

This instruction manual also is applicable to the VMD860AS, VMR860AG, and VMR860AS.

The AS models include a built-in BTSC stereo audio encoder to provide stereo audio.

The VMR models are electrically identical to the VMD units except that they are designed for 19" rack mounting.

In this manual, only the VMD860AG model is discussed except where there are differences. Any differences will be explained.

The R.L. Drake VMD860AG family of Audio-Video Modulators includes high quality, vestigial sideband units with synthesized visual and aural carriers. The frequency agile units allow front panel pushwheel switch selection of standard CATV channels 2 through 135, CATV subband channels, T7 through T14, or VHF/UHF TV channels 2 through 69. Additionally, IRC or HRC CATV channel plans may be selected after moving an internal jumper. Aeronautical channels are offset positive with a tolerance of ±5 kHz as required by FCC rules.

The heterodyne conversion system, in conjunction with the use of a SAW filter, ensures optimum vestigial selectivity for adjacent channel headends.

Broadband noise and in-channel noise are reduced to a very low levels to provide excellent performance in multichannel CATV headend environments.

The modulators are designed to accept any standard audio/video source such as NTSC video and audio baseband signals from a satellite receiver, TV camera, videotape recorder, TV demodulator, or similar signal source. The VMD860AS and VMR860AS can accept stereo audio inputs and produce a BTSC stereo audio signal.

When stereo audio is required, the preferred method of providing a BTSC stereo signal is to use the VMD860AS or VMR860AS model. No special setup or test equipment is required.

Also, field-defeatable audio pre-emphasis in the AG models allows transmission of BTSC encoded baseband stereo audio signals from an external BTSC stereo encoder, such as the Drake MMTS20. Optimum performance requires proper test equipment for setup with external BTSC encoders.

The AG models will accept either mono or stereo inputs and output a mono audio signal with left and right inputs being summed in the modulator.

The modulators are designed to accept standard (negative sync) polarity video at 0.6 to 1.5 Vp-p level. All level controls are located on the front panel for ease of operation. Audio and video overmodulation indicators are provided. Output level is +45 dBmV and is adjustable downward.

FCC pre-distortion is provided in the video IF.

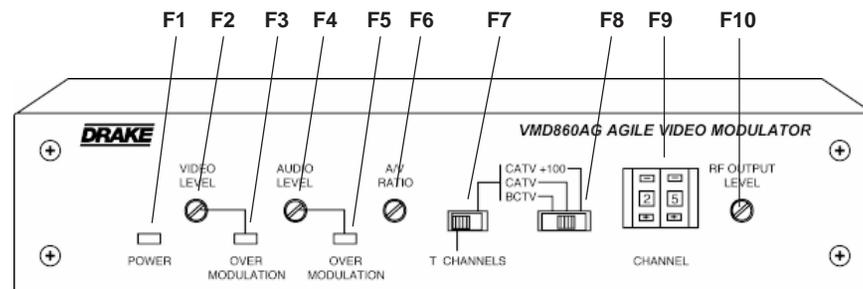


Figure 1

F1 - POWER/Error Indicator

Lights when the unit is connected to the required source of DC power via the rear panel DC INPUT connector. A flashing condition indicates an invalid channel setting or other conditions that would cause the unit to operate on an invalid channel. The RF output is switched off for flashing (ERROR) conditions.

F2 - VIDEO Level Control

The setting of this screwdriver adjustment determines the video modulation level. Clockwise rotation increases the modulation depth.

F3 - Video OVER MODULATION LED

With a video input applied, adjust (F2) until this indicator just illuminates, then set just below this point.

F4 - AUDIO Level Control

The setting of this screwdriver adjustment determines the aural carrier deviation. Clockwise rotation increases the carrier deviation.

F5 - Audio OVER MODULATION LED

With audio applied, adjust (F4) until this indicator just illuminates on peaks.

F6 - A/V RATIO Control

This screwdriver adjustment varies the level of the aural carrier over a range from 12 to 20 dB below the visual carrier. The aural carrier should be adjusted to approximately 15 dB below the visual carrier (normal operation). Clockwise rotation increases the aural carrier level.

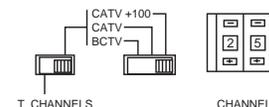
F7 - T CHANNEL Switch

Set this switch to the "T" channel setting to enable "T" channel coverage. Use the Channel Number switch (F9) to select 7 - 14. For normal CATV or broadcast TV channels, this switch must be set to the right to enable selection by the mode switch (F8).

