12 POSITION RACK MOUNT   POWER SUPPLY

TMQAM*asi* MODULATOR   TMQAM MODULATOR

Figure 1

The R.L. Drake model TMQAM and TMQAM*asi* modulators are professional quality modular digital headend components designed to provide optimum performance with minimized rack space requirements. These modulators accept an MPEG2 transport stream input in either the SPI format or ASI serial format, depending on the model, and is capable of providing a QAM output with 16, 32, 64, 128, or 256 constellation points.

The modulators perform the forward error correction (FEC) encoding according to ITU J.83 Annex A or Annex B. Annex A is referred to as 'DVB' and Annex B is referred to as 'DigiCipher II®'. The front panel push-buttons and display provide full access to many other parameters that can be set to match a particular application.

The TMQAM model provides a choice of two clock modes. In the 'Auto' mode, the output clock rate is automatically locked to the incoming data clock rate.

Thus the output symbol rate can change if the input data rate changes. The TMQAM*asi* model does not have an "Auto" selection. In the 'Fixed' mode, the desired output symbol rate is programmed from the front panel. This rate must be equal to or greater than the incoming data rate. The output rate will be maintained at the set rate and if the input rate is slower than this rate, the TMQAM and TMQAM*asi* will add null packets to make up for the slower input rate.

The modulators have several test modes that can be selected. In these modes, a pseudo-random binary sequence stream is substituted for the input source. This will provide a modulated output without any external input source.

A CW output mode is selectable to allow measurement of the output level with an analog signal meter.

The RF output is +30 dBmV. This IF output can be connected to one of the DRAKE DUC series of digital upconverters to provide an output on a CATV or broadcast channel.
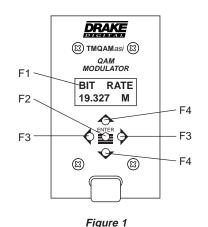
F1 - LCD Display
Displays the modulator parameter and its setting.

F2 - ⊡ ENTER
Use the ENTER button to enter the adjust mode or to save and load a new parameter value. Hold for 2 seconds to enter the adjust mode. After adjustment, press this button once to load and save the value.

F3 - ◇ ◇ **Left and Right Button**
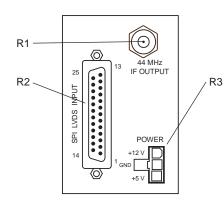Use the Left and Right buttons to select the parameter you desire to view or adjust.

F4 - △ ▽ **Up and Down Buttons**
Use the Up and Down buttons to adjust a parameter value when in the adjust mode. When not in the adjust mode, the UP button displays the version number. The Down button displays the incoming bit rate if the "AUTO" clock mode has been selected.
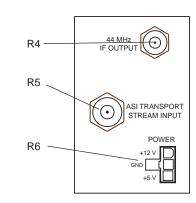
Figure 2

Figure 3

R1 - 44 MHz IF OUTPUT Connector
This is the modulator output. The level is +30 dBmV.

R2 - 25 Pin SPI LVDS INPUT Connector
This is the MPEG2 transport stream input - DVB Synchronous Parallel Interface. The levels comply with low voltage differential signalling specifications.

R3 - DC Power Connector
This is the power input connector. Connect to a Drake PS8 or equivalent power supply, (12 V @ 0 mA, 5 V @ 380 mA for the SPI input version).

R4 - 44 MHz IF OUTPUT Connector
This is the modulator output. The level is +30 dBmV.

R5 - 75 Ohm, Type BNC Connector
This is the MPEG2 transport stream input; ASI input, asynchronous serial interface.
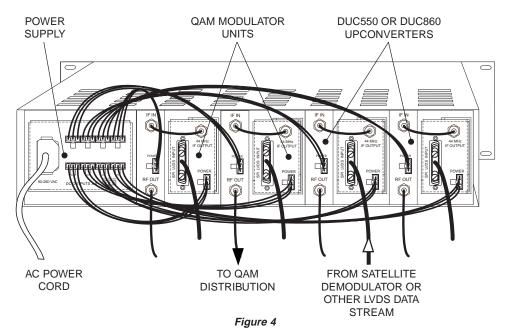
R6 - DC Power Connector
This is the power input connector. Connect to a Drake PS8 or equivalent power supply, (12 V @ 0 mA, 5 V @ 500 mA for the ASI input version).

CONNECTIONS AND CONTROLS
All connections to and from each modulator are made through the rear panel. Refer to Figure 4 for correct cable and wiring connections.

