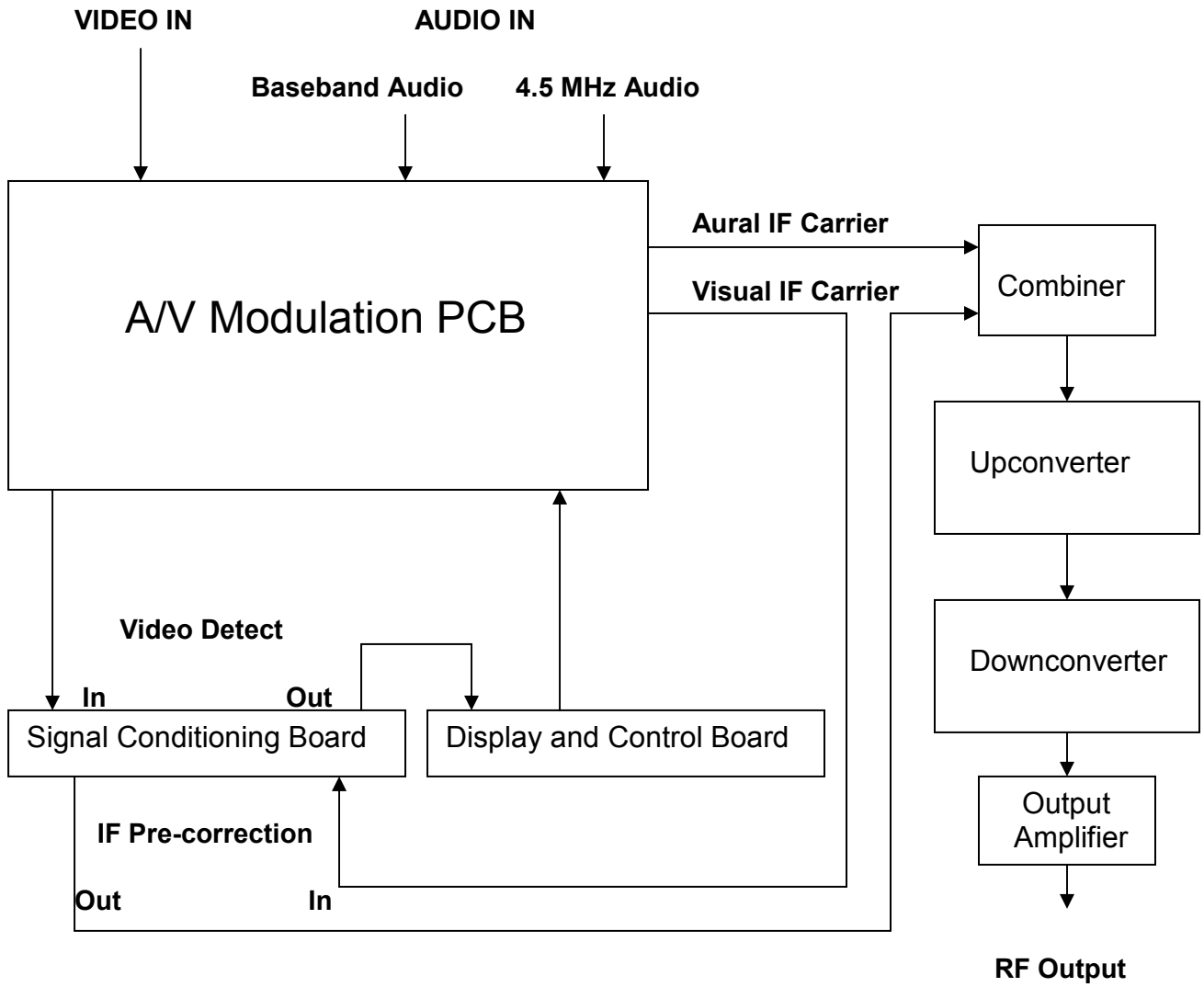
- Totally microprocessor controlled with self-diagnostic monitoring.
- Selectable output channels:
 - Standard Broadcast VHF 2 – 13, UHF 14 – 60, T7 – T13
 - HRC channels 1 through 118
 - ± 10 kHz offsets
- SAW filtered IF designed for adjacent channel operation.
- + 10 dBm (minimum) output using low distortion hybrid amplifiers.
- Synthesized oscillators – crystal referenced phase locked.
- Bar graph modulation and digital LED readout.
- Internal switch selects standard or HRC output.
- Surface mount technology construction.
- RF muted during tuning.
- Optional aural sub-carrier and baseband audio input
- Phase lock loop FM audio.
- BTSC stereo compatible.
- External separate audio/video and composite IF loop-through.
- RS-232 control option
- Sound carrier level adjustable –10 dB to –15 dB.
- Video delay pre-distortion network meets FCC 73.687.
- High stability TCXO, ± 250 Hz
- Non-volatile memory retains channel selection after power loss.
- Video Detection turns off carrier in event of loss of video.
- IF pre-correction allow slope/knee linearization of signal.
- Sync level adjustment to ensure sync tip at proper levels.
- White clip and DC restoration of baseband video signal.
- 50-ohm RF Output and tap-off

Available Options

- 4.5 MHz sub carrier and baseband audio inputs.
- Dual RS-232 control with daisy chain capabilities that allow for remote control by PC workstation.
- HRC Output Frequency Set - This feature is controlled by an internal dip switch assembly, DS-1. The switch is located near the right front corner (with the panel facing you) between the test point and the output converter module. DS-1 is clearly marked on the PCB. Switch #3 placed in the OFF position switches the output frequency to HRC on all channels. The switch is normally set to ON at the factory.

Block Diagram

The baseband input source enters through a *Video In* connector, and *Baseband Audio In* or *4.5 Audio In* connector on the back of the modulator. The connectors are mounted directly on the A/V Modulation PCB where the IF output is generated. The baseband video signal passes into the modulator, through a group delay filter, and onto the Signal Conditioning PCB to the video detect/sync level adjust section. The IF signal from the IF loop on the modulator is connected through the IF pre-correction portion of the same Signal Conditioning PCB. The visual IF carrier and the aural IF carrier are then combined before entering the Upconverter PCB. The outputs are at RF frequencies of 945.75 MHz for the visual carrier and 941.25 MHz for the aural carrier. Then, the signal passes through a Downconverter section allowing a user selectable VHF or UHF broadcast television channel. Finally, the signal passes through an output amplifier which increases the RF signal level typically to 15 dBm.



Specifications

RF Characteristics

Frequency range	7 to 750 MHz
Frequency Response (one channel)	±0.5 dB
Frequency Stability	±250 Hz
RF Output Level	+60 dBmV max
Output Impedance	50 Ohms
Harmonics	> 60 dB below rated power
Predominant Intermodulation Distortion	dBc = decibels below visual carrier
+ 920 kHz	> -53 dBc
- 920 kHz	> -53 dBc
+ 2.66 MHz	> -53 dBc
- 2.66 MHz	> -53 dBc
+ 5.42 MHz	> -53 dBc
+ 7.16 MHz	> -53 dBc
3 rd Order Intermodulation Distortion	
+ 4.5 MHz	> -60 dBc
+ 9.0 MHz	> -60 dBc
All others	> -60 dBc
Spurious Emissions	> -60 dBc

NTSC Video Characteristics

Input Level to modulator (for 87.5% modulation)	1.0 V _{PP}
Differential Phase (at 87.5% modulation)	±2 Degrees
Differential Gain (at 87.5% modulation)	2%
Group Delay	< ±40 nS
Video Group Delay Pre-emphasis	Conforms to IC/FCC specifications
K-Factor	1.9% for 2T Pulse
Hum and Noise	> 60 dB below rated power

Aural Characteristics

Input: 50 Hz – 15 KHz	0 dBm (0.8V)
Impedance	600 ohms, balanced
Frequency Response	+/- 1.0 dB
Frequency Tolerance, +/- 500 Hz	4.5 MHz
Frequency Deviation	+/- 25 KHz
Harmonic Distortion	1% max
Preemphasis (mono)	75 µs
Internally Defeatable	

