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Operating Manual

for the

M369S Agile **Modulator**



M-369S Agile Modulator with Stereo

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Rev. A

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Important Notices

Shipping Loss or Damage

Before signing the Common Carrier's delivery receipt, count the number of cartons and inspect each for visible damage. If the number of cartons does not agree with the receipt or there is damage, make note of these discrepancies on all copies of the receipt before signing.

Immediately unpack the equipment and inspect for concealed damage. If damage is found, notify the carrier immediately. We suggest you keep the shipping carton and packaging material should the equipment ever need to be returned.

CAUTION – Unauthorized Repair

Unauthorized repair, modification or disassembly during the warranty period may cancel the warranty. Should field repairs or modifications be desired, CADCO technicians may be able to provide helpful suggestions, saving you both time and money.

Notice of Proprietary Data and Changes

Data, drawings, designs represented and all other material contained herein are the proprietary property of CADCO Systems, and may not be reproduced or duplicated in any form without written authorization by CADCO Systems. All material is subject to change without notice or obligation.

Equipment Return

Should you desire to return the equipment for service, please call CADCO prior to shipping. Enclosing as much information as possible on the reason for return and the work desired will expedite service and help to insure your satisfaction. If possible, pack the equipment in the original carton and materials. If the original packaging material is no longer available, pack the equipment in cushioning material sufficient to provide a minimum of 1.5 inches separation between the carton and the equipment. Return Authorization numbers are required, please call your sales representative for your RMA and shipping instructions. Include your return address, telephone number and method of return shipment. Ship the equipment prepaid to the address in this manual.

Reasons for using CADCO Factory Service:

- Designed and manufactured your equipment
- Technicians are trained on all CURRENT and PAST technical product information
- Technicians use specialized testing and alignment tools designed for your equipment
- Technicians may often help with a specialized application
- Toll-free factory sales and service hotline
- Factory service rates are very competitive and in many cases less expensive than non-factory service stations
- New equipment warranty for two years
- 90 day guarantee on out of warranty service
- Fast and friendly customer service

Suggestions for Headend Racking and Maintenance

For prolonged equipment life and operating stability, CADCO makes the following recommendations:

- All headends should be installed in an environmentally controlled dust-free room having a nominal temperature of 80°F (26°C) and 60% humidity. The room should be protected from rodents and insect pests.
- All equipment should be mounted in standard equipment racks or cabinets
- All equipment should be rack spaced at one panel height, 1.75 inches (4.44cm). There should be nothing between the equipment preventing air circulation.
- Please make certain headend wiring and current capacity has adequate safety margins. Never cascade AC powering strips. Use separate outlets. If AC power is subject to fluctuation we recommend a constant voltage transformer be used. Beware of ground loops and be certain all wiring is bonded and properly grounded. Consult a code book as needed.
- All equipment racks should be electrically bonded together and earth grounded
- All equipment interconnecting RF cables should be a minimum of double shielded and quad shielded is recommended. Poorly shielded cable causes cross-modulation picture degradation between equipment.
- Always use the coax connector intended for the coaxial cable used. Be certain it is installed as recommended by the manufacturer. Connectors should be RFI shielded.
- RF Input and RF Output cables should be on opposite sides of the equipment rack. Never bundle input and output RF cables together.
- Operate each up-converter at the RF output level recommended. If it is necessary to reduce the RF Output level, always operate the equipment as recommended and reduce the RF
- Equipment RF test points are only relative indicators of the actual RF output level. All RF operating level measurements should be made at the RF Output of each unit.
- When the headend is initially placed in service, create a record of all operating parameters for each channel's equipment. Referring to these records during routine maintenance provides a helpful record of operating changes.

Forward

INTRODUCTION. CADCO Technologies thanks you for purchasing the Model M369S Low-Noise modulator. The M369S contains the latest in CATV electronics, including synthesized crystal-referenced phase-locked-loop oscillators, microprocessor control, saw-filtered if and hybrid amplifiers. In addition to these features, the U.S. version contains automatic input offset programming to remove input offsets that are part of off-air channels (0, +10KHz), cable standard channels (0, +12.5KHz, +25KHz) and Cable HRC channels (0.3KHz master oscillator offset). The stereo circuit is engineered to process right and left analog audio signals and baseband composite video to generate a stereophonic composite signal in accordance with BTSC system standards.

