



QM1000

QAM MODULATOR with UPCONVERTER

INSTRUCTION MANUAL



WARNING: TO PREVENT FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE TO RAIN OR MOISTURE

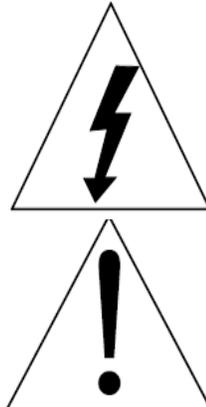


A product and cart combination should be moved with care. Quick stops, excessive force and uneven surfaces may cause the product and cart combination to overturn.

The lightning flash with arrow head symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

	CAUTION RISK OF ELECTRIC SHOCK DO NOT OPEN	
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL		



*****NOTE: Connect and apply power only after all other connections are made.*****

IMPORTANT SAFETY INSTRUCTIONS

WARNING:	TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE. DO NOT OPEN THE CABINET, REFER SERVICING TO QUALIFIED PERSONNEL ONLY.
CAUTION:	TO PREVENT ELECTRIC SHOCK, DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.
ATTENTION:	POUR PREVENIR LES CHOCS ELECTRIQUES, NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR, UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

- 1. Read Instructions:** All the safety and operating instructions should be read before the product is operated.
- 2. Retain Instructions:** The safety and operating instructions should be retained for future reference.
- 3. Heed Warnings:** All warnings on the product and in the operating instructions should be adhered to.
- 4. Follow Instructions:** All operating and use instructions should be followed.
- 5. Cleaning:** Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleansers. Use a damp cloth for cleaning.
- 6. Attachments:** Do not use attachments that are not recommended by the product manufacturer as they may cause hazards.
- 7. Water and Moisture:** Do not use this product near water—for example, near a bathtub, wash bowl, kitchen sink or laundry tub; in a wet basement; or near a swimming pool; and the like.
- 8. Accessories:** Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the product. Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the product. Any mounting of the product should follow the manufacturer's instructions, and should use a mounting accessory recommended by the manufacturer.
- 9.** A product and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.
- 10. Ventilation:** Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or similar surface. This product should not be placed in a built-in installation such as bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

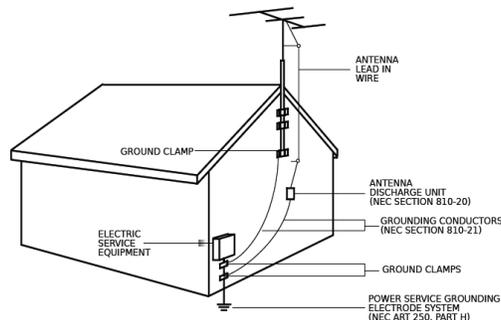
11. **Power Sources:** This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supplied to your home, consult your product dealer or local power company. For products intended to operate from battery power, or other sources, refer to the operating instructions.
12. **Grounding or Polarization:** This product may be equipped with a polarized alternating-current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature. If you are unable to insert the plug fully into the outlet, try reversing the plug. If the plug should still fail to fit, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the polarized plug. Alternate Warnings – If this product is equipped with a three-wire grounding-type plug, a plug having a third (grounding) pin, the plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.
13. **Outdoor Antenna Grounding:** If an outside antenna or cable system is connected to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Article 810 of the National Electrical Code, ANSI/NFPA 70, provides information with regard to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
14. **Power-Cord Protection:** Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the product.
15. **Lightning:** For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the product due to lightning and power-line surges.
16. **Power Lines:** An outside antenna system should not be located in the vicinity of overhead power lines, other electric light or power circuits, where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them may be fatal.
17. **Overloading:** Do not overload wall outlets, extension cords, or integral convenience receptacles as this can result in a risk of fire or electric shock.
18. **Object and Liquid Entry:** Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
19. **Servicing:** Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
20. **Damage Requiring Service:** Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - a) When the power-supply cord or plug is damaged,
 - b) If liquid has been spilled, or objects have fallen into the product,
 - c) If the product has been exposed to rain or water,
 - d) If the product does not operate normally by following the operating instructions.

Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation, e. If the product has been dropped or damaged in any way, and f. When the product exhibits a distinct change in performance—this indicates a need for service.