IF Section

Output Impedance	75 ohms, unbalanced
Video IF level	+ 37 dBmV, +97 dB μ V
Audio IF Level	+22 dBmV
Adjustable	+82 dB μ V
Return Loss	> 14 dB
IF Frequency, Video Carrier	45.75 MHz
IF Frequency, Audio Carrier	41.25 MHz
Video Sound Spacing	+ 4.5 MHz
Vestigial side-band width	0.05 MHz
Second IF Frequency	945.75 MHz

Physical Characteristics

Power Requirements	100-130 Vac, 210-230 Vac, 50/60 Hz, 1 Aac at 110 Vac
Operating Temperature	0 - 50°C
Weight	12 lbs
Dimensions (modulator only)	W-19", D-16" with connectors, H- 2U- high

Signal Conditioning Module

The TM-200 modulator includes a separate circuit board called the Signal Conditioning Module. The Signal Conditioning PCB contains the video detect/sync level adjust section in addition to the IF pre-correction section. The baseband video signal passes into the modulator, through a group delay filter, and onto the Signal Conditioning PCB to the video detect/sync level adjust section. The IF signal from the IF loop on the modulator are connected through the IF pre-correction portion of the same PCB. The Signal Conditioning features are as follows:

1. Sync Level Adjust - Allows the user to adjust the sync level to maintain the proper level. Adjustment is made via front panel.
2. Video Detect - Turns off the 24Vdc supply to the final amplifier stage in the TM-200 in the event of missing video input. The power supply for the final amplifier (+24Vdc) is routed through a relay on the Signal Conditioning PCB. In the event of a missing video signal, the relay contact is opened and the +24Vdc is disconnected from the final amplifier stage.
3. IF Pre-Correction – Allows the user to optimize the linearity of their power amplifier using slope-knee adjustments available from front panel. Adjustment will alter several RF performance parameters including in-band intermodulation products, differential phase and gain, and others.

The input and output impedance of the Signal Conditioning PCB is 75-ohms. Baseband video connections are made via RCA connectors for the sync level adjust and video detect sections and the IF connections are made via F connectors. The Signal Conditioning PCB can be bypassed, if necessary.

4.0 INSTALLATION

This section contains installation recommendations, unpacking, inspection, and installation instructions for the Technalogix TM-200 Modulator. Carefully read all material in this section prior to installation. Also read and review operating procedures later in this section.

Building Recommendations

The quality of the building is of great importance if you are to expect long life and continued performance from the modulator. The building must be clean, dry, temperature controlled and secure. The modulator takes up a single 1-U high space on a 19" rack. Don't forget to allow space in the building for any additional racks to house test equipment, a workbench area, line regulating transformers, ladders, equipment and parts storage, first aid kit, emergency generator if used, as well as heating and cooling devices that may be unique to your installation. A sloping roof will tend to develop leaks less rapidly. The building should be well roofed with good material. The cooling load will be lowered with reflective or light colored roofing material.

Heating and Cooling Requirements

The environment's temperature will contribute greatly to the length of the modulator's life. Technalogix recommends that the building's filtered air intake must have capacity for all air-flow in the building plus an additional 20%. Keep the intake below the roofline to avoid intake of solar heated air. Please ensure that the intake and exhaust areas are on the same side of the building to avoid pressure differentials during windy conditions. Also, do not position intake near exhaust's preheated air. If air conditioning is required to cool the shelter, discuss the situation with a qualified HVAC technician. Under average conditions, 12,000 BTUs will cool approximately 500 square feet to a comfortable level.

Electrical Service Recommendations

Technalogix recommends that a qualified, licensed local electrician be consulted for the required electrical service. We suggest local electricians because:

- The personnel knows the local codes
- The personnel can be on site readily
- You are apt to get better overall support if you give what business you can to local suppliers

Technalogix recommends that proper AC line conditioning and surge suppression be provided on the primary AC input to the power amplifier. All electrical service should be installed with your national electrical code in your area, any applicable provincial or state codes, and good engineering practice. Special consideration should be given to lightning protection of all systems in view of the vulnerability of most transmitter sites to lightning. Lightning arrestors are recommended in the service entrance. Straight and short grounds are recommended. The electrical serviced must be well grounded. Do not connect the unit to an open delta primary power supply, as voltage fluctuations could harm the unit. Branch your circuits. Do not allow your lights, your workbench plugs, and your transmitting or translating equipment off of one circuit breaker. Each transmitter should have its own circuit breaker, so a failure in one does not shut off the whole installation.

Antenna and Tower Recommendations

Your preliminary engineering workgroup should establish your antenna and tower requirements, both for receiving and transmitting antennas. Construction of sturdy, high quality antenna/tower systems will pay off in terms of coverage of your service area, the overall quality and saleability of your radiated signal, and reduced maintenance expenses. Technalogix provides complete turnkey antenna systems if needed. Transmitting antennas can enhance or seriously impair the transmitter output. It is assumed that one has been selected prior to system installation, but the best-designed antenna system will function poorly if shortcuts and compromises are used during installation. Follow the manufacturer's instructions exactly, along with any engineering data prepared for the site.

The selection, routing, and length of coaxial cable is extremely important in the installation. If there is a 3 dB line loss in the cable between your unit's output and the transmitting antenna, a 500 watt unit will only deliver 250 watts to the antenna. Buy the best cable you can obtain, route it via the shortest way to the antenna, and keep it straight. Do not form it into sharp bends on its way. Do not use any more cable fittings for the installation than absolutely necessary. All cautions here apply equally to all coaxial cables in the system - input and output. The better known tower manufacturers offer complete technical and safety documentation with their towers. Be sure that you have this information as it regards wind loading, guying, etc. Be absolutely safe and certain about this aspect as human lives may be at stake.

Shelter Security

The FCC requires that the transmitter be secure from entry or control by unauthorized persons, and that any hazardous voltages or other dangers (including most tower bases) be protected by locks or fences as necessary to protect personnel and prevent unauthorized tampering or operation. Security of the building further implies that it be secure from wildlife. Use sturdy construction materials, including sheet metal if necessary. Holes around conduit, cable, and other similar entry points should be stuffed with steel wool and caulked to prevent entry of wildlife. Other features of security for your shelter may include its location with respect to the prevailing wind conditions. A location leeward of some natural topographical feature will prevent wind damage and snowdrifts. Check the soil runoff conditions that may slow or hasten wind or water erosion and other concerns that may be unique to your location.

Unpacking and Inspection

Check the outside of the container. Carefully open the container and remove the modulator. Retain all packing material that can be reassembled in the event that the equipment must be returned to the factory.

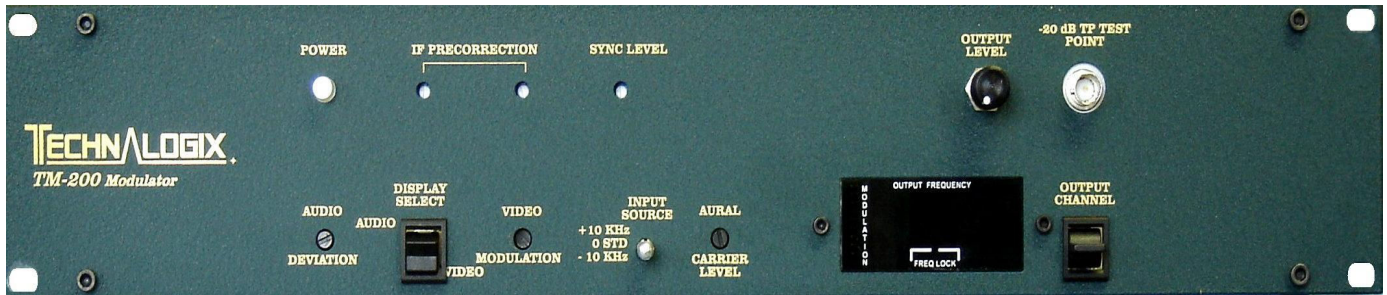
Exercise care in handling equipment during inspection to prevent damage due to rough or careless handling.