FEATURES

- Tunes Channels 2 - 125 by channel number and T Channels are designated by -7 indicating T7
- BAR Graph Modulation and Channel LED Readout
- Balanced Stereo Inputs - 600 Ω
- Synthesized Oscillators - Crystal Referenced Phase Locked
- Non-Volatile Channel Selection
- RF Muted During Tuning
- +60dBmV Output Using Low-Distortion Hybrid Amplifiers
- Phase Lock Loop FM Audio
- Optional Aural Subcarrier and Baseband Audio Inputs
- External Separate Audio/Video & Composite IF Loop-Through
- Sound Carrier Level Adjustable -10dB to -20dB
- SAW Filtered IF: Designed for Adjacent Channel Operation
- Internal Switch Selects Standard or HRC Output
- RS 232 Control Option (Daisy Chain Capable)
- Video Delay Predistortion Network meets FCC 73.687
- Non-Volatile Memory Retains memory after Power Loss
- Surface Mount Technology

AVAILABLE OPTIONS

- Dual RS232 Control for Daisy Chain Capability

General Setup and Operating Instructions CADCO M369S Agile Modulator

1. Position the CADCO M369S Agile Modulator in its installation mount or rack.
2. Locate the cable drop that will provide the input video signal and/or audio signal for the M369S Agile Modulator.
3. The recommended input levels for best performance from the CADCO M369S Agile Modulator are: 1.4 V_{PP} for the video signal and 1V_{PP} at 1KHz for the audio signals (right & left).
4. Connect the input video source to the F-connector on the rear panel of the M369S marked "VIDEO IN;" wire the stereo audio to the green plastic plug (provided), then insert the plug into the jack on the rear panel of the M369S.
5. Connect the output of the M369S to a 75Ω load, normally a channel combiner, via an RF cable connected to the F-connector marked "RF OUTPUT" on the rear panel of the M369S. If the M369S is under test (*see* Step 8, below), connect the test equipment to the relevant ports, ensuring that they are properly (75Ω) terminated.

NOTE: A hybrid combiner – such as the CADCO 24-1000 – is strongly recommended for this purpose because of its flat response and maximum isolation between channels.

6. Connect the CADCO M369S to a proper AC electrical source. The correct electrical input type for the unit is marked on the rear panel, directly under the entrance of the power cord into the unit.

NOTE: CADCO power supplies are designed so that, under certain power line or heat buildup conditions, the unit shuts off. An indication is no RF output, although the POWER LED on the front panel remains illuminated. If this occurs, unplug the power cord and wait at least two (2) minutes before reapplying power. Upon reapplying power, you should again have RF output. If the unit fails to provide RF output again, or should the unit return to shutdown mode, telephone your distributor for assistance or call CADCO Systems direct at 800-877-2288. Remember: CADCO recommends a 1.75" air circulation space between each piece of rack-mounted equipment.

7. Select the desired output channel. Unless otherwise specified, the unit is factory set for cable standard channel frequencies and the microprocessor automatically selects the proper FCC offset for the output channels, requiring no calculations or adjustments.

NOTE: For HRC output channels, see the section in this manual entitled HRC Output Frequency Set.

NOTE: During output-channel tuning, the FREQUENCY LOCK LED on the front panel display may also blink during input-channel tuning. This is because, when the unit is being tuned, an RF-OUTPUT MUTING circuit is enabled to ensure that moving RF carriers do not interfere with any existing channels on the cable system.

8. Connect a Spectrum Analyzer (recommended) or a Field Strength Meter to the F-connector marked "RF OUTPUT" on the rear panel of the M369S Agile Modulator. If the unit is already connected to another device, disconnect that device from the unit.
9. Using the front panel control marked "OUTPUT LEVEL," adjust the RF output of the unit. The recommended output level is between +55dBmV and +60dBmV (+115dBuV and +120dBuV).

NOTE: Setting the RF output level below +55dBmV may adversely affect the parameters of the modulating signal; setting the RF output level above +60dBmV will adversely affect the quality of performance of the M369S. Ensure that the RF output level is checked each time an output channel is selected, particularly when the selected channel is a return or "T" channel or when the channel selected is in a different band from the previous channel.