21. **Replacement Parts:** When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutes may result in fire, electric shock or other hazards.
22. **Safety Check:** Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.
23. **Wall or Ceiling Mounting:** The product should be mounted to a wall or ceiling only as recommended by the manufacturer.
24. **Heat:** The product amplifiers) that pr

ther products (including

NOTE TO CABLE INSTALLER:
 THIS REMINDER IS PROVIDED TO CALL THE CATV SYSTEM INSTALLER'S ATTENTION TO ARTICLE 820-40 OF THE NEC THAT PROVIDES GUIDELINES FOR PROPER GROUNDING AND, IN PARTICULAR, SPECIFIES THAT THE CABLE GROUND SHALL BE CONNECTED TO THE GROUNDING SYSTEM OF THE BUILDING, AS CLOSE TO THE POINT OF CABLE ENTRY AS PRACTICAL.



NEC - NATIONAL ELECTRIC CODE
 Example of antenna grounding as per National Electrical Code, ANSI/NFPA 70

THREE YEAR LIMITED WARRANTY

R.L. DRAKE LLC 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 LLC 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 LLC may replace a defective unit.

To obtain such a 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 LLC 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 LLC 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 important 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 LLC 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 LLC'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.

For Service, contact:

R. L. DRAKE HOLDINGS LLC
710 Pleasant Valley Drive
Springboro, OH 45066

Customer Service and Parts: (937) 746-6990
Fax: (937) 806-1576
Email: servicehelp@rldrake.com
Web Site: www.rldrake.com

Introduction

The Drake® QM1000 QAM Modulator with Upconverter is a professional quality modular digital headend component designed to provide optimum performance with minimized rack space requirements. This modulator accepts a MPEG2 transport stream input in an ASI serial format and is capable of providing a QAM output with 64 or 256 constellation points.

The modulator performs the forward error correction (FEC) encoding according to ITU J.83 Annex B. Annex B is referred to as 'DigiCipher II®'. The front panel push wheel selector and channel display allow the selection of QAM RF Channel Output, and a sliding Modulation Selector allows for setting the QM1000's QAM Output modulation mode (a CW output mode option is also selectable to allow measurement of the output level with an analog signal meter). The output symbol rate is set at 5.056941MS/S for 64QAM, and 5.360537MS/S for 256QAM. The maximum RF output is +45dBmV nominal (+30dBmV 44MHz IF mode) and may be attenuated with the RF Output Level Adjustment Dial located on the front panel. This RF Output Level Adjustment Dial attenuates in 0.5dB increments with a total range of 15dB. **NOTE:** the 44MHz IF mode is selected by setting the front panel Channel Selector switches to 000.

NOTE:
The QM1000 requires the use of a separate power supply and module chassis:

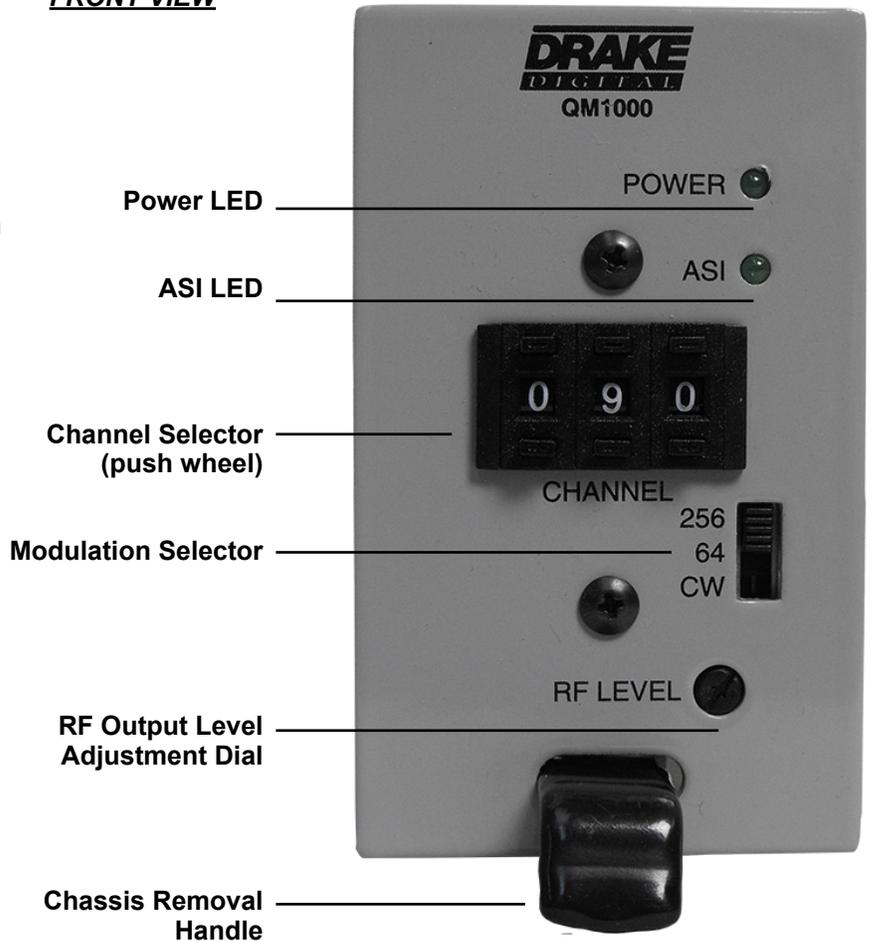


The power supply is the Drake PS8.

