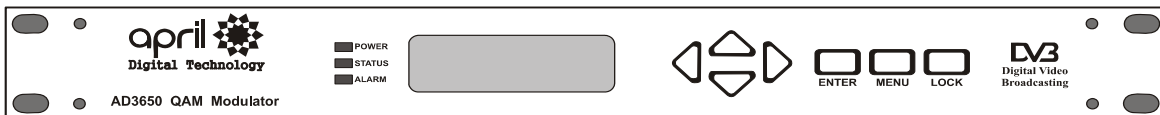


QAM Modulator

AD3650

USER GUIDE



CONTENT

1 SAFETY INSTRUCTIONS	1
2 COMPOSITIONS OF SYSTEM AND OPERATING PRINCIPLE	2
2.1 COMPOSITIONS OF SYSTEM.....	2
2.2 OPERATING PRINCIPLE.....	2
3 MAIN FEATURES	3
4 TECHENICAL SPECIFICATION	4
4.1 DATA INTERFACE.....	4
4.1.1 ASI INTERFACE.....	4
4.1.2 SPI INTERFACE.....	4
4.2 IF INTERFACE.....	4
4.3 RF INTERFACE.....	5
4.4 SIGNAL CHANNEL ENCODING.....	5
4.5 NETWORK MANAGEMENT INTERFACE.....	5
4.6 POWER SUPPLY.....	5
4.7 OPERATION ENVIORMENT.....	5
4.8 RADIATION AND SAFETY STANDARD.....	6
4.9 MECHANICAL CHARACTERISTICS:.....	6
4.10 E3/DS3 INTERFACE (OPTIONAL)	6
GQ-3650D QAM modulator CONTENT	
5 EQUIPMENT CONNECTIONS	7
5.1 PANLE DISPLAY AND KEYBOARD.....	7
5.2 FRONT PANEL SKETCH	7
5.3 REAR PANEL SKETCH.....	7
5.4 SPI INPUT AND OUTPUT INTERFACE CHARACTERISTICS.....	8
6 PARAMETER SETUP	9
6.1 KEYBOARD FUNCTION.....	9

6.2 OPERATION MODE SELECT.....	9
6.3 HOW TO SETUP AND CHANGE PARAMENTERS.....	10
7 QAM MESSAGES.....	17
8 SYSTEM ERRORS AND DEBUGGING.....	18
8.1 INDICATOR LIGHTS.....	18
8.2 TROUBLE SHOOTING.....	18
9 NETWORK MANAGEMENT.....	19

Safety Instruction

- 1.1 Before starting using this unit, please be sure to refer to this manual.
- 1.2 Do not to open the cabinet, otherwise the guarantee to repair are not available. Meanwhile touching the inside makes you in great danger of electric shock.
- 1.3 Please make sure to cut off the power supply if you will not use this unit in long term, and do not use any broken jack, which could result in fire or electric shock.

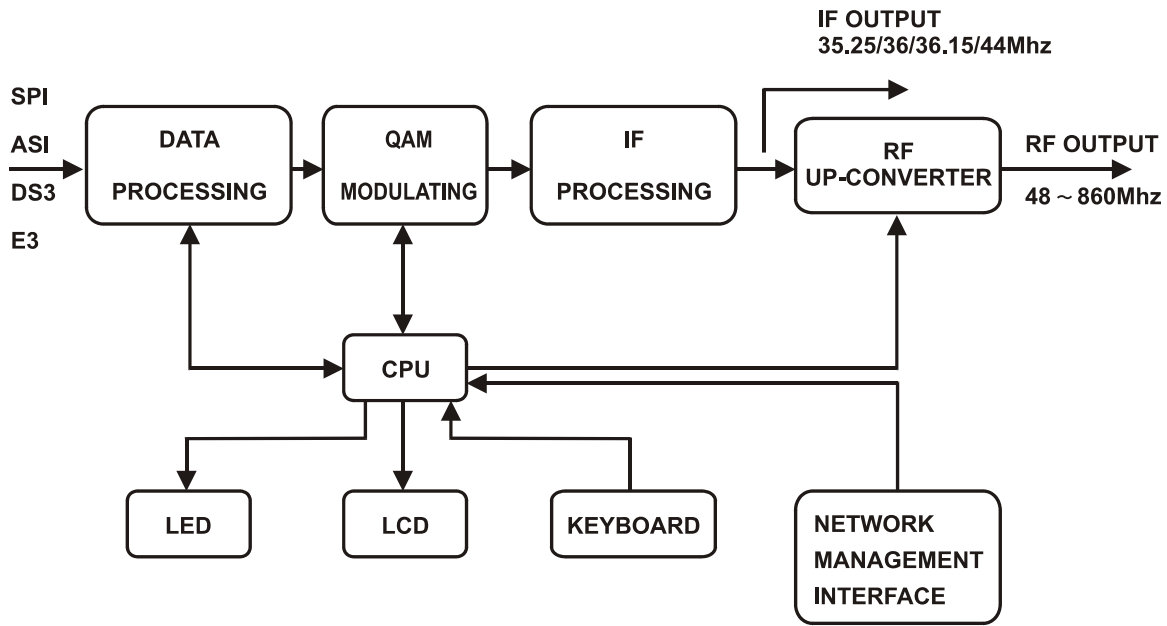
- 1.4 Wet hands are forbidden to touch the power jack, to avoid risk of electric shock.
- 1.5 Please pull the plug itself instead of the wire when you pull out power plug.
- 1.6 Any thing flammable and metal or liquid, which will destroy the unit, must be kept out the box.
- 1.7 Do not place this unit in a location near a heat source such as radiator or air ducts, or in a place exposed to direct sunlight, excessive dust, moisture, rain, mechanical vibration.
- 1.8 Keep the device working in a good ventilative environment, if not the destruction will occur.
- 1.9 Please keep the packaging for the safety of transit.