Visually inspect the enclosure of the modulator for damage that may have occurred during shipment. Check for evidence of water damage, bent or warped chassis, loose screws or nuts, or extraneous packing material in connectors. Inspect all connectors for bent connector pins. If the equipment is damaged, a claim should be filed with the carrier once the extent of the damage is assessed. Technalogix cannot stress too strongly the importance of immediate careful inspection of the equipment and subsequent immediate filing of the necessary claims against the carrier if necessary. If possible, inspect the equipment in the presence of the delivery person. If the equipment is damaged, the carrier is your first area of recourse. If the equipment is damaged and must be returned to the factory, phone for a return authorization. Claims for loss or damage may not be withheld from any payment to Technalogix, nor may any payment due be withheld pending the outcome thereof. Technalogix cannot guarantee the carrier's performance.

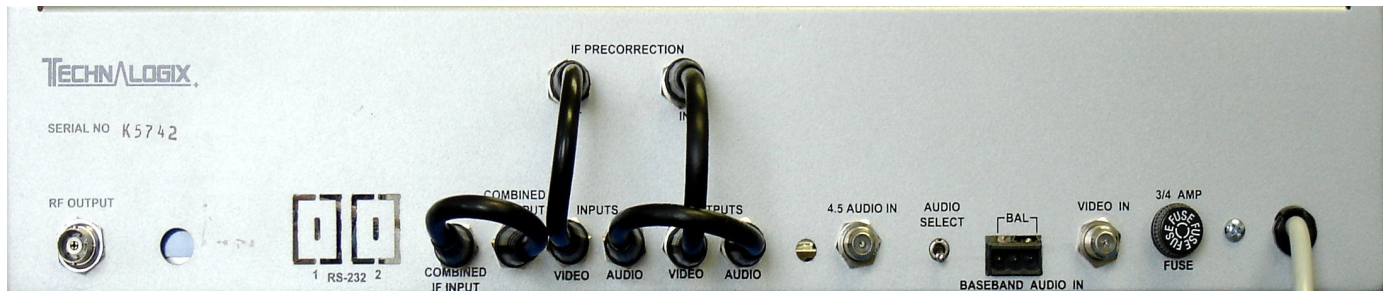
Location and Function of Controls and Connectors

The following illustrations depict the location of the installation connectors when installing the power amplifier with a modulator or processor.

FRONT



BACK



Audio Deviation – Allows user to control extent of audio deviation. Original factory setting at 25 KHz deviation using standard pre-emphasis curve.

Audio/Video Display Select - Provides a graphical representation of audio deviation and visual modulation levels on an LED bar graph. The switch selects between audio deviation or visual modulation.

Video Modulation -- Allows user to control extent of video modulation. Original factory setting at 87.5% video modulation with 1.0 Volt peak to peak baseband input video signal.

Frequency Offset Select – Toggles between +10 KHz, 0KHz, and -10 KHz frequency offset.

Aural Carrier Level - Allows user to set aural carrier level relative to visual carrier level. Modulator is factory tested at -10 dBc (decibels below visual carrier).

Output Select – Selects the desired channel of operation. If you require a lower channel than the one currently displayed, push the toggle switch down. The channels will change one at a time as many times as you press the switch. Holding the select switch in the up or down position will “scan” to the desired channel. It is normal for the frequency lock LED to turn off during and for a few seconds after, changing channels. The switch must be held up or down initially for three seconds. This helps to ensure that no accidental channel changes will occur.

Output Level – Sets visual carrier output level.

RF Out Test Point – Provides a sample of the RF output level which is 20 dB below the actual value. RF test point is only a relative indicator of the actual RF output level and may vary. All RF operating measurements should be made at the RF output of the unit.

RF Output - Modulated Audio/ Video output capable of +60 dBmV levels using built in low distortion hybrid amplifiers.

RS-232 Ports – Set up for optional RS-232 control option.

Combined IF Input/ Output – 45.75 MHz visual carrier and 41.25 MHz audio carrier intermediate frequency signal loop.

Audio Input/ Output Loop – Available for baseband audio processing.

Video Input/ Output Loop - Available for baseband video processing.

IF Pre-Correction Loop – Allows pre-correction adjustment to improve linearity, intermodulation performance, and other RF parameters. Internally connected to Signal Conditioning PCB.

Video In – Connection for 1.0 Volt peak to peak video source.

Balanced Baseband Audio In – Used to connect a 1 Volt peak to peak baseband audio signal. For balanced input connection, connect 1 audio input lead to the left terminal on the connector and the other audio input lead to the right terminal. For an unbalanced input connection, connect one audio input lead to the left terminal on the connector and the other audio input lead to the centre terminal. The center terminal is chassis ground.

5.0 OPERATING PROCEDURE

Preliminary Hook-up

1. Terminate modulator into a 50 ohm load before applying power.
2. Connect the power cord of the Technalogix TM-200 agile modulator to a proper electrical source as indicated on the back of the unit.
3. Observe the front panel. If power is applied and present, the red power LED will illuminate. Also, all the elements of the displays behind the display readout window will illuminate momentarily as a display test.
4. Observe the numbers displayed behind the display readout window after the test. They will indicate:
 - Microprocessor software version;
 - Internal option dipswitch settings;
 - RS-232 unit ID (if so equipped); and
 - Last tuned channel.
5. After a moment, the Lock Detect LED will illuminate.

Setup of Output Level and Channel Selection

1. Connect a spectrum analyzer, or a field strength meter tuned to the frequency of the video RF carrier of the desired channel, to the RF OUTPUT jack on the rear panel of the unit. Alternatively, connect a spectrum analyzer or a field strength meter to the –20dB TEST POINT on the front panel of the unit.
2. Select the desired output channel using the CHANNEL SELECT paddle switch on the front panel.
 - Hold the CHANNEL SELECT switch in the up- or down-position for approximately 3 seconds to activate the channel-select circuit;
 - Toggle the CHANNEL SELECT switch up to select a higher channel or toggle it down to select a lower channel. The switch may be held in the up- or down-position for rapid channel switching.
3. Observe the output on the spectrum analyzer, or the field strength meter. If measuring from the rear panel RF OUTPUT jack, adjust the front panel OUTPUT LEVEL potentiometer for an output level between +55dBmV and +60dBmV. If measuring from the front panel –20dB TEST POINT, ensure that the rear panel RF OUTPUT jack is terminated into a 50 Ω load, then adjust the front panel OUTPUT LEVEL potentiometer for an output level between +35dBmV and +40dBmV.
4. If using a field strength meter, retune the meter to the frequency of the audio RF Carrier.
5. Still observing the output on the spectrum analyzer, or the field strength meter (now tuned to the frequency of the audio RF carrier), adjust the front panel AURAL CARRIER potentiometer for an output level 10-13dB lower than that at which the video RF Carrier is set.
6. Remove the spectrum analyzer, or field strength meter from the unit. If available, connect a television/monitor to the front panel –20dB TEST POINT, apply power to the television/monitor and tune to the selected output channel of the Technalogix TM-200 modulator.

Setup of Video Input Connection and Adjustment

1. Connect a $1.0V_{P-P}$ video source to the VIDEO IN jack on the rear panel.
2. Adjust the front panel VIDEO MODULATION control for 87.5% modulation.
 - Set the front panel DISPLAY SELECT switch to VIDEO (down) position;
 - Observe front panel LED bar graph behind front panel display readout window.
 - First RED LED will begin illumination at approximately 87.5% modulation; or
 - Observe TV monitor for good visual image.

