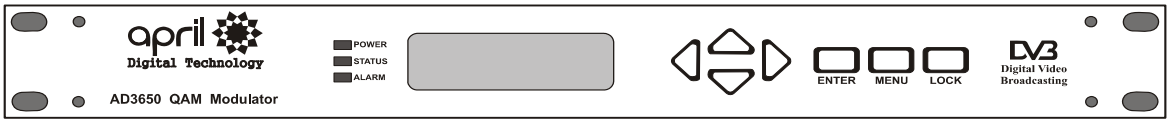
QAM Modulator

AD3650

USER GUIDE



april
Digital Technology

CONTENT

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.

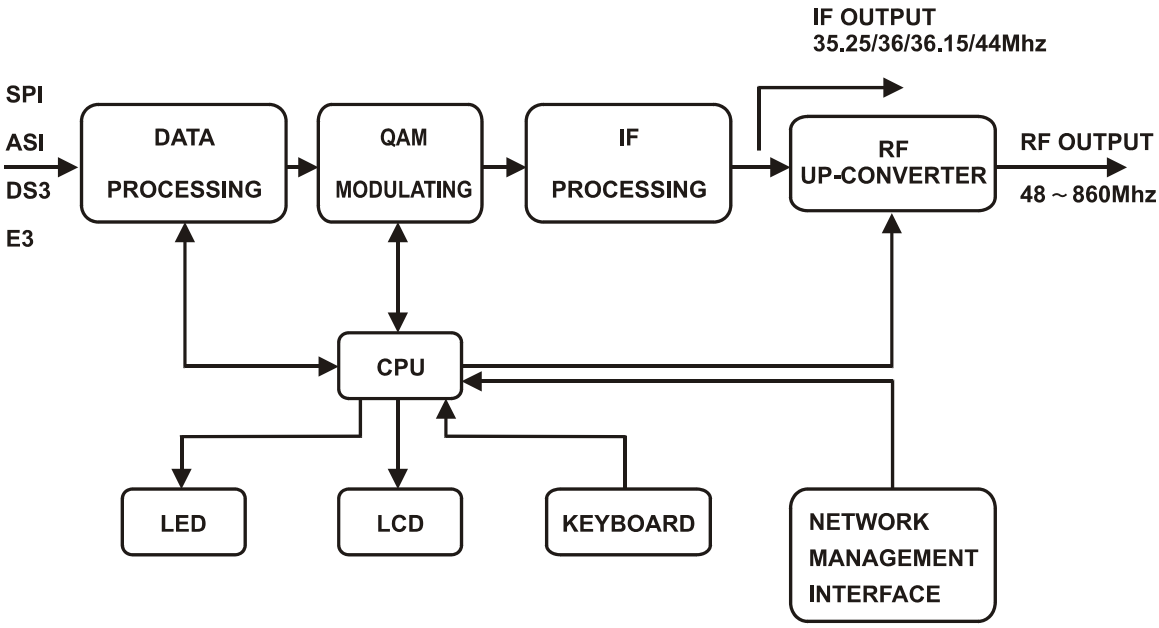
1.4 Wet hands are forbidden to touch the power jack, to avoid risk of electric shock.
1.5 Please pull the plug itself instead of the wire when you pull out power plug,.
1.6 Any thing flammable and metal or liquid, which will destroy the unit, must be kept out the box.
1.7 Do not place this unit in a 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≤8MHz
Reflect loss ≥18dB
Input level: 100dBuV (rms)
B:IF loop output:
Connector: BNC
Impedance: 50Ω
IF frequency: 35.25/36/36.15/44 MHz (optional)
IF Bandwidth≤8MHz
Reflect loss ≥18dB
Output level: 100±2dBuV(rms)

RF interface

A. RF output:
Connector: BNC
Impedance: 75Ω
Output Frequency: 48~800MHz
Reflect loss ≥15dB
Output level:
105~115dBuV (adjustable)
Carrier rejection: > 55dB
SNR(out of band):≥50dB
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

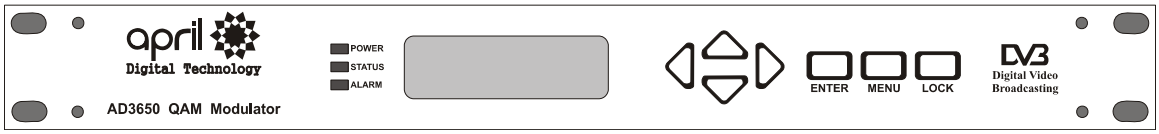
ARROW KEYS (UP/DOWN/LEFT/RIGHT)

