# DS1610 "KingStone"
## Broadband Network Monitoring System

### Overview

DS1610 monitoring system offers real-time signal monitoring and analyzing on multiple return and forward paths of HFC network simultaneously. The captured results could also be saved and managed for further operations. The operator is able to monitor the entire network on live through a PC located at the head end office or any remote locations.

DS1610 system is capable of capturing any transient noise and ingress noise which is less than 1ms.Other key features of DS1610 such as alarm setting, data storage, data analysis, data comparison in 3D and video record would simplify the installation, maintenance and troubleshooting of HFC network.

### Key Features

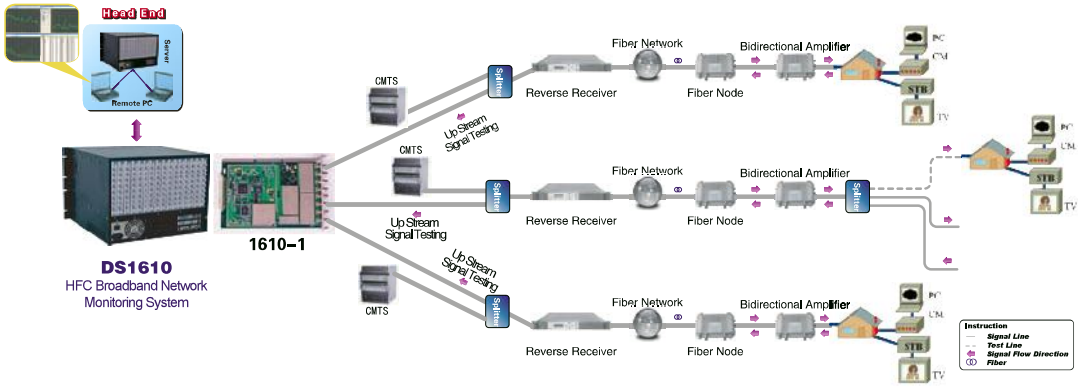
- Module designed, with maximum 16 cards and 128 ports in 1 housing
- Sweep time ≤ 1 ms
- 50 dB dynamic range
- 1 year history data record
- 24 hours real time sweep and monitor
- Remote control
- User management could set users with different authority levels

### System Configuration

| Standard Configuration | |
|---|---|
| DS1610 | Housing with built-in Local Management Software |
| | DS1610 Server Software |
| | DS1610 Client Management Software |
| **Optional Module** | |
| DS1610-1D | Return Path Monitor Card |
| DS1615 | RF FSK Modulator |
| DS1610-3 | Forward Path Monitor Card |

**1. Return Path Monitoring Solution**

The return path signal transmits from cable modem finally to CMTS via splitter, reverse amplifier, fiber network and reverse receiver. DS1610 monitoring system with DS1610-1D card could monitor the real-time signal before it enters the CMTS and help capture the injected noises and troubleshoot the errors.



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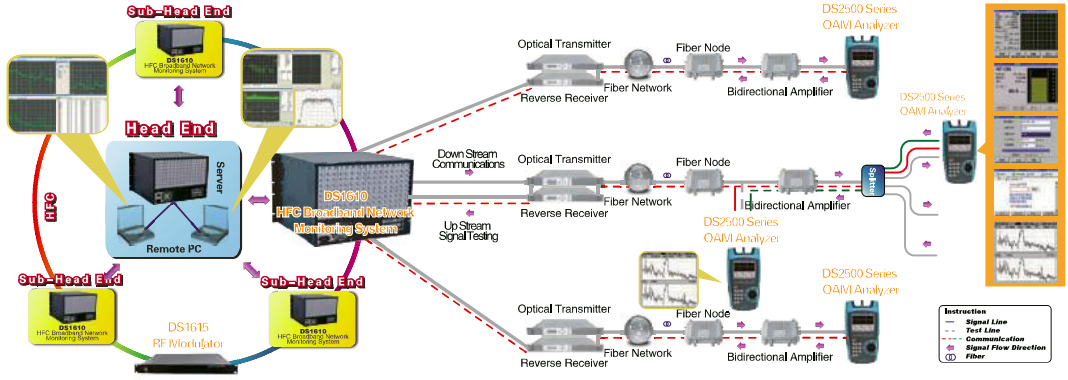
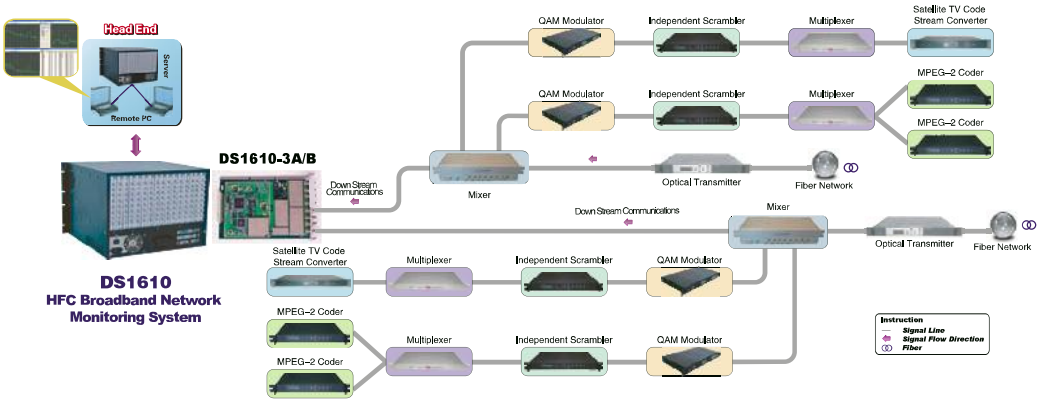
### 2. Return & Forward Path Debugging and Troubleshooting Solution