NOTE: After all parameters are set up, please press the **LOCK** button. When LCD display is dark, the protection function takes effect.

Composition of system and operating principle

Composition of system

THE SYSTEM CONSISTS UNITS OF THE FOLLOWING CHART



QAM Digital Modulator is mainly composed of the following modules:

◆Data processing unit

The unit converts signals from different interfaces into standard signal, then make data processing to carry out the preprocess of QAM modulating.

◆QAM modulating unit

The unit modulates data stream into frequency spectrum signal. IF output is 35.25/36/36.15/44MHz.

◆RF Up-converter unit

The unit up-converts IF signals to RF signals from 48MHz to 860MHz, divided into segments.

◆CPU/LCD/LED/Keyboard unit

The unit carries out keyboard input, LED display and intelligent control, etc.

Operating principle

GQ-3650 QAM Digital modulator converts input data streams into frequency signals, it meets to DVB-C standard. Signals from MPEG-II compact encoder or multiplexer was sent into QAM modulator. According to DVB standard, such as interlacing, RS error correction encoding, etc. After IF processing and up-converting into the range of TV channels, signals can be transmitted through HFC and MMDS networks. It's widely used in digital TV, data broadcasting, VOD, Internet, video conference etc.

Main features

Support ITU-T J.83A and B

DVB-C Standard

Constellation: 16QAM、 32QAM、 64QAM、 128QAM、 256QAM

Input interface: ASI and SPI (or DS3 /E3 optional)

Input bit rate: 1.5~51.6Mbps

Output bit rate: 2~56Mbps

Output bit rate: 1.15~8.05MHz(Modulus 0.15)

Output symbol rate: 1~7Mbaud/s

RF output: 48~860MHz

Output level: 105dBuV~115dBuV(step adjustable)

188/204 packet automatic identification

NIT mapping and sending function, support 44 NIT mapping

10 PID filter and re-mapping

PSI/SI information pick-up, parse and modification

SI information replacement and insert

Input data null packet filtering and output data filling.

PCR correction

Show and inspect system input bit rate and valid bit rate real time

Technical specification

Data interface

ASI interface (Asynchronous Serial interface)

A: Input:

Connector: BNC

Impedance: 75Ω

Packet format: 188/204 bits

Access data rate: 270Mbps

Max valid bit rate: 51.6Mbps

DVB standard

B: Loop output:

Connector: BNC

Impedance: 75Ω

SPI input interface (Synchronous Parallel interface)

Connector: DB-25 female

Packet format: 188 or 204 bits

DVB Standard: LVDS

IF interface

A: IF input

Connector: BNC

Impedance: 50Ω

IF frequency: 35.25/36/36.15/44 MHz (optional)

IF Bandwidth $\leq 8\text{MHz}$

Reflect loss $\geq 18\text{dB}$

Input level: 100dBuV (rms)

B: IF loop output:

Connector: BNC

Impedance: 50Ω

IF frequency: 35.25/36/36.15/44 MHz (optional)