10. While the RF OUTPUT signal is still connected to the Spectrum Analyzer or Field Strength Meter, observe the aural carrier level. The difference between the video carrier level and the audio carrier level – the "Delta AV" or ΔAV – should be the same as the input source. In other words, if the RF INPUT signal ΔAV is 15dB, the RF OUTPUT signal ΔAV should be 15dB \pm 2dB. Minor adjustment of this ΔAV may be made either at the input signal source (if the input signal is not from an off-air source) or with the AURAL CARRIER LEVEL control on the front panel of the M369S. When switching to either of the cable frequency sources (STD or HRC), the internal aural carrier attenuator drops automatically from 6dB to 0dB since the ΔAV for cable signals has normally been preset at the headend. However, the ΔAV for off-air signals may vary considerably. Normal operation level of the AURAL CARRIER is 10- to 22db below the VIDEO CARRIER. If adjustment of the AURAL CARRIER LEVEL control on the front panel of the M369S will not bring the ΔAV of an off-air signal into an acceptable range, check the ΔAV of the input signal. If the ΔAV of the input signal is too small or is negative (the aural carrier is above the video carrier), it is possible that the AURAL CARRIER LEVEL control of the M369S will be unable to compensate. Check the input signal before contacting CADCO Systems for return-for-repair information.

GENERAL SETUP AND OPERATION – DUAL RS-232 REMOTE CONTROL OPTION

INTRODUCTION If you have chosen the DUAL RS-232 Remote Control option for your agile unit, CADCO thanks you for your choice. We think you will agree that this option adds many useful capabilities to the product.

All of the CADCO frequency-agile products are equipped with a microprocessor that controls many functions within the unit. The RS-232 option gives the user remote access to all of the monitoring and control functions *via* a standard RS-232 communications link. To facilitate use of the DUAL RS-232 option, each unit is assigned an individual identification code at the factory. That code is displayed during the unit’s initial POST (Power On Self Test) and can be changed at any time through the RS-232 link.

CONNECTION Connection to the unit and between units is *via* RJ-11-6 jacks on the rear panel. The unit communication jack is marked J1 and is the outermost jack on the rear panel (the one nearest the RF OUTPUT connector). The interface cable, readily constructed by the customer, should have an RJ-11-6 modular connector on one end and the appropriate connector on the other end for the terminal or modem to which the unit will connect. *See* Figure 2-1a, below.

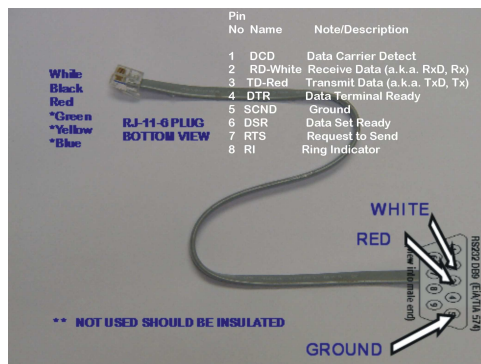


Figure 2-1a

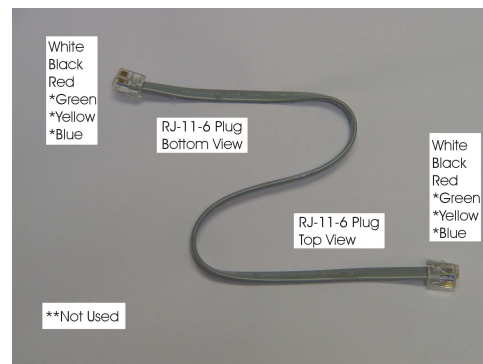


Figure 2-1b

Connection between units is also *via* an interface cable, but with an RJ-11-6 connector on each end and wired in “straight-through” configuration. *See* Figure 2-1b, above. J2 is the throughput jack and connects to J1 on another unit, allowing units to be linked together. Up to 255 units can be daisy-chained in this fashion.

COMMUNICATION The RS-232 option communicates with the CADCO unit by “dumb” terminals, by computers running terminal emulation software or by high level computers with custom software. The CADCO unit automatically recognized the source type. Any leading ASCII character that lies between HEX 00 and HEX 7F will identify the source to be a ‘dumb’ terminal. Any leading ASCII character from HEX 80 to HEX FF will identify the source as high level.