The combination of DS1610-1D with 1U rack RF FSK Modulation DS1615 and Handheld Analyzer DS2500R could fully meet the requirements of network installation, debugging and maintenance for both forward and return paths.



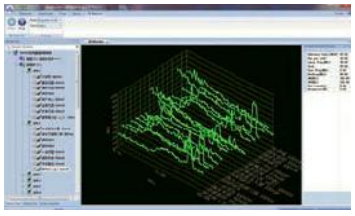

### 3. Forward Path Monitoring Solution

DS1610 monitoring system with DS1610-3 card could monitor the forward signal in real-time at different nodes within the network such as modulator, mixer, fiber receiver, etc. The forward path monitoring module offers QAM Constellation, MER, BER, V/A, C/N, HUM, CTB/CSO and so on.




## Software Interface

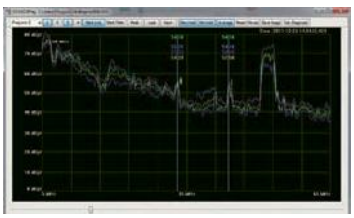

Real-time Monitoring


3D Monitor


Limit Lines Setup


Spectrogram History


Video Timing


Video Replay

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## Specifications

| DS1610-1D | |
|---|---|
| **Frequency** | |
| Range | 5 MHz ~ 65 MHz |
| Span | 500 kHz ~ 60 MHz |
| Sweep Time | ≤1 ms (Full Span) |
| RBW | 30 kHz ~ 300 kHz 1-3 Step |
| VBW | 30 kHz ~ 300 kHz 1-3 Step |
| **Amplitude** | |
| **Level** | |
| Max. Safe Input | +110 dBμV 25 V DC |
| Displayed Average Noise Level | ≤18 dBμV, 5 MHz ~ 65 MHz(No Input Signal, 0dB Attenuation, 300 kHz RBW, 30 kHz VBW, Sampling Demodulation) |
| **Attenuator** | |
| Range | 0 dB ~ 30 dB |
| Step | 1 dB |
| **Spurious Responses** | |
| Second Harmonic | <-55 dBc for +80 dBμV Signal at input mixer |
| Third Order Intermodulation | <-55 dBc for two +80 dBμV Signals at input mixer with ≥1MHz Separation, Amplifier Off |
| **Display** | |
| Logarithm Scale | 0.1 ~ 0.9 dB/div at 0.1 dB Step: 1 ~ 40 dB/div at 1 dB Step |
| Linear Scale | 8 Divisions |
| Scale Unit | dBm, dBmV, dBμV |
| Trace Detector | Sample |
| Reference Level | 0 dBμV ~ +140 dBμV |
| Level Accuracy | Typical ≤±1.5 dB@+20 ˚C |
| **Others** | |
| Working Temperature | 0 ˚C ~ +40 ˚C |
| Storage Temperature | -10 ˚C ~ +50 ˚C |

| DS1615 | |
|---|---|
| Structure | 1U Rack |
| Power Supply | AC 220 V / 50 Hz |
| RF Frequency | 87 MHz ~ 120 MHz |
| Output | 75 dBμV ~ 100 dBμV, 1 dB Step |
| Modulation Type | FSK (±67 kHz) |
| Data Baud Rate | 38.4 kbps |
| Port to connect DS1610 | RS232 |