ENTER

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

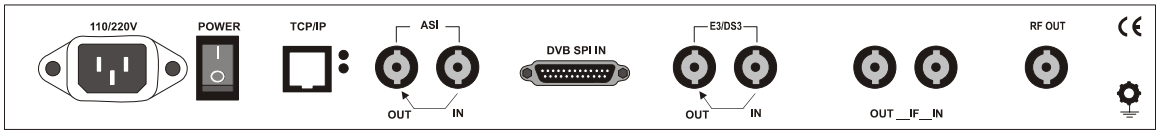
MENU

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.:**
  XXXXXXXXXXXXXXXXX (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**
36.00MHz6*36.15MHz/36.65MHz

IF output is 36.15MHz when BW>≥7MHz under 36.15MHz/36.65MHz and IF output is 36.65MHz when BW<77MHz 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**

CH1 0032 → 0120(D)(PID Map)

▸3 **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

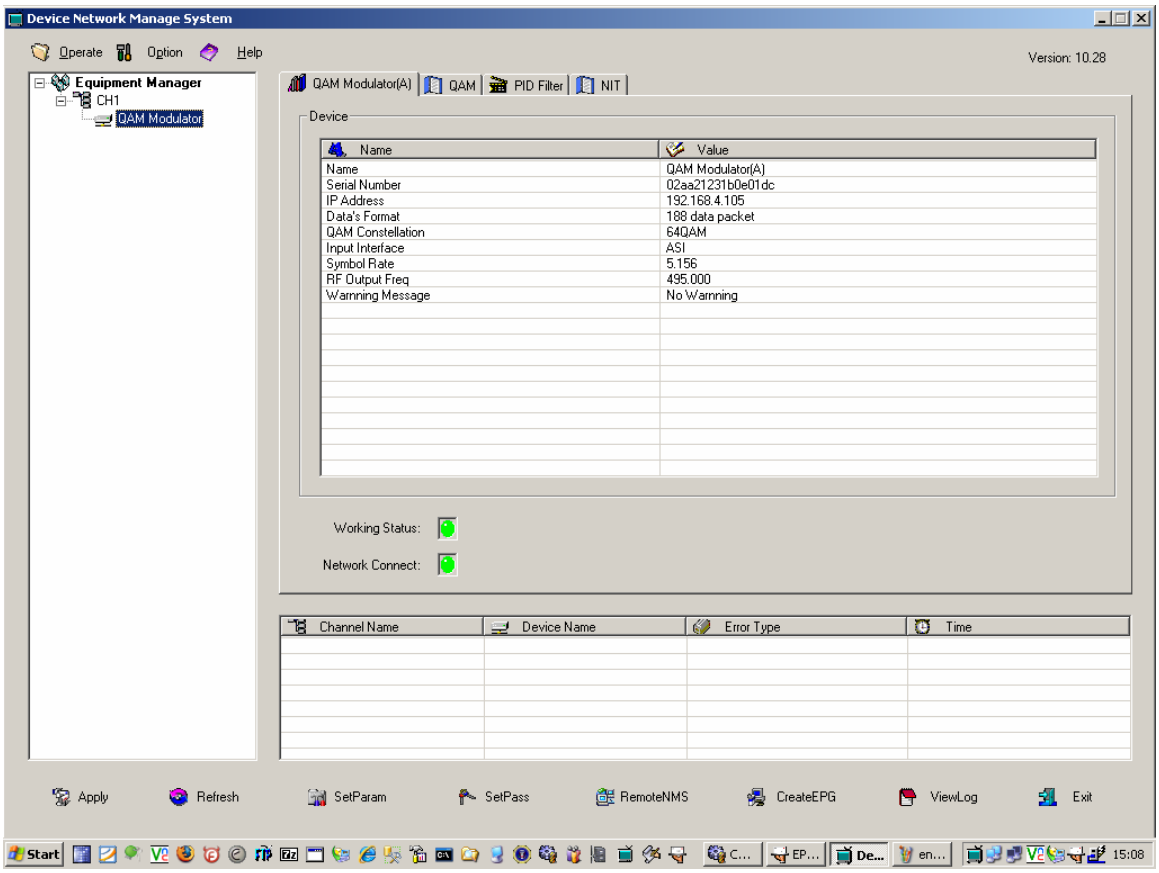
The ”POWER” indicator light does not illuminate.
Please check the wire to make sure the wire is connected to the socket properly and the power switch is on.