RACK 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 cooling.

Figure 4

TMQAM OPERATION AND SETUP
The TMQAM provides user access to many parameters of the modulator so that it can be setup to precisely match the requirements of the system.

1) To VIEW parameter settings only – no adjustment:
Press either the left or right arrow buttons to scroll through each parameter page. The parameter is listed on the first line of the display and the present setting will be displayed on the second line. After viewing, press the left or right arrow button again to advance to the next parameter. After viewing, the display will time-out and return to the output baud (BD) rate/symbol rate page.

2) To ADJUST or change parameter settings or for initial set up, follow these steps:
Press and hold the enter button for 2 to 3 seconds until the display begins to flash. Press the left or right arrow button to scroll to the desired parameter. Now press the up or down arrow button to adjust the parameter value. Note that no change is made at this point until the new value is loaded and saved. When the value is adjusted to the value required, press the enter button again. This will load and save the new value until this procedure is repeated.

The following chart shows all choices that are available for each parameter.

SOURCE:	INPUT:	OUTPUT:	LOOP BW:	MODE:	ENCODER:	QAM:	ALPHA:	INTERLV	CLOCK:	BD RATE:
EXTERNAL	CLK-NORM	CW	1 Hz	ITU-A	DVB	FOR ITU-A MODE	15%	I 12, J 17	AUTO*	DISPLAYS OUTPUT SYMBOL RATE.
PRBS 23M	CLK-INV	MOD-INV	10 Hz	ITU-B	DAVIC	16			FIXED	ADJUST RATE IF FIXED CLOCK IS SELECTED.
PRBS 23		MOD-NORM	20 Hz			32 (DVB only)				
PRBS 15M			100 Hz			64				▲ FOR FIRMWARE VERSION (WHEN NOT IN ADJUST MODE)
PRBS 15						128 (DVB only)				
						256				▼ FOR BIT RATE DISPLAY (ONLY IN AUTO CLOCK)
						FOR ITU-B MODE	18%	I128, J4		
						64		I32, J4		
						256		I128, J3		
								I64, J2		
								I128, J2		
								I128, J1		
								I1, J 128		
								I128, J8		
								I2, J64		
								I128, J7		
								I4, J32		
								I128, J6		
								I8, J16		
								I128, J5		
								I 16, J 8		

*Auto clock mode is only available in the TMQAM, SPI input model. The TMQAMasi operates in fixed mode only.

The following information may serve as an aid in setting up the TMQAM parameters. Use the procedure on page 4 to enter the adjust mode. Select the SOURCE menu. Normally, the EXTERNAL selection would be used to select the MPEG2 transport stream input. The PRBS selections provide test sequences generated inside the TMQAM and are for testing the modulator without a MPEG2 input source. Advance to the next menu using the left or right arrow buttons. Continue this process until all parameters have been checked and/or adjusted. Press the ENTER button to load and store all adjusted parameters. The ENTER button can be used after each parameter adjustment or, if desired, wait until all parameter adjustments are set and then "ENTER" adjustments all at once.

The INPUT menu is used to select an inverted clock if this is required. Usually the NORM selection for normal clock will be required. Select INV if an inverted clock is used.

The OUTPUT menu is used to select the output mode. The CW setting is for testing and should be selected to allow setting of the upconverter output level using a device such as a signal level meter or spectrum analyzer. For normal operation, one of the MOD settings is required. If the output upconverter uses high side local oscillator injection and inverts the output spectrum of the TMQAM (the Drake DUC upconverters do this), select the MOD-INV setting to provide a normal output from the upconverter. If the upconverter does not invert the spectrum or if you are use the 44 MHz IF output directly, you may need to select the MOD-NORM setting.

The LOOP BW menu is used to adjust the loop bandwidth of the input tracking loop. Use 20 Hz as a default setting. In some cases, this may need to be changed – 100 Hz if the signal is very jittery or 1 Hz if stable and weak. 20 Hz or 10 Hz are usually best for most sources.

The MODE menu is used to select the desired forward error correction mode. This must match that of the demodulating device (set top box, etc). Select ITU-A for DVB applications or select ITU-B for DigiCipher II® applications.

The ENCODER menu is used only if ITU-A was set as a mode. Select DVB or DAVIC mapping as required.

The QAM menu is used to select the QAM order desired. 16QAM, 32, 64, 128, or 256QAM may be selected in the ITU-A mode.