SETUP AND OPERATION – DUAL RS232 OPTION

1. After completing SETUP AND OPERATION for the CADCO units in the appropriate Operation Manual, install and setup the CADCO units which have the RS-232 option.
2. Connect together, in “daisy-chain” fashion, all units (up to 255) which will be communicating *via* the RS-232 option. Link these units with RJ-11-6 interface cables wired in straight-through fashion as shown below in Figure 2-2. Connections should go from J2 on one unit to J1 on the next. Unit ID, at this point, is not relevant. When all units are linked together, the first unit in the chain will have an open J1; the last unit will have an open J2.

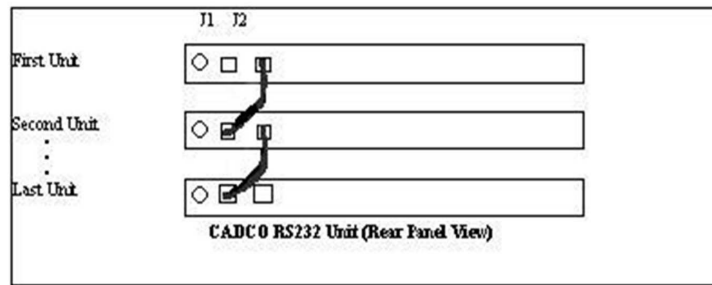


Figure 2-2

3. Using the customer-made interface cable which will connect to the interface device (terminal modem port or modem) RS-232 port, connect the first unit to port of the interface device. See Figure 2-3.

NOTE: If power has not yet been applied to the units, it may be applied now. However, it is recommended that power be applied to each unit in the link sequentially, in order to read and notate the unit ID for each unit and to facilitate changes in the event of duplicate unit ID. Alternatively, each unit can be individually tested and the unit ID set, following the steps below, prior to installation and link with other units.

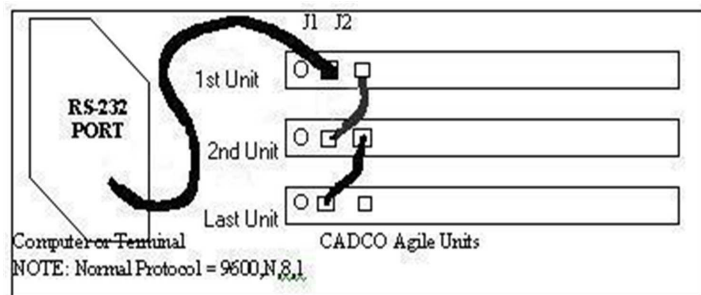


Figure 2-3

4. To identify the unit ID of a CADCO product, observe the front panel display at the time the unit is connected to a power source. The display will flash in the following sequence, providing the following information:

Seq	Observe	Function
1	All segments flash (“8 . 8 . 8”)	Segment test
2	Specific number to two (2) decimal places	Microprocessor version
3	Three- (3-) digit number from 0 to 255 followed by “.”	Unit ID
4	Number from 2-125, possibly preceded by minus sign (“-“)	Last channel selected

5. To initialize communications with a CADCO product equipped with the DUAL RS-232 option, enter the following keyboard sequence:

^#

where ^ is the symbol obtained by pressing the <SHIFT> and <6> keys, and # is the unit ID number (from 0 to 255, obtained from step four (4), above) of the unit to which a connection is desired.

6. The menu which appears (*see* Figure 2-4) shows the current configuration of the unit with which communication is established. On the initial communication, it may be necessary to press <ENTER> to allow the unit to communicate initial information for each parameter command displayed in the “ENTER SELECTION” field until that field is clear. Each time <ENTER> is pressed, new information will appear in the appropriate field in the menu displayed.

Cadco Remote Control Unit Menu v1.94	

CADCO UNIT:	M369 RS-232
CONFIG SWITCH:	11011000
UNIT ID:	255
SWITCH STATUS:	ENABLED
CARRIER STATUS:	CARRIER ON
INPUT CHANNEL:	21 – OFF AIR
OUTPUT CHANNEL:	33- CABLE STANDARD
U = Enter new Unit ID text	
S = Enable/Disble Front Panel Switch and Mode	
C = Toggle Carrier ON/OFF	
I = Enter new Input Channel	
O = Enter new Output Channel	
^#<CR> = Enter Unit Comm ID (# = 0 to 255)	

Figure 2-4

7. To change parameters in the unit, follow the instructions provided on the menu. Changeable parameters, with their field entry code, are:

Code	Meaning
U	Enter New Unit ID
S	Enable/Disable Front panel Switches and Offsets
T or C	Turn output [RF Carrier] On or Off <i>or</i> Toggle Carrier ON/OFF
I	Enter New Input Channel

- O Enter New Output Channel
- ^#<CR> Enter Unit Communication ID (# = 0 to 255)

NOTE: Depending upon whether your CADCO unit is a processor or a modulator, the menu will have slight variations. For example, the menu for the modulator will not display “I” for “Enter New Input Channel” because a modulator cannot tune an input channel. Different versions of units with different features may result in similar variations, but all will be understandable from the menu.