| DS1610-3 | | |
|---|---|---|
| | DS1610-3A | DS1610-3B |
| **Frequency** | | |
| Range | 5 MHz ~ 1000 MHz | |
| Sweep Range | —— | 0 Hz( Zero Span), 1 MHz ~ 1000 MHz |
| Sweep Time | —— | ≤20 mS (Full Span) |
| RBW | 280 kHz | 10 kHz ~ 3 MHz 1-3 Step |
| VBW | —— | 1 kHz ~ 1 MHz 1-3 Step |
| **Amplitude** | | |
| **Level** | | |
| Max. Safe Input | +120 dBμV 25 V DC | |
| Displayed Average Noise Level | —— | ≤15 dBμV, 5 MHz ~ 1000 MHz ( No Signal Input, 0 dB Attenuation, 300 kHz RBW, 30 kHz VBW, Sampling Demodulation) |
| **Anttenuator** | | |
| Range | 0 dB ~ 50 dB | |
| Step | 1 dB | |
| **Spurious Responses** | | |
| Second Harmonic | —— | <-65 dBc for +87 dBμV Signal at input mixer |
| Third Order Intermodulation | —— | <-65 dBc for two +87 dBμV Signals at input mixer with ≥1 MHz separation and amplifier Off |
| **Display** | | |
| Logarithm Scale | 0.1 ~ 0.9 dB/divison, 0.1 dB Step; 1 ~ 40 dB/division, 1 dB Step | |
| Linear Scale | 10 Divisions | |
| Scale Unit | dBm, dBmV, dBμV | |
| Reference Level | 0 dBμV ~ +140 dBμV | |
| **Analog CATV** | | |
| Level | 20 dBμV ~ 110 dBμV ±1.5 dB@+20˚C S/N >30 dB | 20 dBμV ~ 110 dBμV ±1.0 dB@+20˚C S/N >30 dB |
| V/A | ±1 dB (S/N >30 dB) | |
| **HUM** | | |
| Range | —— | 1% ~ 20% |
| Accuracy | —— | ±0.5% at 1% ~ 5% ±1% at 5% ~ 20% |
| **Modulation Depth** | | |
| Range | —— | 40% ~ 95% |
| Resolution | —— | 0.1% |
| Accuracy | —— | ±1.5%(C/N >40 dB) |
| **C/N** | | |
| Optimum Input Range | 60 dBμV ~ 67 dBμV 0 dB Attenuation, Amplifier Off | 92 dBμV ~ 97 dBμV 0 dB Attenuation, Amplifier Off 72 dBμV ~ 77 dBμV 0 dB Attenuation, Amplifier On |
| Max. | 40 dB wtih ±1 dB Accuracy | 60 dB with ±1 dB accuracy 65 dB with ±3 dB accuracy |
| Resolution | 0.5 dB | 0.1dB |
| **CTB/CSO** | | |
| Optimum Input Range | —— | 82 dBμV ~ 87 dBμV 0 dB Attenuation, Amplifier Off 62 dBμV ~ 67 dBμV 0 dB Attenuation, Amplifier On |
| Max. | —— | 63 dB 78 channels with ±1.5 dB accuracy 70 dB 78 channels with ±4 dB accuracy |
| Resolution | —— | 0.01 dB |
| **DVB-C** | | |
| **Modulation** | | |
| Type | 16/32/64/128/256QAM, QPSK ITU-T J.83 Annex A,B&C DOCSIS, EuroDOCSIS | |
| Constellation Display | QPSK 16/32/64/128/256QAM Zoom In/Out | |
| **Power Level** | | |
| Range | 40 dBμV ~ 110 dBμV | |
| Resolution | 0.01 dB | |
| Accuracy | Typical ±1.5 dB@+20˚C | |
| MER | > 38 dB | > 40 dB |
| Accuracy | ± 0.5 dB 22 ~ 30 dB; ±1.0 dB 30 ~ 35 dB; ± 1.8 dB 35 ~ 40 dB | |
| EVM | 0.65% ~ 4.1% | |
| BER | 2E-3 ~ 1E-9 | |
| SR | 1 ~ 7 MS/s | |
| **Others** | | |
| Operating Temperature | 0 ˚C ~ +40 ˚C | |
| Storage Temperature | -10 ˚C ~ +50 ˚C | |