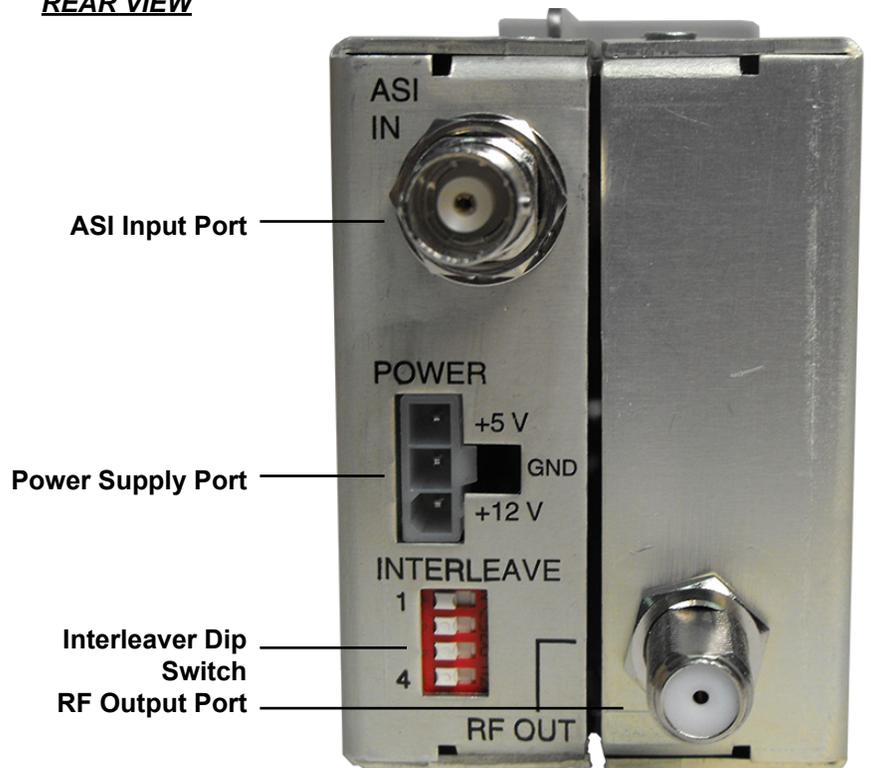


The chassis is the Drake DRMM12.

FRONT VIEW



REAR VIEW



RACK MOUNTING

Adequate ventilation is very important in multi-channel 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 cooling.

QM1000 OPERATION, SETUP, CONNECTIONS AND CONTROLS

The following information may serve as an aid in setting up the QM1000 parameters:

Modulation Selector: the CW setting is for testing and should be selected to allow setting of the up-converter output level using a device such as a signal level meter or spectrum analyzer. For normal operation, one of the MOD settings (256QAM, or 64QAM) is required.

Interleave Dip Switch: this allows the setting of the interleaver values. The ITU-B mode allows many combinations. The required setting should be specified by the system designer. If the demodulating device must have a particular set of values, then select the appropriate matching setting. For ITU-B, many systems use I128, J4 or I128, J1.

The chart to the right should be used for setting the INTERLEAVER MODE:

The output symbol rate is set at 5.056941MS/S for 64QAM, and 5.360537MS/S for 256QAM.

Output Filter Range is automatically set to match user-selected QAM Channel Output.

LED indicators:

Power LED - Indicates power.
Blinking indicates invalid channel selection.

ASI LED - Indicates ASI input.
Momentarily blinking off indicates input FIFO overflow.
Rapid alternate blinking of both the power and ASI LEDs indicates an over-temperature condition.