8. To address a new unit in the network, or after a power-up, enter a ^ followed by a valid unit number (0 – 255) and <CR> or <ENTER>. If a unit in the network matches the unit ID number sent, that unit will respond by returning a menu. When a ^ is sent, no further characters will be echoed from any of the units on the network until a valid unit number and carriage return are also sent. This is to avoid collisions on the network.

NOTE: If you are sending a ^ followed by a known valid unit ID number and are still not receiving a menu, check to ensure that the unit ID number is not duplicated in another unit. To check this, each unit which has not already been tested and confirmed to have a valid unit ID number will have to be powered down and repowered and the unit ID recorded from the POST sequence on the front panel LED display.

HIGH LEVEL MODE. High-level commands are used for faster computer-to-Agile Unit communications. Commands from an external computer take on the form of a command byte, followed by any data bytes required, and ending with a checksum byte used for ensuring message accuracy. Upon receiving a high-level command, data and a checksum, the unit will respond with one or more bytes of data and a checksum.

Available high-level commands consist of:

- POLLING Determines if any unit changes have taken place;
- READING Unit sends current configuration data; and
- WRITING Unit configuration is modified.

QUESTIONS, PROBLEMS, COMPLAINTS, SUGGESTIONS OR RETURNS

If you purchased your CADCO product through a distributor, please contact that distributor first should you have any questions, problems, complaints, or suggestions concerning your CADCO product. If you need to return the product for any reason, check with your distributor. They may have an exchange or loaner policy in order to minimize any down-time the loss of the unit may cause; or they may prefer that any returns or repairs be processed through them.

If you purchased your product directly from CADCO, or even if you purchased through a distributor, you may contact your CADCO sales representative at 800-877-2288 or 972-271-3651. Simply tell the receptionist the city and state from which you are calling and your call will be directed to the proper representative.

BEFORE RETURNING ANY PRODUCT DIRECTLY TO CADCO FOR CREDIT, REPAIR OR TRADE-IN, PLEASE CONTACT YOUR CADCO REPRESENTATIVE TO OBTAIN A RETURN AUTHORIZATION NUMBER. Failure to do so may delay any credit due your account or may extend repair turnaround time. Our address for returns is:

CADCO Technologies
3401 Wywood Drive
Plano, TX 75074

If returning a product for repair, please include the name and telephone number of the contact technician, a fax number, and a brief description of the symptoms. CADCO recommends that, prior to returning a product for repair, an on-site technician review the PROBLEM TROUBLESHOOTING GUIDE in this booklet. However, to preserve your warranty, please contact the CADCO repair department for authorization to break the warranty seal before opening the unit.

THANK YOU FOR CHOOSING CADCO PRODUCTS

Figures

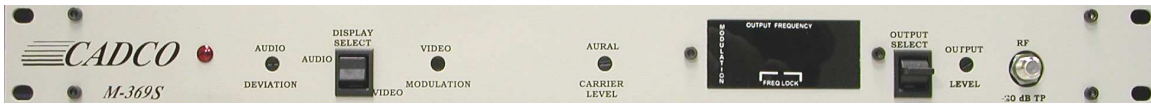
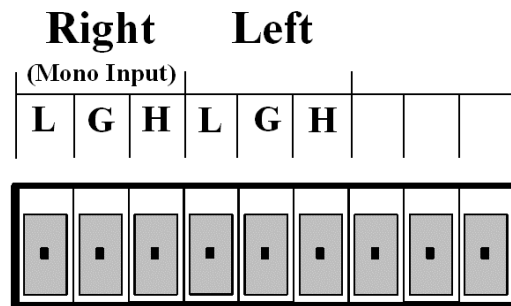


Figure 1.1a
Front Panel Layout of CADCO M369S Agile Modulator



Audio Input Guide

Figure 1.1b
Rear Panel Audio Layout of the M369S Agile Modulator

Manual also available on line at: www.cadcosystems.com