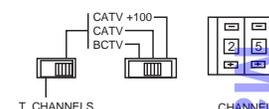
F8 - Mode Switch

Sets the type of channel, CATV or Broadcast TV ("BCTV"). This switch does not function if switch (F7) is in the "T" channel position. The last position of the switch ("+100") sets a leading "1" for CATV channels 100 through 125. See Item (F9) for setting the channel number.

Example 1:
Setting for CATV channel "125"-



Example 2:
Setting for CATV channel "25"-



F9 - CHANNEL Number Switch

Sets the desired operating channel for standard CATV channels 02 through 135, "T" channels T7 through T14, or Broadcast TV channels 02 through 69. See Item (F8) which sets the type of channel (CATV or Broadcast TV) and sets the leading "1" for CATV channels 100 through 125.

F10 - RF OUTPUT LEVEL

This screwdriver adjustment permits decreasing the RF output level a minimum of 10 dB as the control is rotated counterclockwise. Set the control for a desired output level.

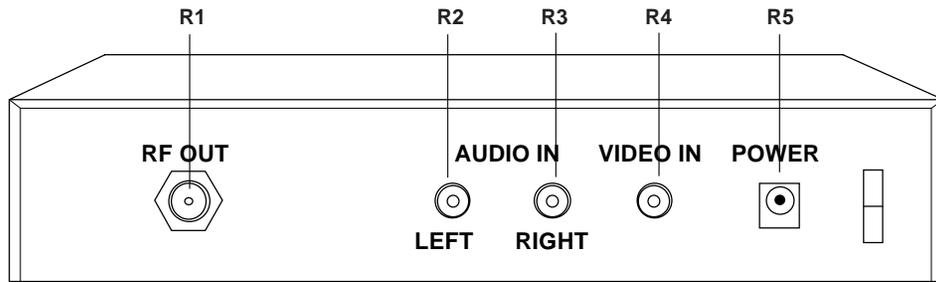


Figure 2

R1 - RF OUTPUT Connector
This is the modulator output.

R2 and R3 - AUDIO INPUT Connectors
These "RCA" (phono) connector inputs accept baseband audio from 250 mVrms to 3 Vrms levels. **NOTE:** In the AG models, an internally selected jumper can defeat the audio pre-emphasis for use with a stereo encoder. See Diagram on page 4.

For AG mono models, the inputs from the left and right jacks are internally summed. Input can be from a stereo source to both inputs or from a mono source to just one of the inputs.

For the AS stereo models, R2 and R3 are the left and right stereo channel inputs. A mono source connected to an AS stereo unit should be input to both connectors using a "Y" cable.

R4 - VIDEO INPUT Connector
This is the baseband video input to the IF circuits. This input accepts baseband input levels from 0.6 Vp-p to 1.5 Vp-p.

R5 - POWER / DC INPUT Connector
This connector accepts the appropriate mating DC power cable from the supplied AC adapter.

INSTALLATION NOTES

Level adjustment provides optimum performance in multichannel installations. The modulator outputs should be checked periodically with a spectrum analyzer or signal strength meter to maintain a ± 1 dB variation of adjacent channel carriers. Aural/Visual (A/V) ratios should be held to -15 dB or less. The output 'RF' and 'A/V (Ratio)' controls are used respectively to make these adjustments.

MOUNTING

Adequate ventilation is very important in multichannel installations. Units should be spaced apart by at least one panel height wherever possible, and some air movement is mandatory in enclosed rack cabinets. Excessive heat will shorten component life and modulator performance will be degraded without proper ventilation.