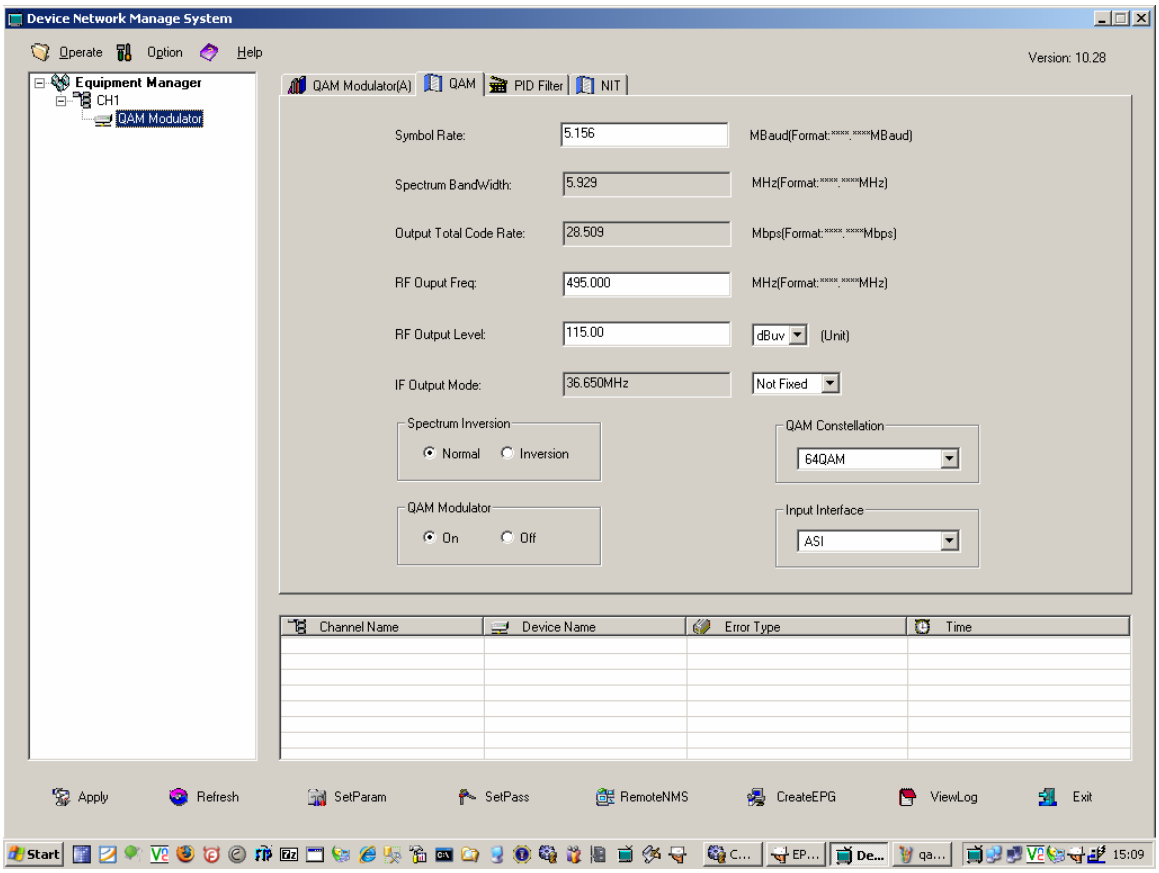
“STATUS” illuminates（in red）
This means lack of synchronal signals or input data abnormal or no valid data input, please check the input data cable is connected properly, and the input interface is selected correctly. If the answer is yes, it means the unit is broken, needs to be replaced.