IF Bandwidth $\leq 8\text{MHz}$

Reflect loss $\geq 18\text{dB}$

Output level: $100 \pm 2\text{dBuV(rms)}$

RF interface

A. RF output:

Connector: BNC

Impedance: 75Ω

Output Frequency: 48~800MHz

Reflect loss $\geq 15\text{dB}$

Output level:

105~115dBuV (adjustable)

Carrier rejection: $> 55\text{dB}$

SNR(out of band): $\geq 50\text{dB}$

B: RF output for test

Connector: BNC
Impedance: 75Ω
Output level: 85dBuV~105dBuV (adjustable)

Channel signal encoding

Constellation: 16QAM, 32QAM, 64QAM, 128QAM, 256QAM.
Channel encoding: RS encode, DVB standard
MER: ≥42dB
SNR(out of band): ≥50dB

Network management interface

IEEE802.3 ETHERNET, RJ45 interface
Software protocol: SNMP protocol

Power supply

Voltage: 165V~265VAC or 85V~265VAC
Frequency: 50Hz±2%
Power consumption: 50W

Operation environment

Operation temperature: +5~45°C;
Storage temperature: -25~+55°C.
Relative humidity: 10~75%

Radiation and safety

Up to GB13837-92 and GB8898-88

Mechanic characteristics

Dimension: 44.5mm(1U)*483mm*(19")*400mm
Weight: 7kg

E3 /DS3 Interface (optional)

A: Input (G.703 standard)
Connector: BNC
Impedance: 75Ω
Packet format 188/204 bits
Bit rate: E3/DS3 No-frame format (34.368Mbps/44.736Mbps)
B. Output (loop)
Connector: BNC
Impedance: 75Ω

Note: The information contained herein is subject to change without notice.

Equipment connection

Panel display and keyboard

A. Panel display

a. LED instruction

Power

Sync

Alarm

b: LCD

B: Keyboard

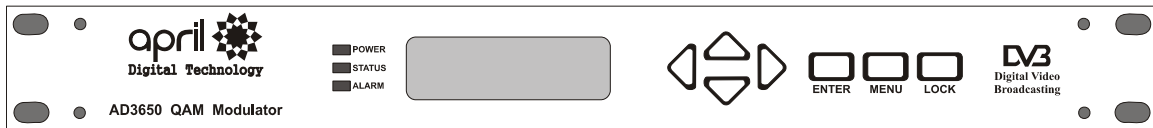
ARROW KEYS (UP/DOWN/LEFT/RIGHT)

ENTER

LOCK: press once to lock; press once again to unlock

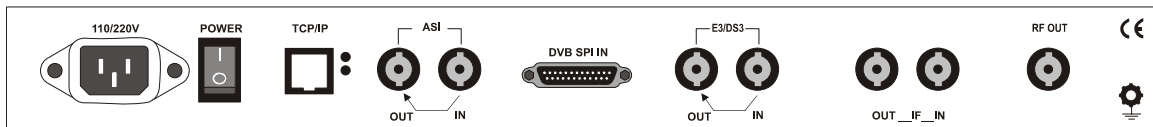
MENU

Front panel sketch



AD3650 Front panel

Rear panel sketch



AD3650 Rear panel

SPI input and output interface characteristics

No	Signals	Description	No	Signals	Description
1	CLK-A	Signal clock	14	CLK-B	Signal clock
2	GND	GROUND	15	GND	GROUND
3	D7-A	DATA 7	16	D7-B	DATA 7
4	D6-A	DATA 6	17	D6-B	DATA 6
5	D5-A	DATA 5	18	D5-B	DATA 5
6	D4-A	DATA 4	19	D4-B	DATA 4
7	D3-A	DATA 3	20	D3-B	DATA 3
8	D2=A	DATA 2	21	D2-B	DATA 2
9	D1-A	DATA 1	22	D1-B	DATA 1
10	D0-A	DATA 0	23	D0-B	DATA 0
11	DVALID-A	DATA AVAILABLE	24	DVALID-B	DATA AVAILABLE
12	PSYNC-A	PACK SYNCHRONOUS	25	PSYNC-B	PACK SYNCHRONOUS
13	CABLE	SHEILD CABLE			

Parameter check and setup

Keyboard Function

Move Right/Left key: choose sub-menu/move cursor

Move up/down key: setup cursor/change parameters

Enter: confirm operations

Lock: lock/unlock the keyboard /remote-control/exit menu

MENU: Select main menu and cancel operations

Note: 1.Be sure to press **ENTER** key after setup the parameters, all new parameters will take effect only without *, otherwise the old parameters will be kept.