ACCESSING THE JUMPERS

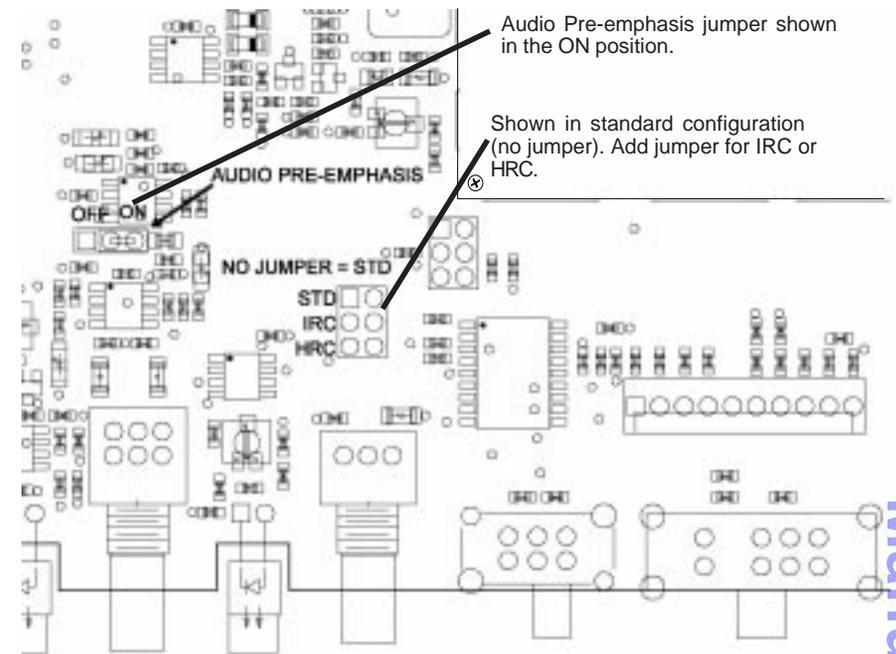
- First, **make certain the unit is disconnected from its power source.**
- Next, remove the four #4 screws from each side of the top cover. Save the screws for later reassembly.
- Carefully remove the top cover by lifting it upward from the chassis. The jumpers are now accessible for setting as desired.

JUMPER FUNCTIONS

Refer to the INTERNAL JUMPER FUNCTIONS diagram for a brief explanation of the two jumpers used in the jumper settings.

Refer to the INTERNAL JUMPER SETTINGS Diagram for proper jumper placement of the desired mode.

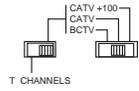
INTERNAL JUMPER FUNCTIONS



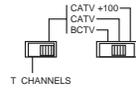
Front of VMM860AG With Cover Removed

5 CATV CHANNEL OUTPUT FREQUENCIES

TABLE 1: CATV CHANNELS



Output Channel Switch Setting	Visual Carrier Frequency (MHz)	Frequency Offset (kHz)
02	55.25	NONE
03	61.25	NONE
04	67.25	NONE
05	77.25	NONE
06	83.25	NONE
07	175.25	NONE
08	181.25	NONE
09	187.25	NONE
10	193.25	NONE
11	199.25	NONE
12	205.25	NONE
13	211.25	NONE
14	121.25	±12.5
15	127.25	±12.5
16	133.25	±12.5
17	139.25	NONE
18	145.25	NONE
19	151.25	NONE
20	157.25	NONE
21	163.25	NONE
22	169.25	NONE
23	217.25	NONE
24	223.25	+12.5
25	229.25	+12.5
26	235.25	+12.5
27	241.25	+12.5
28	247.25	+12.5
29	253.25	+12.5
30	259.25	+12.5
31	265.25	+12.5
32	271.25	+12.5
33	277.25	+12.5
34	283.25	+12.5
35	289.25	+12.5
36	295.25	+12.5
37	301.25	+12.5
38	307.25	+12.5
39	313.25	+12.5
40	319.25	+12.5
41	325.25	+12.5
42	331.25	+25
43	337.25	+12.5
44	343.25	+12.5
45	349.25	+12.5
46	355.25	+12.5
47	361.25	+12.5
48	367.25	+12.5
49	373.25	+12.5
50	379.25	+12.5
51	385.25	+12.5
52	391.25	+12.5
53	397.25	+12.5
54	403.25	NONE
55	409.25	NONE
56	415.25	NONE
57	421.25	NONE
58	427.25	NONE
59	433.25	NONE
60	439.25	NONE
61	445.25	NONE
62	451.25	NONE
63	457.25	NONE
64	463.25	NONE
65	469.25	NONE
66	475.25	NONE
67	481.25	NONE
68	487.25	NONE
69	493.25	NONE