Setup of Baseband Audio Input Connection and Adjustment

1. If your Technalogix TM-200 agile modulator is equipped with a 4.5MHz sub-carrier input option, ensure that the rear-panel AUDIO SELECT switch is in the BASEBAND position.
2. Connect a $1V_{P-P}$ baseband audio signal to the rear panel baseband audio connector as follows:
 - For balanced input connection, connect one audio input lead to the left terminal on the connector and the other audio input lead to the right terminal.
 - For unbalanced input connection, connect one audio input lead to the left terminal on the connector and the other audio input lead to the center terminal.
 - Center terminal is chassis ground.
 - Insert the terminal into the connector on the rear panel of the TM-200.
3. Adjust the front panel AUDIO MODULATION control for 100% modulation.
 - Set the front panel DISPLAY SELECT switch to AUDIO (up) position.
 - Observe front panel LED bar graph behind front panel display readout window.
 - First RED LED will begin illumination at approximately 95% modulation; or
 - Adjust for $\pm 25\text{KHz}$ deviation using a spectrum analyzer; or
 - Listen to the audio output from TV monitor and setting the loudness equal to that of an off-air channel carried on your system.

Setup of 4.5 MHz Sub-Carrier Audio Input Connection and Adjustment

1. Set the rear panel AUDIO SELECT switch in the 4.5 position.
2. Connect a modulated 4.5MHz sub-carrier signal to the rear panel 4.5MHz input F-connector jack.
3. Inject a minimum +36dBmV (-12.75dBm) 4.5MHz RF carrier into the unit.
4. Using the setup in *Step 5, Setup of Output Level and Channel Selection*, measure the audio RF carrier output level at the rear panel RF OUTPUT jack. Level should be within ± 2 dB of the measurement taken in *Step 5, Setup of Output Level and Channel Selection*.

Setup of IF Pre-Correction on Signal Conditioning PCB

1. Install the modulator but do not apply power yet.
2. Ensure that the two IF pre-correction potentiometers on the front panel of the modulator are turned fully counter clockwise.
3. With the transmitter and modulator fully installed, apply power and bring the transmitter up to rated power.
4. Apply a red field test signal to the input of the modulator with the aural carrier turned on.
5. Take a sample of the RF output and view it on a spectrum analyzer.
6. Looking at the +/- 920kHz intermodulation products, adjust the two IF pre-correction potentiometers to obtain the lowest level on the intermodulation products.

Varying these two pots can increase and decrease the output power, so this should be carefully monitored.

Setup of Sync Level on Signal Conditioning PCB

1. With the transmitter at rated power and an NTC7 Composite signal applied to the input of the modulator, view the demodulated waveform on a waveform monitor.
2. Adjust the sync level potentiometer on the front panel clockwise for more sync or counter clockwise for less sync to obtain 40 IRE of sync.
3. Maintain the white bar level at 100 IRE by adjusting the video modulation potentiometer on the front panel.

Varying these two pots can increase and decrease the output power, so this should be carefully monitored.

Automatic Shut Down

Technalogix power supplies are designed so that under certain power line or heat buildup conditions, the unit shuts off. An indicator would be no RF output, but the POWER LED remains on. If this occurs, unplug the power cord and wait two minutes before re-powering. Upon applying power, you should again have RF output. If not, or should the unit return to shutdown mode, please contact Technalogix for assistance. Technalogix highly recommends a 1.75 inch air circulation space between any rack mounted equipment.

Transmitter Hookup

1. Connect modulated video from TM-200 RF OUT to the Technalogix power amplifier.
2. Turn down RF level on TM-200 all the way.
3. Ensure that IF OUT is connected to IF IN on the TM-200 modulator using the loop F to F cable supplied. If the IF pre-correction circuit is to be used, simply jumper 75-ohm coaxial from the IF PRE-CORRECTION - IN to the OUTPUTS – VIDEO and jumper from IF PRE-CORRECTION – OUT to the INPUTS – VIDEO connection.
4. Connect the transmitting antenna cable to the RF output connector on the power amplifier. It is recommended that a quality through line wattmeter be installed in this same line.
5. Verify that all signal and RF cables are connected properly.
6. After following proper installation procedures outlined in the power amplifier manual, plug the power amplifier's power cords into an appropriate electrical outlet.

Output power should be adjusted with a sync and blanking signal only with the aural carrier removed. This is simply done by disconnecting one end of the audio carrier loop found on the back panel of the TM-200.

6.0 PROBLEM TROUBLESHOOTING GUIDE

The guide below covers some typical symptoms, possible associated causes and suggested actions to follow before returning the unit for repair. It is not meant to be all-inclusive.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Suggested Action</i>
No output or weak output	Baseband input level too weak	Ensure proper 1 Vp-p video signal present on input
	IF loop cable on rear of unit loose or disconnected	Check IF loop cable is securely attached
	Unit not plugged in or getting AC power	Check power cord and power source, fuse
	Unit tuned to output channel different from desired (this occurs particularly on the units which have green LED on the front panel to indicate "T" channels and channels above 99)	Ensure selected output channel is desired channel
Excessive noise or spurious signals	Loss of video on the input – video detect turned off RF Output	Ensure proper 1 Vp-p video signal present on input
	Output level above rated maximum (most often occurs when changing from high-number channel to low-number channel, especially to the "T" channels)	Measure RF output from rear panel jack and adjust front panel OUTPUT LEVEL control as required
	IF level too high (most often occurs when routing IF through scrambler or other external device)	Measure normal IF output level for applied CW/unmodulated input carrier and ensure same level is returned to unit after external processing
	Input signal too strong or no input signal at all	Measure video level and pad to within specified input levels.
Bad/noisy video	Aural carrier interfering with video carrier	Measure Aural Carrier level and/or adjust AURAL CARRIER LEVEL control on front panel
Channels do not change	Delay feature active	Hold channel change switch in raised/lowered position for at least three seconds

7.0 BILL OF MATERIALS, SCHEMATICS, AND PCB OVERLAYS

Agile Logic Board Bill of Materials

Last Revision: 09.12.00

Component Reference	Quantity	Identification	Modifier	Package
C1	1	22pF		CAP250D
C10	1	0.47uF		CAP100RP
C11	1	10 uF		CAP100RP
C12	1	22 uF		CAP100RP
C13	1	22 uF		CAP100RP
C14	1	22 uF		CAP100RP
C15	1	22 uF		CAP100RP
C16	1	0.01uF		CAP250D
C17	1	0.01uF		CAP250D
C18	1	47 uF		CAP100RP
C19	1	47 uF		CAP100RP
C2	1	22pF		CAP250D
C20	1			CAP100RP
C21	1	0.01uF		CAP250D
C22	1	0.01uF		CAP250D
C23	1	0.01uF		CAP250D
C24	1	0.01uF		CAP250D
C3	1	22 uF		CAP100RP
C4	1	10 uF		CAP100RP
C5	1	0.47uF		CAP100RP
C6	1	0.47uF		CAP100RP
C7	1	0.01uF		CAP250D
C8	1	0.01uF		CAP250D
C9	1	470 uF		CAP197R
D1	1		RED T1	LED T1-W/HLD
D2	1		T1 W/HLD	LED
D3	1		RED T1	LED T1-W/HLD
DS1	1		8 POS	DPS8W
JP1	1		4 POS HEADER	JP-DUAL4
JP2	1		8 POS HEADER	JP-DUAL8
JP3	1			JP-DUAL4
JP4	1		3PIN	JP3IL
JP5	1		3PIN	JP3IL
JP6	1		3PIN	JP3IL
JP7	1		3 POS	JP3IL
JP8	1		3 IL	JP3IL
L1	1	6 T		COIL 60