INTERLEAVER DIP SWITCH SETTINGS CHART

	I128, J1		I128, J5
	I128, J1		I8, J16
	I128, J2		I128, J6
	I64, J2		I4, J32
	I128, J3		I128, J7
	I32, J4		I2, J64
	I128, J4		I128, J8
	I16, J8		I1, J128

TABLE 1: CATV

CABLE TV CHANNELS	
<i>Channel Number</i>	<i>Center of Channel</i>
EIA/NCTA Numeric Equivalent	Frequency in MHz
2	57
3	63
4	69
5	79
6	85
95	93
96	99
97	105
98	111
99	117
14	123
15	129
16	135
17	141
18	147
19	153
20	159
21	165
22	171
7	177
8	183
9	189
10	195
11	201
12	207
13	213
23	219
24	225
25	231
26	237
27	243
28	249
29	255
30	261
31	267
32	273
33	279
34	285
35	291
36	297
37	303
38	309
39	315
40	321

CABLE TV CHANNELS	
<i>Channel Number</i>	<i>Center of Channel</i>
EIA/NCTA Numeric Equivalent	Frequency in MHz
41	327
42	333
43	339
44	345
45	351
46	357
47	363
48	369
49	375
50	381
51	387
52	393
53	399
54	405
55	411
56	417
57	423
58	429
59	435
60	441
61	447
62	453
63	459
64	465
65	471
66	477
67	483
68	489
69	495
70	501
71	507
72	513
73	519
74	525
75	531
76	537
77	543
78	549
79	555
80	561
81	567
82	573
83	579
84	585
85	591

CABLE TV CHANNELS	
<i>Channel Number</i>	<i>Center of Channel</i>
EIA/NCTA Numeric Equivalent	Frequency in MHz
86	597
87	603
88	609
89	615
90	621
91	627
92	633
93	639
94	645
100	651
101	657
102	663
103	669
104	675
105	681
106	687
107	693
108	699
109	705
110	711
111	717
112	723
113	729
114	735
115	741
116	747
117	753
118	759
119	765
120	771
121	777
122	783
123	789
124	795
125	801
126	807
127	813
128	819
129	825
130	831
131	837
132	843
133	849
134	855
135	861

CABLE TV CHANNELS	
<i>Channel Number</i>	<i>Center of Channel</i>
EIA/NCTA Numeric Equivalent	Frequency in MHz
136	867
137	873
138	879
139	885
140	891
141	897
142	903
143	909
144	915
145	921
146	927
147	933
148	939
149	945
150	951
151	957
152	963
153	969
154	975
155	981
156	987
157	993
158	999

Modulation modes:	64QAM, 256QAM or CW selected via front panel slide switch.
Symbol rate:	5.056941MS/S for 64QAM, 5.360537MS/S for 256QAM.
FEC:	ITU-B
Interleaver modes:	I128-J1, I128-J2, I64-J2, I128-J3, I32-J4, I128-J4, I16-J8, I128-J5, I8-J16, I128-J6, I4-J32, I128-J7, I2-J64, I128-J8, or I1-J128. Selected via rear panel DIP switch.
I/Q phase error:	<1 degree.
Carrier suppression:	>40dB.
Channel amplitude error:	<0.5dB.
MER:	>40dB with blind equalizer.
Output frequency range:	44MHz to 1002MHz.
Channel plan:	Standard CATV and 44MHz IF mode(channel 000).
Frequency stability:	+/- 2.5ppM.
Output level:	+45dBmV nominal. +30dBmV for 44MHz IF mode.
Output adjustment range:	+/-15dB via front panel potentiometer. Output level adjusts in 0.5dB steps.
Output flatness:	+/-2dB.
Output return loss:	>10dB within output filter passband.
Output filter ranges:	44MHz to 100MHz 100MHz to 150MHz 150MHz to 250MHz 250MHz to 450MHz 450MHz to 600MHz 600MHz to 1002MHz
Spurious:	> -60dBc except 44MHz IF mode where the 3rd harmonic is > -35dBc.
Phase noise:	> -101dBc at 10KHz offset. 1KHz to 10KHz = < -55dBc double sideband noise power. 10KHz to 50KHz = < -52dBc double sideband noise power. 50KHz to 3MHz = < -48dBc double sideband noise power.
Adjacent channel:	+/- 3.0MHz to +/- 3.75MHz = > -60dBc in 750KHz. +/- 3.75MHz to +/- 9.0MHz = > -59dBc in 5.25MHz. +/- 9.0MHz to +/- 15.0MHz = > -65dBc in 6.0MHz.
Broadband noise:	-78dBc in 6MHz bandwidth.
Power:	+12V @ 275mA, +5V @ 400mA typical.
Weight:	TBM
Size:	TBM
Operating temperature range:	0 to 50 degrees Celsius.
Note concerning operating temperature:	If the operating temperature of the unit changes by more than 25 degrees Celsius the unit will recalibrate its internal synthesizer. This will cause a momentary interruption of the output.

R.L. Drake Holdings, LLC

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