2. Under any status of setting parameters, press **LOCK** key will make unit return to the status of showing operating parameters.

Operation mode select (keyboard unlocked)

Press **MENU** or **ENTER** to display main menu circularly

ONCE	1.0 VIEW ALARMS
	ALARMS LIST EMPTY
TWICE	2.0 QAM MODE
	64 QAM
THRICE	3.0 RF OUT FREQUENCY

	200.0000MHz
FOUR TIMES	4.0 SIGNAL IN PORT INPUT FROM ASI
FIVE TIMES	5.0 FID FILTER OFF
SIX TIMES	6.0 NIT TABLE MODE KEEP ORIGINAL NIT

How to setup and change parameters

Setup system parameters

A: Press **MENU** once: display as follows

1.0 VIEW ALARMS
ALARMS LIST EMPTY or **NO INPUT SIGNAL** or **RF UNLOCK** or
BUFFER FULL or **SYSTEM ERROR**

B: Press UP/DOWN key to view/change parameters /select functions

▼ **1.0VIEW ALARMS**
CLEAR ALL ALARMS

C: Press **ENTER** to store change or confirm operation

1.0 VIEW ALARMS
ALL ALARMS BE CLEARED

D: Press LEFT/RIGHT to view sub-menu

- ▶ 1 **1.1 SET IP ADDRESS**
120.120.120.160
- ▶ 2 **1.2 SET NET MASK**
255.255.255.000
- ▶ 3 **1.3 SET NET GATE**
120.120.120.001
- ▶ 4 **1.4 NET STATUS**
NOT CONNECTED or CONNECTED
- ▶ 5 **1.5 SERIAL No.:**
XXXXXXXXXXXXXXXXXXXX (18-digits)
- ▶ 6 **1.6 VERSION**
H: XX.XX S: XX.XX
- ▶ 7 **1.7 GET PRESET PARAMETER**
*FACTORY PRESET

Press **ENTER** to store exchange.

- ▶ 8 **1.8 SAVE NOW PARA.** (Reload input parameters)
*SAVE IN CHANNEL(Reload input channel parameters)

Setup QAM parameters

A: Press **MENU** twice: display as follows

2.0 QAM MODE
64 QAM

B: Press UP/DOWN to view/change parameters or select function

2.0 QAM MODE
***128 QAM *256 QAM * QPSK * 16 QAM * 32 QAM * 64 QAM**

C: Press **ENTER** to store exchange or confirm operation

D: Press LEFT/RIGHT to view sub-menu

- ▶ 1 **2.1 SYMBOL RATE [36.00]-IF frequency**

6.875MBd[38.014Mbps] or 6.875MBd[7.906MHz]

While setup new symbol rate, press UP/DOWN key, cursor displays at the ends, then press LEFT/RIGHT key to move cursor to the required position ,and press UP/DOWN again to setup parameters, at last press **ENTER** to change and store.

- ▶ 2 **2.2 BW PREFERENCE UNIT**
uc Bitrate

Press UP/DOWN to display on the second line: *Bandwidth

- ▶ 3 **2.3 IF OUT FREQUENCY**
36.00MHz/36.15MHz/36.65MHz

IF output is 36.15MHz when BW \geq 7MHz under 36.15MHz/36.65MHz and IF output is 36.65MHz when BW<7MHz under 36.15MHz/36.65MHz

Setup RF parameters

A、 Press **MENU** three times, display as follows

- 3.0 RF OUT FREQUENCY**
200.0000MHz

Please refer to SETUP SYMBOL RATE to setup new frequency.

B、 Press LEFT/RIGHT to view sub-menu

- ▶ 1 **3.1 RF OUTPUT LEVEL :**
115dBuV or 110dBuV

C、 Press UP/DOWN to plus or minus 0.5dBuV(don't need to press **ENTER**)

- ▶ 2 **3.2 SPECTRUM INVERSION**
ON ▼ *OFF
- ▶ 3 **3.3 QAM MODULATION**
ON ▼ *OFF

D、 Press **ENTER** to store exchange or confirm operation

E、 In any status, press **LOCK** will exit.