L2	1	6 T		COIL 60
L3	1	6 T		COIL 60
L4	1	6 T		COIL 60
L5	1	6 T		COIL 60
P1	1		4 PIN	SMB
P10	1		10 POS	DIPIL10
P11	1		4 PIN	SMB
P12	1		8 POS	CONNIL8
P2	1		RT ANG F	FCONN
P3	1		12 POS	CONN IL12
P4	1		12 POS	CONN IL12
P5	1		ON DISPLAY BDS	CONN IL19
P6	1		12 POS	CONN IL12
P7	1		12 POS	CONN IL12
P8	1		4 PIN	SMB
P9	1		10 PIN	CONN10IL
Q1	1		2222	TRANS2222
Q2	1		2907	TO18C
QP1	1		4-2222A	DIP14C
R1	1	10 Mohm		RES1-8
R10	1	1 kOhm		RES1-8
R11	1	5 kOhm		POT1
R12	1	10 Kohm		RES1-8
R13	1	10 Kohm		RES1-8
R14	1	1 kOhm		RES1-8
R15	1	6.8 kOhm		RES1-8
R16	1	1 kOhm		RES1-8
R17	1	500 Ohm		POT1
R18	1	10 Kohm		RES1-8
R19	1	5.6 kOhm		RES1-8
R2	1	4.7 Ohm		RES1-8
R20	1	10 Kohm		RES1-8
R21	1	91 Ohm		RES1-8
R22	1	10 Ohm		RES1-8
R23	1	5 kOhm		POT1
R3	1	5 kOhm		POT1
R4	1	10 Kohm		RES1-8
R5	1	1 kOhm		RES1-8
R6	1	68 kOhm		RES1-8
R7	1	68 kOhm		RES1-8
R8	1	68 kOhm		RES1-8
R9	1	4.7 Ohm		RES1-8
RP1	1	10 Kohm		DIPIL11
RP2	1	10 Kohm		DIPIL11
RP3	1	10 Kohm		DIPIL11
RP4	1	150 Ohm		DIP IL8
RP5	1	150 Ohm		DIP IL8

SW1	1		PADDLE	SW1
SW2	1		PADDLE	SW1
SW3	1		ROCKER	SW1
SW4	1		ROCKER	SW1
U1	1		MC74HC165	DIP16C
U2	1		IC34064	REGTO92
U3	1		68705C8	DIP40C
U4	1		74H04	DIP14C
U5	1		74H04	DIP14C
U6	1		MC14499	DIP18C
U7	1		DS232	DIP16C
U8	1		X2402	DIP8C
Y1	1	4MHz		XTAL

Agile Output Amplifier Bill of Materials

Last Revision: 09.12.00

Component Reference	Quantity	Identification	Modifier	Package
C1	1	0.1uF		1206
C2	1	0.1uF		1206
C3	1	2.7 pF		1206
C4	1	3-10pF	VCAP	CGKG27
C5	1	3-10pF	VCAP	CGKG27
C6	1	3-10pF	VCAP	CGKG27
C7	1	2.7 pF		1206
E1	1		E-COAX	
E2	1	12 V		EPAD
E3	1		E-COAX	
E5	1	GND		EPAD
I1	1			1206
L1	1			IND400
L2	1	10 nH		1210
L3	1	12 nH		1210
L4	1	12 nH		1210
L5	1	10 nH		1210
P1	1			FCONN-S
U1	1		AMP6342	

Audio Video Modulator Board Bill of Materials

Last Revision: 09.12.00

Component Reference	Quantity	Identification	Modifier	Package
C1	1	0.1uF		SMD1206
C10	1	0.1uF		SMD1206
C100	1	4.7uF		CAP100RP
C101	1	100pF		SMD1206
C102	1	47uF		CAP100RP
C103	1	0.1uF		SMD1206
C104	1	470pF		SMD1206
C105	1	0.1uF		SMD1206
C106	1	470uF		CAP200RP
C107	1	0.1uF		SMD1206
C108	1	470uF		CAP200RP
C109	1	0.0027uF		SMD1206
C11	1	0.1uF		SMD1206
C110	1	0.1uF		SMD1206
C111	1	NI		SMD1206
C112	1	470uF		CAP200RP
C113	1	0.1uF		SMD1206
C114	1	0.1uF		SMD1206
C115	1	0.1uF		SMD1206
C116	1	0.1uF		SMD1206
C117	1	0.01uF		SMD1206
C118	1	18pF		SMD1206
C119	1	NI		SMD1206
C12	1	0.01uF		SMD1206
C120	1	0.1uF		SMD1206
C121	1	470uF		CAP200RP
C122	1	0.01uF		SMD1206
C123	1	470uF		CAP200RP
C124	1	10pF		SMD1206
C125	1	27pF		SMD1206
C126	1	82pF		SMD1206
C127	1	0.001uF		SMD1206
C128	1	0.01uF		SMD1206
C129	1	0.01uF		SMD1206
C13	1	0.1uF		SMD1206
C130	1	0.1uF		SMD1206
C131	1	NI		SMD1206
C132	1	0.1uF		SMD1206
C133	1	0.01uF		SMD1206
C134	1	0.01uF		SMD1206

C135	1	0.1uF		SMD1206
C136	1	0.1uF		SMD1206
C137	1	0.01uF		SMD1206
C138	1	0.1uF		SMD1206
C139	1	0.01uF		SMD1206
C14	1	0.001uF		SMD1206
C140	1	0.01uF		SMD1206
C141	1	0.01uF		SMD1206
C142	1	0.1uF		SMD1206
C143	1	12pF		SMD1206
C144	1	12pF		SMD1206
C145	1	3-10pF		CGKG27
C146	1	12pF		SMD1206
C147	1	12pF		SMD1206
C148	1	0.1uF		SMD1206
C149	1	0.01uF		SMD1206
C15	1	0.01uF		SMD1206
C150	1	0.1uF		SMD1206
C151	1	27pF		SMD1206
C152	1	56pF		SMD1206
C153	1	27pF		SMD1206
C154	1	0.01uF		SMD1206
C155	1	0.01uF		SMD1206
C156	1	0.01uF		SMD1206
C16	1	0.1uF		SMD1206
C17	1	22pF		SMD1206
C18	1	56pF		SMD1206
C19	1	10pF		SMD1206
C2	1	0.1uF		SMD1206
C20	1	0.001uF		SMD1206
C21	1	0.47uF		SMD1206
C22	1	22pF		SMD1206
C23	1	22pF		SMD1206
C24	1	4.5-20pF		CGKG27
C25	1	0.01uF		SMD1206
C26	1	0.001uF		SMD1206
C27	1	22pF		SMD1206
C28	1	4.7uF		CAP100RP
C29	1	100pF		SMD1206
C3	1	4.7uF		CAP100RP
C30	1	0.01uF		SMD1206
C31	1	0.1uF		SMD1206
C32	1	0.001uF		SMD1206
C33	1	0.01uF		SMD1206
C34	1	68pF		SMD1206
C35	1	100pF		SMD1206
C36	1	100pF		SMD1206
C37	1	68pF		SMD1206

C38	1	470uF		CAP200RP
C39	1	0.01uF		SMD1206
C4	1	0.1uF		SMD1206
C40	1	0.01uF		SMD1206
C41	1	0.1uF		SMD1206
C42	1	0.01uF		SMD1206
C43	1	0.01uF		SMD1206
C44	1	0.1uF		SMD1206
C45	1	470uF	25V	CAP200RP
C46	1	1000uF		CAP300RP
C5	1	4.7uF		CAP100RP
C6	1	0.1uF		SMD1206
C7	1	0.001uF		SMD1206
C8	1	470uF		CAP200RP
C9	1	47pF		SMD1206
D1	1	5236		SOT23
D10	1	3800		SOT23
D100	1	2800		SOT23
D101	1	2800		SOT23
D11	1	3800		SOT23
D2	1	2800		SOT23
D3	1	2800		SOT23
D6	1	MMBV105GL		SOT23
D7	1	10 V		SOT23
D8	1	4.7V		SOT23
D9	1	3800		SOT23
F1	1			SIP5L
F100	1			FILTER2219
F101	1			SF28S
J1	1	NI		SMD1206
JP1	1	NI		SMD1206
JP2	1	0		SMD1206
JP3	1	NI		SMD1206
JP4	1	NI		SMD1206
JP5	1	0		SMD1206
L1	1	10.5 T,26GA		COIL
L100	1	12.5T 22GA		COIL
L101	1	0.47uH		SMD1812
L102	1	0.47uH		SMD1812
L103	1	12.5T 22GA		COIL-S
L104	1	12.5T 22GA		COIL-S
L105	1	0.47uH		SMD1812
L106	1	0.47uH		SMD1812
L107	1	0.47uH		SMD1812
L15	1	0.47uH		IND400
L2	1	0.33uH		SMD1812
L3	1	0.33uH		SMD1812
L4	1	0.33uH		SMD1812