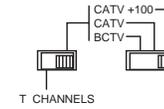


Output Channel Switch Setting	Visual Carrier Frequency (MHz)	Frequency Offset (kHz)
70	499.25	NONE
71	505.25	NONE
72	511.25	NONE
73	517.25	NONE
74	523.25	NONE
75	529.25	NONE
76	535.25	NONE
77	541.25	NONE
78	547.25	NONE
79	553.25	NONE
80	559.25	NONE
81	565.25	NONE
82	571.25	NONE
83	577.25	NONE
84	583.25	NONE
85	589.25	NONE
86	595.25	NONE
87	601.25	NONE
88	607.25	NONE
89	613.25	NONE
90	619.25	NONE
91	625.25	NONE
92	631.25	NONE
93	637.25	NONE
94	643.25	NONE
95	91.25	NONE
96	97.25	NONE
97	103.25	NONE
98	109.25	+25
99	115.25	+25
CATV +100 		
100	649.25	NONE
101	655.25	NONE
102	661.25	NONE
103	667.25	NONE
104	673.25	NONE
105	679.25	NONE
106	685.25	NONE
107	691.25	NONE
108	697.25	NONE
109	703.25	NONE
110	709.25	NONE
111	715.25	NONE
112	721.25	NONE
113	727.25	NONE
114	733.25	NONE
115	739.25	NONE
116	745.25	NONE
117	751.25	NONE
118	757.25	NONE
119	763.25	NONE
120	769.25	NONE
121	775.25	NONE
122	781.25	NONE
123	787.25	NONE
124	793.25	NONE
125	799.25	NONE

cont'd on page 6

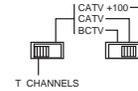
6 CATV & BROADCAST CHANNEL OUTPUT FREQUENCIES

TABLE 1: CATV + 100 cont'd.



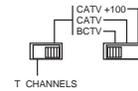
Output Channel Switch Setting	Visual Carrier Frequency (MHz)	Frequency Offset (kHz)
126	805.25	NONE
127	811.25	NONE
128	817.25	NONE
129	823.25	NONE
130	829.25	NONE
131	835.25	NONE
132	841.25	NONE
133	847.25	NONE
134	853.25	NONE
135	859.25	NONE

TABLE 2: T CHANNELS



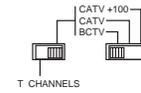
T CHANNELS	
Channel Number	Visual Carrier Frequency (MHz)
7	7.00
8	13.00
9	19.00
10	25.00
11	31.00
12	37.00
13	43.00
14	49.00

TABLE 3: BCTV CHANNELS



VHF BROADCAST CHANNELS	
Channel Number	Visual Carrier Frequency (MHz)
2	55.25
3	61.25
4	67.25
5	77.25
6	83.25
7	175.25
8	181.25
9	187.25
10	193.25
11	199.25
12	205.25
13	211.25

TABLE 3: BCTV CHANNELS, cont'd.



UHF BROADCAST CHANNELS	
Channel Number	Visual Carrier Frequency (MHz)
14	471.25
15	477.25
16	483.24
17	489.25
18	495.25
19	501.25
20	507.25
21	513.25
22	519.25
23	525.25
24	531.25
25	537.25
26	543.25
27	549.25
28	555.25
29	561.25
30	567.25
31	573.25
32	579.25
33	585.25
34	591.25
35	597.25
36	603.25
37	609.25
38	615.25
39	621.25
40	627.25
41	633.25
42	639.25
43	645.25
44	651.25
45	657.25
46	663.25
47	669.25
48	675.25
49	681.25
50	687.25
51	693.25
52	699.25
53	705.25
54	711.25
55	717.25
56	723.25
57	729.25
58	735.25
59	741.25
60	747.25
61	753.25
62	759.25
63	765.25
64	771.25
65	777.25
66	783.25
67	789.25
68	795.25
69	801.25

RF

Frequency Range: 7 to 864 MHz;
Standard CATV channels 2 to 135, IRC or HRC by moving
an internal jumper. CATV T Channels, T7 - T14.
Broadcast TV channels 2 to 69.

FCC Frequency Offsets: Automatic (+12.5 kHz, +25 kHz, or none as required for
each channel).

Output level: +45 dBmV (typical with 12 dB adjustment range).

Output Impedance: 75 Ohms, 12 dB return loss.

A/V Ratio: Audio carrier level, adjustable from -20 to -12 dB refer-
enced to video carrier level.

Frequency Stability: ± 5 ppm.

Inter-carrier Frequency: 4.5 MHz ± 5 ppm.