Most CATV systems are using 64QAM or 256QAM for digital video. In the ITU-B mode, the only choices are 64QAM or 256QAM.

The ALPHA menu displays the roll-off setting for the baseband filtering. ITU-A is 15% and ITU-B is 18% excess bandwidth. THESE CANNOT BE CHANGED.

The INTERLV menu allows setting of the interleaver values. The ITU-A setting is fixed at I=12, J=17. 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 CLOCK menu allows selection of the clock mode of operation. If AUTO is selected, the output baud or symbol rate will automatically track that of the input stream. If FIXED is selected, the output rate will remain fixed at this setting and the TMQAM will add null packets where required if the input rate is slower. If the input rate exceeds the fixed manual setting, an error will result. Some set top boxes are designed to operate at only one fixed symbol rate. If this is the case for your installation, use FIXED setting and set the value in the next menu to match that of the set top box. Advance one menu with the right arrow. This BD RATE menu will display the output symbol rate. If a fixed setting is required, use the BD RATE page to make the selection.

The BD RATE menu displays the current output symbol rate or baud rate. If the FIXED option has been selected for the clock, use this menu to adjust the output rate to the desired rate. When timed out from the set up process or adjust mode, the BD RATE page will be the default display menu. If the Auto Clock selection has been made, this menu will be skipped in the adjust mode. You can check bit rate or firmware version using the procedure described below.

DEFAULT DISPLAY /FIRMWARE REVISION / BIT RATE: After making and saving the above adjustments, the display will time out and default to the BD RATE screen showing the output baud rate or symbol rate. When this menu is being displayed and you are not in the adjust mode, pressing the up arrow will display the firmware revision number. If the down arrow is pressed, the display will display the data bit rate. Press the down arrow button again to go back to displaying the output baud rate.

Output
Output Frequency: 44 MHz.
Output Level: +30 dBmV.
Output Impedance: 75 Ohms.
Spurious Outputs: -55 dBc typical, in band or in adjacent channels. -60 dBc otherwise when used with Drake DUC550 or DUC860 upconverter modules.
MER: 38 dB minimum.

Modulation
Mode: 16, 32, 64, 128, 256 QAM.
Symbol Rate: 7.0 Msymbols/s Max.
Excess Bandwidth: 15% (ITU-A), 18% (ITU-B).

FEC Encoding
FEC Modes: DVB/DAVIC (ITU-T J.83 Annex A), Digicipher® II (ITU-T J.83 Annex B).

Input
Transport Stream: TMQAM - Parallel Input according to DVB SPI, LVDS specifications. TMQAM*asi* - Serial input according to DVB ASI specifications.
Connector: TMQAM - DB25 Female. TMQAM*asi* - BNC, 75 Ohms.

General
DC Power Required: TMQAM - 5 VDC @ 380 mA. TMQAM*asi* - 5 VDC @ 500 mA.
Size: 2.06" W x 3.5" H x 9.25" D (5.23 cm W x 8.9 cm H x 23.5 cm D).
Weight: 1 lb. 2 oz. (0.51 Kg).

The TMQAM and TMQAM*asi* modulator can operate in either of two clock modes:
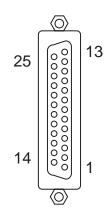
1) It can automatically lock to the incoming bit rates producing an output rate determined by the input stream. Power should be supplied by the model PS8 power supply module which also mounts into the DRMM12. The PS8 and DRMM12 are sold separately.

2) It can be set, from front panel controls, to output a desired symbol rate using an internally generated clock. In this mode, when the input bit rate is less than that needed to produce the set output symbol rate, null packets are added by the modulator.

The QAM signal must be up-converted to the desired channel with the Drake Up-Converter module, prior to transmission on the cable plant.

Specifications subject to change without notice or obligation.

Pin Out DVB SPI Interface

1 Data Clk +
2 GND
3 Data 7 +
4 Data 6 +
5 Data 5 +
6 Data 4 +
7 Data 3 +
8 Data 2 +
9 Data 1 +
10 Data 0 +
11 Data Valid +
12 Start of Packet +
13 GND

14 Data Clk -
15 GND
16 Data 7 -
17 Data 6 -
18 Data 5 -
19 Data 4 -
20 Data 3 -
21 Data 2 -
22 Data 1 -
23 Data 0 -
24 Data Valid -
25 Start of Packet -

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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