L5	1	0.47uH		SMD1812
MX100	1			MIXER
P1	1			FCONN-S
P100	1			FCONN-S
P101	1			RTARCA
P102	1			RTARCA
P103	1			FCONN-S
P2	1			CONN10IL
P7	1			CONHDR6
P8	1			CONHDR6
Q1	1	2369		SOT23
Q100	1	2222		SOT23
Q101	1	2907		SOT23
Q102	1	2222		SOT23
Q103	1	2222		SOT23
Q104	1	2907		SOT23
Q105	1	2222		SOT23
Q106	1	2222		SOT23
Q107	1	2222		SOT23
Q108	1			MRF559B2
Q109	1			MRF559B2
Q110	1			MRF559B2
Q2	1	2369		SOT23
R1	1	300kohm		SMD1206
R10	1	220kohm		SMD1206
R100	1	75ohm		R1206A
R101	1	22kohm		SMD1206
R102	1	270ohm		SMD1206
R103	1	620ohm		SMD1206
R104	1	2kohm		SMD1206
R105	1	360ohm		SMD1206
R106	1	2kohm		SMD1206
R107	1	51ohm		SMD1206
R108	1	330ohm		SMD1206
R109	1	3.6kohm		SMD1206
R11	1	100ohm		SMD1206
R110	1	6.8kohm		SMD1206
R111	1	680kohm		SMD1206
R112	1	1kohm		SMD1206
R113	1	910ohm		SMD1206
R114	1	22ohm		SMD1206
R115	1	330ohm		SMD1206
R116	1	1.5kohm		SMD1206
R117	1	560ohm		SMD1206
R118	1	1kohm		SMD1206
R119	1	330ohm		SMD1206
R12	1	75kohm		SMD1206
R120	1	1kohm	POTENTIOMETER	ST53YJ

R121	1	560ohm		SMD1206
R122	1	1.5kohm		SMD1206
R123	1	470kohm		SMD1206
R124	1	51ohm		SMD1206
R125	1	10kohm	POTENTIOMETER	ST53YJ
R126	1	1kohm		SMD1206
R127	1	1kohm		SMD1206
R128	1	NI		SMD1206
R129	1	360ohm		SMD1206
R13	1	1kohm		SMD1206
R130	1	10kohm	POTENTIOMETER	ST53YJ
R131	1	180ohm		SMD1206
R132	1	51ohm		SMD1206
R133	1	150ohm		SMD1206
R134	1	22ohm		SMD1206
R135	1	10kohm		SMD1206
R136	1	10kohm		SMD1206
R137	1	1.5kohm		SMD1206
R138	1	1kohm		SMD1206
R139	1	10kohm		SMD1206
R14	1	470kohm		SMD1206
R140	1	20kohm	1%	SMD1206
R141	1	27ohm		SMD1206
R142	1	36ohms		SMD1206
R143	1	27ohm		SMD1206
R144	1	1kohm		SMD1206
R145	1	4.7ohm		SMD1206
R146	1	82ohm		SMD1206
R147	1	2kohm		SMD1206
R148	1	220ohm		SMD1206
R149	1	75ohm		SMD1206
R15	1	10kohm	POTENTIOMETER	ST53YJ
R150	1	1kohm		SMD1206
R151	1	18ohm		SMD1206
R152	1	1kohm		SMD1206
R153	1	1kohm		SMD1206
R154	1	2kohm		SMD1206
R155	1	4.7ohm		SMD1206
R156	1	82ohm		SMD1206
R157	1	220ohm		SMD1206
R158	1	75ohm		SMD1206
R159	1	4.7ohm		SMD1206
R16	1	100ohm		SMD1206
R160	1	91ohm		SMD1206
R161	1	4.7ohm		SMD1206
R162	1	4.7ohm		SMD1206
R163	1	75ohm		SMD1206
R164	1	4.7ohm		SMD1206

R165	1	1kohm		SMD1206
R166	1	2kohm		SMD1206
R167	1	4.7ohm		SMD1206
R168	1	82ohm		SMD1206
R169	1	75ohm		SMD1206
R17	1	1kohm		SMD1206
R170	1	220ohm		SMD1206
R171	1	NI		SMD1206
R172	1	NI		SMD1206
R18	1	270ohm		SMD1206
R19	1	10kohm		SMD1206
R2	1	150kohm		SMD1206
R20	1	560ohm		SMD1206
R21	1	10kohm		SMD1206
R22	1	1kohm		SMD1206
R23	1	390ohm		SMD1206
R24	1	100kohm		SMD1206
R25	1	220kohm		SMD1206
R26	1	1Mohm		SMD1206
R27	1	2kohm		SMD1206
R28	1	68ohm		RES2010A
R29	1	220ohm	1/2 WATT	RES2010A
R3	1	300kohm		SMD1206
R30	1	75ohm		SMD1206
R31	1	1kohm		SMD1206
R32	1	1kohm		SMD1206
R33	1	2kohm		SMD1206
R34	1	1kohm		SMD1206
R35	1	4.7kohm		SMD1206
R36	1	2kohm		SMD1206
R37	1	1kohm		SMD1206
R38	1	430ohm		SMD1206
R39	1	27ohm		SMD1206
R4	1	150kohm		SMD1206
R40	1	430ohm		SMD1206
R5	1	1kohm		SMD1206
R7	1	4.7kohm		SMD1206
R8	1	10kohm		SMD1206
R9	1	10kohm		SMD1206
TB1	1			TERBLK
TP100	1	0		SMD1206
TP101	1	0		SMD1206
U1	1	LF353		DIP8SM
U100	1	NE592D		DIP8SM
U101	1	2090		DIP16SM
U102	1	LM1881		DIP8SM
U103	1	LM358		DIP8SM
U2	1	145106		145106

U4	1	501	FPT-08-M01
Y1	1		XTL49
Y100	1	45.75Mhz	XTL49

Signal Conditioning Bill of Materials

Last Revision: 11.07.05

Index	Qty	Designations	Description	Mfg. Part Number	Package
1	1	C832	Capacitor, electrolytic, 10uF 35V	ECE-V1VA100SR	VS "C"
2	2	C839, C840	Capacitor, electrolytic, 100uF, 25V, SMD	ECE-V1EA101UP	VS 'E'
3	1	C817	Capacitor, electrolytic, 100uF, 10V, SMD	ECE-V1AA101SP	VS 'D'
4	4	C803, C806, C809, C815	Capacitor, tantalum, 10uF, 16V, SMD	T491B106K016AS	SMD 3528
5	1	C820	Capacitor, ceramic, 470pF 50V X7R	CC0805KRX7R9BB471	SMD 0805
6	10	C821, C824, C825, C826, C827, C828, C829, C830, C833, C834	Capacitor, ceramic, 1000pF 50V, X7R 10%	ECJ-2VB1H102K	SMD 0805
7	10	C802, C805, C808, C814, C818, C823, C831, C835, C836, C837	Capacitor, ceramic, 0.01uF 50V X7R	C0805C103K5RACTU	SMD 0805
8	9	C801, C804, C807, C810, C811, C812, C813, C816, C819	Capacitor, ceramic, 0.1 uF, 50V, SMD	C0805C104K5RACTU	SMD 0805
9	1	C838	Capacitor, ceramic, 0.33 uF, 25V, SMD	ECJ-2YF1E334Z	SMD 0805
10	1	C822	Capacitor, trim 5-50pF low power	9410-5SL-1	SMD
11	1	D801	Diode, 200mA, 100V, SMD		SOT-23
12	1	D802	Diode Sil 2A 200V DO-214AA	S2D	SMBJ
13	2	D803, D804	Diode, If= 1A, Vbr= 100V		SOT-23
14	1	D805	Diode, LED, 5mm, 1500mCd	SSL-LX5093SRC/DV	TH
15	1	J801	Connector, 4-position, 0.2" spacing, rt. angle	ED120/4DS	0.2" THT
16	2	J802, J803	Connector, RCA, jack, vertical, PC mount, blue	RCJ-021	
		J804, J805	Connector, F, PCB, strait	RFF-1450-03	TH
17	1	K801	Relay, DPDT, 5Vdc coil	TX2SA-5V	SMD
18	5	L801, L802, L803, L804, L805	Inductor, 0.01uH, 0.450A max	NLV32T-010J-PF	SMD 1210
19	1	L806	Inductor, 1.5uH, 5%	KL32LTE1R5J	SMD 1210
20	2	L807, L808	Inductor, 2.2uH, 5%	KL32LTE2R2J	SMD 1210
21	4	Q801, Q802, Q803, Q804	Transistor, general purpose		SOT-23
22	2	R830, R831	Resistor, 0.0Ω, 5%	9C12063A0R00JLHFT	SMD 1206
23	2	R821, R822	Resistor, 39Ω, 1%	MCR10EZHF39R0	SMD 0805
24	1	R826	Resistor, 56Ω, 1%	MCR10EZHF56R0	SMD 0805
25	1	R819	Resistor, 68Ω, 1%	MCR10EZHF68R0	SMD 0805
26	2	R808, R818	Resistor, 75 ohm, 1/4W	CRCW1206-750JRT1	SMD 1206
27	1	R827	Resistor, 100Ω, 1%	MCR10EZHF1000	SMD 0805
28	1	R820	Resistor, 100Ω, 5%	ERJ-1TYJ101U	SMD 2512
29	3	R801, R824, R825	Resistor, 120 ohm, 1/8W	MCR10EZHF1210	SMD 0805