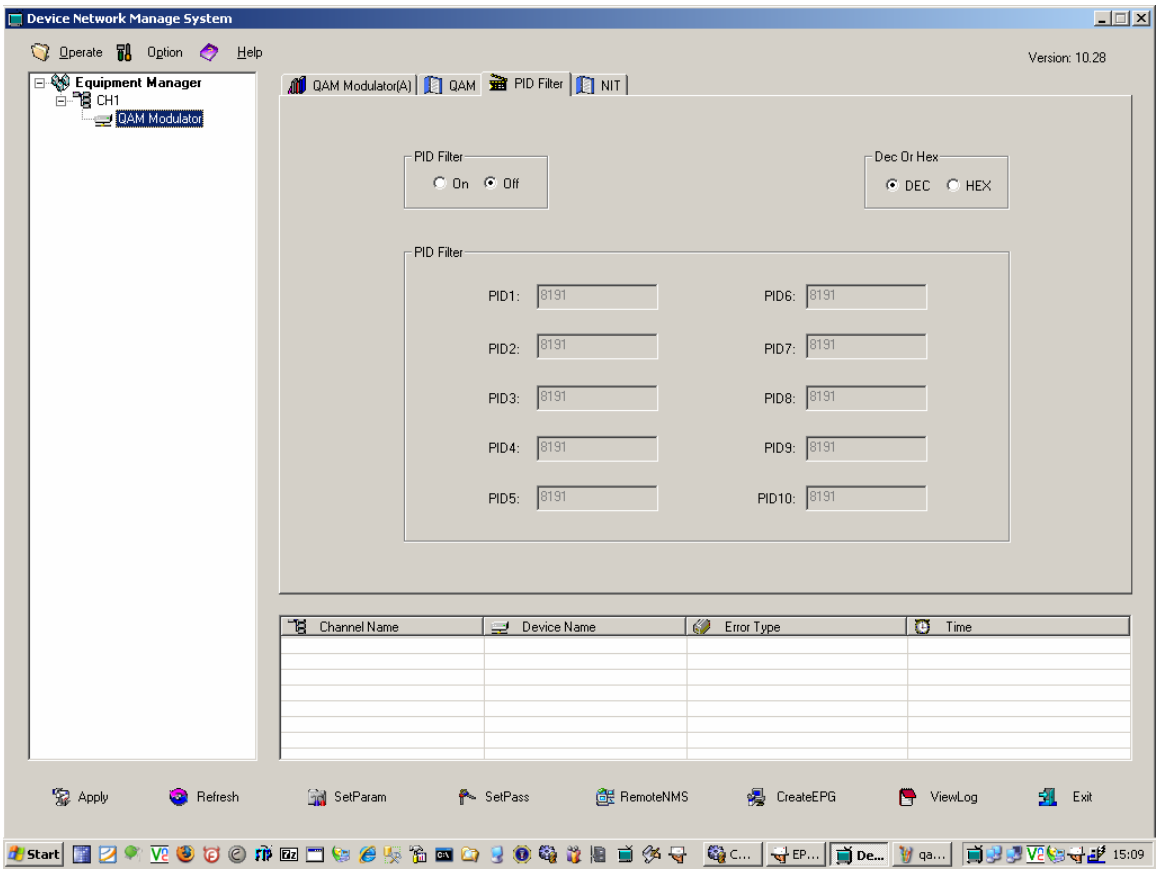
“ALARM”f lashes
This means the equipment is out of order for some faults. Please debug according to the instruction from LCD.