Select input interface

A、 Press **MENU** four times to show following

- 4.0 SIGNAL IN PORT**
INPUT FROM ASI ▼ * INPUT FROM SPI ▼ * INPUT FROM E3 ▼ * INPUT FROM DS3
- ▶ 1 **4.1 IN SIGNAL TYPE**
188 BYTES PACKET or 204 BYTES PACKET or INPORT NOSIGNAL
- ▶ 2 **4.2 IN TS ALL RATE**
038.051Mbps
- ▶ 3 **4.3 TS EFFECT RATE**
033.160Mbps

PID Filter

A、 Press **MENU** five times, display as follows

- 5.0 PID FILTER**
ON ▼ *OFF
- ▶ 1 **5.1 NUMBER00 PID**
CH1 0032 → 0032(D)(PID By-pass)
- ▶ 2 **5.1 NUMBER01 PID**

- ▶ 3 CH1 0032 → 0120 (D) (PID Map)
5.1 NUMBER02 PID
CH1 0032 → 8191 (D) (PID Filter)
- ▶ 4 5.1 NUMBER03 PID
CH1 8191 → 8191 (D) (Empty packet filter)
- ▶ 5 5.1 NUMBER04 PID
CH1 8191 → 8191 (D) (Empty packet filter)
- ▶ 6 5.1 NUMBER05 PID
CH1 8191 → 8191 (D) (Empty packet filter)
- ▶ 7 5.1 NUMBER06 PID
CH1 8191 → 8191 (D) (Empty packet filter)
- ▶ 8 5.1 NUMBER07 PID
CH1 8191 → 8191 (D) (Empty packet filter)
- ▶ 9 5.1 NUMBER08 PID
CH1 8191 → 8191 (D) (Empty packet filter)
- ▶ 10 5.1 NUMBER09 PID
CH1 8191 → 8191 (D) (Empty packet filter)

B. Press UP/DOWN key to view/change parameters or select functions

C. Press **ENTER** to store exchange or confirm operation

D. Press LEFT/RIGHT to view sub-menu.

E. In any status, Press **ENTER** to exit.

Insert NIT

A. Press **MENU** six times, display as follows

- 6.0 NIT TABLE MODE (Exchange NIT mode)
- KEEP ORIGINAL NIT ▼ *EXCHANGE ORIGINAL NIT
- ▶ 1 6.1 NETWORK ID
00001 (read only)
- ▼ 2 6.2 NETWORK NAME
TEST (read only)
- ▼ 3 6.3 CHANNELS IN NIT
001 (read only)

B. Above is controlled by NMS.

QAM Messages

Relations between coding method, band width and symbol rate.

CODING METHOD	QPSK	16 QAM	32 QAM	64 QAM	128 QAM	256 QAM
Min. Bit Rate (Mbps)	2	4	5	6	7	8
Max. Bit Rate (Mbps)	14	28	35	42	49	56
Min. Band Width (MHz)	1.15	1.15	1.15	1.15	1.15	1.15
Max Band Width (MHz)	8.05	8.05	8.05	8.05	8.05	8.05
Min. Symbol Rate (Mbaud)	1	1	1	1	1	1
Max. Symbol Rate (Mbaud)	7	7	7	7	7	7

Band Width=1.15×Symbol Rate

Symbol Rate=Output data rate÷m

m=2, 4, 5, 6, 7, 8 Corresponding to

QPSK, 16QAM, 32QAM, 64QAM, 128QAM and 256QAM

Max. transmission band width for 8MHz

CODE	C/N Limit	Max. Rate	Utilize Rate
16QAM	22dB	25.8Mbps	3.2 bit/Hz
32QAM	25dB	32.2Mbps	4.0 bit/Hz
64QAM	28dB	38.7Mbps	4.8 bit/Hz
128QAM	31dB	44.2Mbps	5.5 bit/Hz
256QAM	34dB	51.6Mbps	6.4 bit/Hz

Effective input data rate=Output rate×188÷204

System errors and debugging

Indicator lights

There are three LED indicator lights.

- 1) "POWER" lights up (Red) means power switch on and working orderly.
- 2) " SYN" lights up(Green) means synchronization clock working orderly.
- 3) "ALARM" lights up(Green) means data processing working orderly.

Trouble Shooting

The "POWER" indicator light does not illuminate.

Please check the wire to make sure the wire is connected to the socket properly and the power switch is on.

"STATUS" illuminates (in red)

This means lack of synchronal signals or input data abnormal or no valid data input, please check the input data cable is connected properly, and the input interface is selected correctly. If the answer is yes, it means the unit is broken, needs to be replaced.

"ALARM" flashes

This means the equipment is out of order for some faults. Please debug according to the instruction from LCD.

Network management

The unit could be controlled remotely via network management software. It needs authorization.