30	1	R823	Resistor, 120Ω, 5%	MCR18EZHZ121	SMD 1206
31	2	R806,R807	Resistor, 402 ohm, 1/8W	MCR10EZHF4020	SMD 0805
32	2	R803, R832	Resistor, 470 ohm, 1/8W	MCR10EZHF4700	SMD 0805
33	1	R829	Resistor, 680Ω, 1%	MCR10EZHF6800	SMD 0805
34	1	R813	Resistor, 1 kohm, 1/8W	MCR10EZHF1001	SMD 0805
35	1	R828	Resistor, 1.8KΩ, 1%	MCR10EZHF1801	SMD 0805
36	4	R811, R812, R816, R817	Resistor, 3 kohm, 1/8W	MCR10EZHF3001	SMD 0805
37	5	R802, R804, R810, R814, R815	Resistor, 10 kohm, 1/8W	MCR10EZHF1002	SMD 0805
38	1	R809	Resistor, 47 kohm, 1/8W	MCR10EZHF4702	SMD 0805
39	1	R805	Resistor, TBD, 1/8W (Not stuffed)		SMD 0805
40	1	S801	Square post header, 3 position, 0.1" breakaway	7000-1X25SG	-
41	1	S802	Square post header, 2 position, 0.1" breakaway		
42	1	U801	IC, video signal conditioner	MAX7450	SOIC-8
43	2	U802, U803	IC, op-amp, voltage limiting	OPA698ID	SOIC-8
44	1	U804	IC, comparator, dual	LM393M	SOIC-8
45	1	U805	IC, voltage reference		SOT-23
46	1	U806	Amplifier		SMD
47	1	U807	IC, regulator, +5V, 500mA	LM78M05CDT	SMD
48	1	U808	IC, voltage converter, 100mA, 735mW	LM2660M	SOIC-8
49	1	VR801	Potentiometer, 10KΩ, 3/8" top adj.	3386P-1-103	TH
50	2	VR804, VR805	Potentiometer, 10KΩ, 4MM top adj.	3214W-1-103E	SMD
51	2	VR802, VR803	Potentiometer, 500Ω, 3/8" top adj.	3386P-1-501	TH
52	1	PCB	Printed circuit board, double sided, FR4, 0.062", 3.359" (W) X 1.550" (H)		-
53	3		Spacer, 1/4" Hex, Aluminum, M/F, 4-40	139213	
54	1		Cable, RG-179/PP7.5", connects V.C.B. to modulator	500-0010-045	

Digital Up converter Bill of Materials

Last Revision: 09.12.00

Component Reference	Quantity	Identification	Modifier	Package
C1	1	0.1uF		1206
C101	1	100 Pf		1206
C102	1	0.1uF		1206
C103	1	100uF	25V	CAP100RP
C104	1	0.47uF		1812
C105	1	0.1uF		1206
C106	1	0.22uF		1206
C107	1	100 Pf		1206
C108	1	1pF		1206
C109	1	100 Pf		1206
C11	1	0.1uF		1206
C110	1	100 Pf		1206
C111	1	1pF		1206
C112	1	1pF		1206
C113	1	1pF		1206
C114	1	1pF		1206
C115	1	0.47uF		1812
C116	1	0.1uF		1206
C116A	1	100uF	25V	CAP100RP
C117	1	0.1uF		1206
C118	1	0.1uF		1206
C119	1	0.1uF		1206
C12	1	0.01uF		1206
C120	1	100 Pf		1206
C126	1	0.1uF		1206
C127	1	0.1uF		1206
C128	1	100 Pf		1206
C129	1	0.1uF		1206
C13	1	0.1uF		1206
C130	1	2.2pF		1206
C131	1	100 Pf		1206
C132	1	0.1uF		1206
C133	1	0.47uF		1206
C134	1	100uF	25V	CAP100RP
C135	1	10 Pf		1206
C136	1	10 Pf		1206
C137	1	10 Pf		1206
C138	1	10 Pf		1206
C139	1	10 Pf		1206
C14	1	0.01uF		1206
C140	1	10 Pf		1206
C141	1		NI	1206

C15	1	0.1uF		1206
C2	1	0.01uF		1206
C201	1		NI	CGKG27
C204	1	0.1uF		1206
C205	1	0.1uF		1206
C206	1	100 Pf		1206
C207	1	0.1uF		1206
C208	1	2.2pF		1206
C209	1	0.1uF		1206
C21	1	0.1uF		1206
C210	1	0.1uF		1206
C3	1	0.01uF		1206
C300	1	0.1uF		1206
C301	1	100 Pf		1206
C303	1	470 uF	25 V	CAP200RP
C4	1	0.01uF		1206
C5	1	0.1uF		1206
D1	1	3800		SOT-23
D100	1	9.1V	DIODEZ	DO214AC
D101	1	9V	914	SOT-23
D102	1	4.7V		SOT-23
D103	1	10 V	DIODEZ	DO214AC
D2	1	3800		SOT-23
D3	1	3800		SOT-23
F2	1			F-LP-TOKO
F4	1			F-LP-TOKO
FT200	1			FIL-TOKO
J1	1	N/A		THRU-HOLE
J10	1	N/A		THRU-HOLE
J2	1	N/A		THRU-HOLE
J3	1	N/A		THRU-HOLE
J4	1	N/A		THRU-HOLE
J5	1	N/A		THRU-HOLE
J6	1	N/A		THRU-HOLE
J7	1	N/A		THRU-HOLE
J8	1	N/A		THRU-HOLE
J9	1	N/A		THRU-HOLE
L1	1	0.47uH		1812
L104	1	10nH		1812
L107	1	0.22uH		1210
L108	1	0.22uH		1210
L109	1	0.22uH		1210
L5	1	0.47uH		1812
L6	1	0.47uH		1812
M1	1		MIXER-RF2	
P1	1	N/A		FCONN-S
P2	1	N/A		FCONN-S
R1	1	1k Ohm		1206