Spurious Outputs (5 MHz to 900 MHz): -60 dBc typical, measured at -15 dB A/V ratio and with
modulator output level of +45 dBmV.

In-channel C/N: 65 dB typical, 4 MHz bandwidth.

Broadband Noise: -75 dBc typical, 4 MHz bandwidth @ +45 dBmV output.

VIDEO

Input Level for 87.5% Modulation: 0.6 Vp-p to 1.5 Vp-p. Manual gain adjust with
front panel control. Overmodulation indicator provided.

Input Impedance: 75 Ohms, return loss of 26 dB minimum.

Frequency Response: 20 Hz to 4.2 MHz, ± 1 dB.

C/L Delay: Within 50 nSec. of FCC Predistortion curve.

Differential Gain: 3% maximum (10 to 90% APL).

Differential Phase: 3° maximum (10 to 90% APL).

Video S/N: 65 dB minimum, luminance weighted.

AUDIO

Input Level for 25 kHz Peak Deviation: 250 mVrms to 2.5 Vrms. Manual gain adjust with
front panel control. Overmodulation indicator provided.

Input Impedance: 10 K Ohms, unbalanced.

Pre-emphasis: 75 μ Sec., defeatable by internal jumper for BTSC baseband
stereo encoder compatibility.

Frequency Response

AG models: 40 Hz to 15 kHz, ± 1.0 dB referenced to 75 μ Sec.
pre-emphasis curve.

40 Hz to 100 kHz, ± 0.5 dB if pre-emphasis is defeated.

AS Models: 50 Hz to 14 kHz, ± 1.0 dB referenced to 75 μ Sec.
pre-emphasis curve.

Stereo Separation: >30 dB, 100Hz to 10kHz, >20 dB, 50 Hz to 100 Hz,
>25 dB, 10 kHz to 14 kHz.

S/N ratio: 65 dB.

Total Harmonic Distortion: .5% maximum.

GENERAL

DC Power Input: +10 to +18 VDC / 475 mA - from supplied AC adapter.

Supplied AC Adapter: Input, 120 VAC / 60 Hz, wall adapter.

Output, 12 VDC / 800 mA maximum.

Operating Temperature: 0° C to +50° C ambient.

Size: 8.25" (21 cm) W x 1.75" (4.45 cm) H x 7" (17.78 cm) D.

Weight: 2 lbs. 6 oz. (1.08 Kg).

Specifications subject to change without notice or obligation.

THREE YEAR LIMITED WARRANTY

R.L. DRAKE COMPANY warrants to the original purchaser this product shall be free from defects in material or
workmanship for three (3) years from the date of original purchase.

During the warranty period the R.L. DRAKE COMPANY or an authorized Drake service facility will provide, free of charge,
both parts and labor necessary to correct defects in material and workmanship. At its option, R.L. DRAKE COMPANY
may replace a defective unit.

To obtain such warranty service, the original purchaser must:

(1) Retain invoice or original proof of purchase to establish the start of the warranty period.

(2) Notify the R.L. DRAKE COMPANY or the nearest authorized service facility, as soon as possible after discovery
of a possible defect, of:

(a) the model and serial number,

(b) the identity of the seller and the approximate date of purchase; and

(c) A detailed description of the problem, including details on the electrical connection to associated equipment and the
list of such equipment.

(3) Deliver the product to the R.L. DRAKE COMPANY or the nearest authorized service facility, or ship the same in
its original container or equivalent, fully insured and shipping charges prepaid.

Correct maintenance, repair, and use are necessary to obtain proper performance from this product. Therefore carefully
read the Instruction Manual. This warranty does not apply to any defect that R.L. DRAKE COMPANY determines is
due to:

(1) Improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality
and specifications of the original parts.

(2) Misuse, abuse, neglect or improper installation.

(3) Accidental or intentional damage.

All implied warranties, if any, including warranties of merchantability and fitness for a particular purpose, terminate three
(3) years from the date of the original purchase.

The foregoing constitutes R.L. DRAKE COMPANY'S entire obligation with respect to this product, and the original
purchaser shall have no other remedy and no claim for incidental or consequential damages, losses or expenses. Some
states do not allow limitations on how long an implied warranty lasts or do not allow the exclusions or limitation of incidental
or consequential damages, so the above limitation and exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state. This
warranty shall be construed under the laws of Ohio.



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