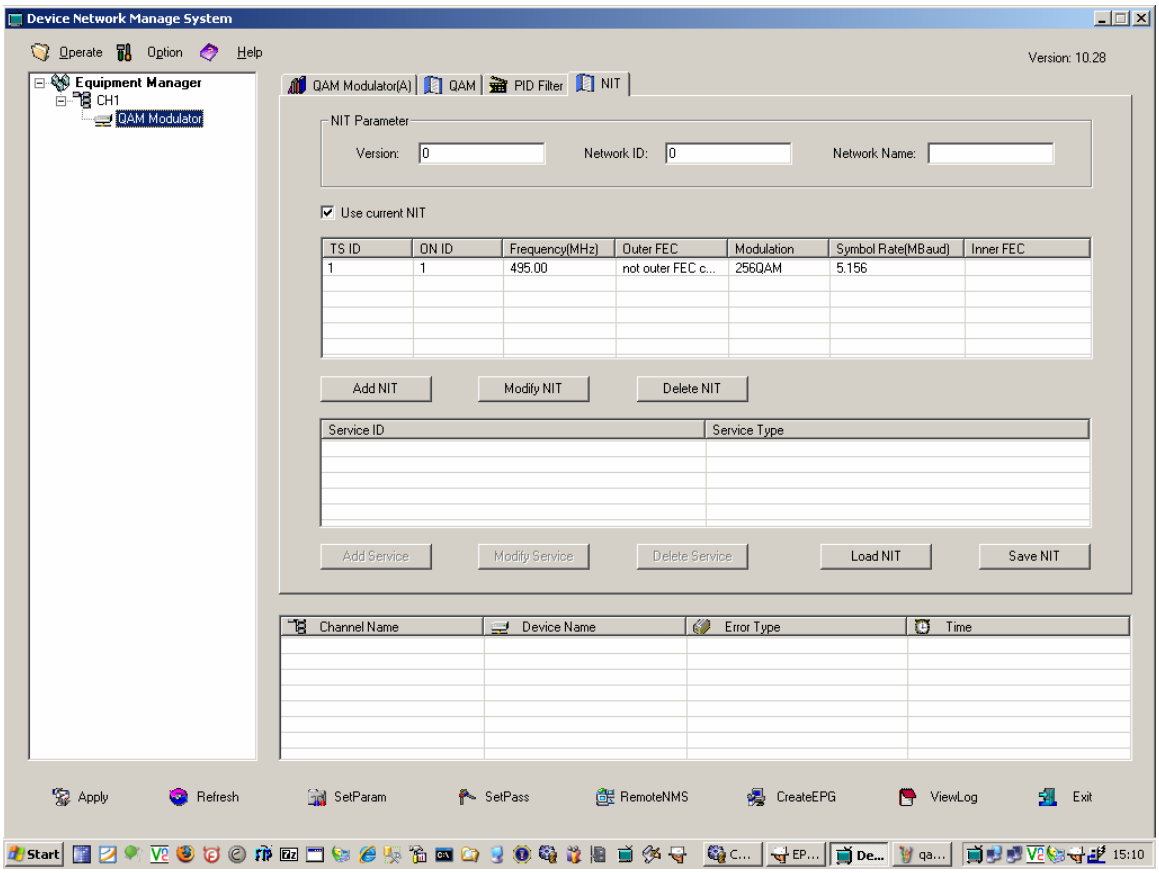
Network management

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


Device Network Manage System
Operate
Option
Help
Version: 10.28
Equipment Manager
CH1
QAM Modulator
QAM Modulator(A)
QAM
PID Filter
NIT
Device
Name
Value
Name
QAM Modulator(A)
Serial Number
02aa21231b0e01dc
IP Address
192.168.4.105
Data's Format
188 data packet
QAM Constellation
64QAM
Input Interface
ASI
Symbol Rate
5.156
RF Output Freq
495.000
Warnning Message
No Warnning
Working Status:
Network Connect:
Channel Name
Device Name
Error Type
Time
Apply
Refresh
SetParam
SetPass
RemoteNMS
CreateEPG
ViewLog
Exit
Start
15:08


Device Network Manage System
Operate
Option
Help
Version: 10.28
Equipment Manager
CH1
QAM Modulator
QAM Modulator(A)
QAM
PID Filter
NIT
Symbol Rate:
5.156
MBaud(Format:****.****MBaud)
Spectrum BandWidth:
5.929
MHz(Format:****.****MHz)
Output Total Code Rate:
28.509
Mbps(Format:****.****Mbps)
RF Ouput Freq:
495.000
MHz(Format:****.****MHz)
RF Output Level:
115.00
dBuv
(Unit)
IF Output Mode:
36.650MHz
Not Fixed
Spectrum Inversion
Normal
Inversion
QAM Constellation
64QAM
QAM Modulator
On
Off
Input Interface
ASI
Channel Name
Device Name
Error Type
Time
Apply
Refresh
SetParam
SetPass
RemoteNMS
CreateEPG
ViewLog
Exit
Start
15:09


Device Network Manage System
Operate
Option
Help
Version: 10.28
Equipment Manager
CH1
QAM Modulator
QAM Modulator(A)
QAM
PID Filter
NIT
PID Filter
On
Off
Dec Or Hex
DEC
HEX
PID Filter
PID1: 8191
PID2: 8191
PID3: 8191
PID4: 8191
PID5: 8191
PID6: 8191
PID7: 8191
PID8: 8191
PID9: 8191
PID10: 8191
Channel Name
Device Name
Error Type
Time
Apply
Refresh
SetParam
SetPass
RemoteNMS
CreateEPG
ViewLog
Exit
Start
15:09


Device Network Manage System
Operate
Option
Help
Version: 10.28
Equipment Manager
CH1
QAM Modulator
QAM Modulator(A)
QAM
PID Filter
NIT
NIT Parameter
Version:
0
Network ID:
0
Network Name:
Use current NIT
TS ID
ON ID
Frequency(MHz)
Outer FEC
Modulation
Symbol Rate(MBaud)
Inner FEC
1
1
495.00
not outer FEC c...
256QAM
5.156
Add NIT
Modify NIT
Delete NIT
Service ID
Service Type
Add Service
Modify Service
Delete Service
Load NIT
Save NIT
Channel Name
Device Name
Error Type
Time
Apply
Refresh
SetParam
SetPass
RemoteNMS
CreateEPG
ViewLog
Exit
Start
15:10