R101	1	1k Ohm		1206
R102	1	910 Ohm		1206
R103	1	910 Ohm		1206
R104	1	0		1206
R105	1	47 kOhm		1206
R106	1	220 Ohm	1/2 WATT	RES2010A
R108	1	43 Ohm	1/2 WATTS	RES2010A
R109	1	220 Ohm	1/2 WATT	RES2010A
R111	1	33 Ohm		1206
R112	1	180 Ohm		1206
R113	1	180 Ohm		1206
R114	1	220 Ohm	1/2 WATT	RES2010A
R115	1	75 Ohm		1206
R116	1	10 Ohm		1206
R117	1	36 Ohm		1206
R118	1	10 Ohm		1206
R119	1	75 Ohm		1206
R120	1	110 Ohm	1 WATT	RES2010A
R121	1	4.7 Ohm		1206
R122	1	91 Ohm		1206
R123	1	4.7 Ohm		1206
R14	1	36 Ohm		1206
R15	1	62 Ohm		1206
R16	1	36 Ohm		1206
R17	1	1k Ohm		1206
R18	1	2k Ohm		1206
R19	1	75 Ohm		1206
R2	1	1k Ohm		1206
R20	1	8.2 Ohm		1206
R200	1	300 Ohm		1206
R201	1	18 Ohm		1206
R202	1	300 Ohm		1206
R203	1	100 Ohm		1206
R204	1	110 Ohm	1 WATT	RES2010A
R205	1	4.7 Ohm		1206
R206	1	75 Ohm		1206
R207	1	4.7 Ohm		1206
R21	1	82 Ohm		1206
R22	1	220 Ohm		1206
R23	1	100 Ohm		1206
R24	1	4.7 Ohm		1206
R25	1	100 Ohm		1206
R3	1	2k Ohm		1206
R4	1	4.7k Ohm		1206
R5	1	2k Ohm		1206
R6	1	1k Ohm		1206
U100	1		145200	TSSOP20
U101	1		ERA5	WW107

U102	1		ERA5	WW107
U2	1		RF559B2	
U200	1		ERA5	WW107
VC01	1			MINI14SL

750 MHz Down Converter Bill of Materials

Last Revision: 09.13.00

Component Reference	Quantity	Identification	Modifier	Package
C1	1	27 pF		1206
C10	1	100 pF		1206
C100	1	2.2 pF		1206
C101	1	2.2 pF		1206
C102	1		NI	1206
C11	1	0.1 uF		1206
C12	1	0.47 uF		1812
C13	1	100 uF	25 V	CAP100RP
C14	1		NI	1206
C15	1	10 pF		1206
C16	1	10 pF		1206
C17	1	10 pF		1206
C18	1	10 pF		1206
C19	1	10 pF		1206
C2	1	27 pF		1206
C20	1	10 pF		1206
C200	1		NI	1206
C205	1	2.7 pF		1206
C206	1	3-10 pF		CGKG27
C207	1	3-10 pF		CGKG27
C208	1	3-10 pF		CGKG27
C209	1	2.7 pF		1206
C21	1	0.1 uF		1206
C210	1	0.1 uF		1206
C211	1	0.1 uF		1206
C212	1	0.1 uF		1206
C213	1	100 pF		1206
C214	1	1 pF		1206
C215	1	10 pF		1206
C22	1	0.22 uF		1206
C23	1	100 pF		1206
C24	1	1 pF		1206
C25	1	100 pF		1206
C26	1	0.1 uF		1206
C27	1	100 uF	25 V	CAP100RP
C28	1	0.1 uF		1206
C29	1	0.1 uF		1206
C3	1	4.5-20 pF		CGKG27
C30	1	0.1 uF		1206
C301	1	0.1 uF		1206
C302	1	100 pF		1206
C303	1	470 uF	35 WV	CAP275RP650

C304	1	0.1 uF		1206
C31	1			1206
C33	1	1 pF		1206
C34	1	1 pF		1206
C35	1	1 pF		1206
C36	1	1 pF		1206
C37	1	0.1 uF		1206
C38	1	0.1 uF		1206
C39	1		NI	1206
C4	1	0.47 uF		1812
C40	1		NI	1206
C41	1		NI	1206
C44	1	0.1 uF		1206
C45	1	0.1 uF		1206
C46	1	100 pF		1206
C5	1	100 pF		1206
C6	1	0.1 uF		1206
C7	1	0.47 uF		1812
C8	1	100 uF	25 V	CAP100RP
C9	1	100 pF		1206
D1	1	9 V	D914	SOT23
D2	1	9.1 V	DIODEZ	D0214AC
D3	1	9 V		SOT23
D4	1		DIODEZ	D0214AC
FT100	1			FIL-TOKO
J1	1			THRU-HOLE
J2	1			THRU-HOLE
J3	1			THRU-HOLE
J4	1			THRU-HOLE
J5	1			THRU-HOLE
J6	1			THRU-HOLE
J7	1			THRU-HOLE
J8	1			THRU-HOLE
J9	1			THRU-HOLE
L1	1	0.22 uH		1210
L100	1	10 nH		1210
L2	1	0.22 uH		1210
L200	1	10 nH		1210
L201	1	12 nH		1210
L202	1	12 nH		1210
L203	1	10 nH		1210
L204	1	10 nH		1210
L3	1	0.22 uH		1210
L4	1	10 nH		1210
M1	1		PULSAR	MIXER-RF2
OSC1	1		MA06	MINI14SL
P1	1			FCONN-S
P2	1			FCONN-S

R10	1	180 Ohm		1206
R100	1	33 Ohm		1206
R101	1	51 Ohm		1206
R102	1	4.7 Ohm		1206
R103	1	91 Ohm		1206
R104	1	4.7 Ohm		1206
R11	1	33 Ohm		1206
R12	1	180 Ohm		1206
R13	1	220 Ohm	1/2 WATT	RES2010A
R14	1	0 Ohm		1206
R15	1	75 Ohm		1206
R16	1	10 Ohm		1206
R17	1	33 Ohm		1206
R18	1		NI	1206
R19	1		NI	1206
R2	1	10 kOhm		1206
R20	1	4.7 Ohm		1206
R200	1		NI	1206
R201	1		NI	1206
R202	1	0 Ohm		1206
R203	1		NI	1206
R204	1	0 Ohm		1206
R207	1	0 Ohm		1206
R208	1	110 Ohm	1 WATT	RES2010A
R209	1	0 Ohm		1206
R21	1	110 Ohm	1 WATT	RES2010A
R210	1		NI	1206
R211	1	0 Ohm		1206
R22	1	75 Ohm		1206
R3	1	220 Ohm	1/2 WATT	RES2010A
R4	1	47 kOhm		1206
R5	1			RES2010A
R6	1	910 Ohm		1206
R7	1	910 Ohm		1206
R8	1	0 Ohm		1206
R9	1	43 Ohm	1/2 WATT	RES2010A
U1	1		145200	TSSOP20
U2	1		ERA3	WW107
U201	1		ERA5	WW107
U3	1		ERA5	WW107
Y1	1	4000 MHz		XTL49

Power Supply Bill of Materials

Last Revision: 09.12.00

Component Reference	Quantity	Identification	Modifier	Package
C1	1	4700	35 V	CAP400RPHORZ
C10	1	0.1 uF		CAP250
C11	1	0.1 uF		CAP250
C12	1	0.1 uF		CAP250
C13	1	0.1 uF		CAP250
C14	1	1000	50 V	CAP275RP650
C15	1	0.1 uF		CAP250
C16	1	4700	16 VDC	CAP275RP650
C17	1	1000	50 V	CAP275RP650
C18	1	0.1 uF		CAP250
C19	1	0.1 uF		CAP250
C2	1	4700	35 V	CAP400RPHORZ
C3	1	0.1 uF		CAP250
C4	1	0.1 uF		CAP250
C5	1	0.1 uF		CAP250
C6	1	0.1 uF		CAP250
C7	1	2200	35 V	CAP275RP650
C8	1	0.1 uF		CAP250
C9	1	10000	25 VDC	CAP400RPHORZ
P1	1			CONHDR6
P2	1			CONHDR6
P3	1			CONHDR6
P4	1			CONHDR6
P5	1			CONHDR6
P6	1			CONHDR6
P7	1			CONHDR8
R1	1	2 kOhm		RES400
R2	1	240 Ohm		RES400
R4	1	5.6 kOhm		RES400
U1	1			BRIDGE
U2	1			RBRDG-RECT-403M
U3	1		LM317	T0-220-AB
U4	1		7824	T0-220-AB
U5	1		7812	T0-220-AB
U6	1		7805	T0-220-AB
U7	1			DIP6-2

