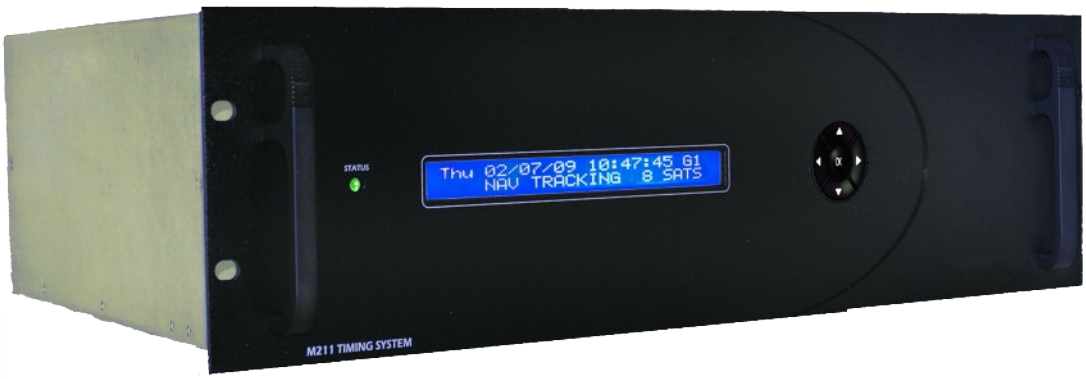
M210/M211/M842 - Modular Time & Frequency System

A Configurable Master Clock System for High Integrity Time and Frequency Synchronization Applications



AS9100D Certificate Number : C0210021-AS3

M210/M211/M842 - Modular Time & Frequency System

System Overview

This Stratum 1 modular time and frequency master clock system is an advanced, high precision timing platform commonly specified for use in critical timing applications that depend upon a reliable, quality time standard.

With a range of over 40 functional module blocks, each system can be optimised to suit specific application demands spanning multi format I/O networks, time code readers and generators, multi-sync sources, oscillators and power supplies with single, double or triple redundancy.

Typical Applications

These modular high integrity units are common place and thoroughly proven worldwide in safety critical applications such as Air Traffic Control, Rail & Road Networks, Oil & Gas installations and some military applications.

The robust design and unrivalled build quality delivers exceptional performance and trouble free product field longevity. Software interfaces are proven and hardened against common cyber attack methods.

The wide range of modules provides a high degree of flexibility in performance definition and future proofing expansion capability.

Core Timing Platform Features

Built around a high performance CPU core, intuitive user interface and supported with a performance choice of precision disciplined oscillator modules, each 19” rack mountable master clock can be configured with a wide choice of functional modules. Manufactured to strict AS9100D aerospace quality standards, the M211 3U format accepts up to 9 time functional modules while the smaller M210 1U variant accepts up to 3 modules.

Where total system redundancy protection is required, the M842 interfacing unit provides a fully automatic means by which one of two tandem systems may be automatically selected dependant upon prevailing fault conditions.

Optimal time source reference selection can be automatically or manually prioritised to suit the application.

COMMON OPTIONS SUMMARY

Feature	Options
Module Expansion Slots	M210 - 3 Slots M211 - 9 Slots M842 is a dual redundant interfacing switch for M211
Disciplined Oscillators	Choice of TCXO, OCXO and high performance Rubidium atomic clock
Power Supplies	Single or Twin Universal AC mains or 48 V DC or combination as required
Time Sync Sources	GPS, MSF, DCF, 1PPS, IRIG-B, IRIG-E, 2137, XR3, AFNOR, Mains AC, NTP
Output Formats	NTP, RS422, RS232, 1PPS, AFNOR, 1MHz, 5MHz, 10MHz, E1/T1 Telecoms, HQ, IRIG-B, SMPTE-EBU, Audio, Video Overlay, 4-20mA, Clock Impulse, Volt free relay
Approvals	Qualified for use in ATC, Public Transport, Oil & Gas - CE, ISO9001, AS9100D
Remote interfaces	Web browser based Clock Management System (CMS), configuration tools and Virtual Machine Interface
Warranty	3 Years standard - Options for extended warranty and support contracts

M210/M211/M842 - Base System Options

SYSTEM OPTIONS - OSCILLATORS

Synchronised to GPS or another Stratum 1 time source, these units provide an RMS accuracy of <15ns to UTC at 1 pulse per second (1PPS). If the timing signal e.g. GPS is lost for any reason, then these precision master clocks continue to provide high accuracy timing based upon the oscillator configuration during this holdover period.

Dual redundant systems (M842) automatically select the optimal time source under fault conditions.

These systems are offered with a choice of disciplined oscillator module to suit the Holdover time and frequency demands of the application and can be selected using the following chart.

Oscillator type	Stability per °C	Performance while disciplined Averaging Time Error						Holdover accuracy at constant temperature after loss of reference		
								Time	Frequency	
		1s	10s	100s	1000s	10000s	1 Day	1 Day	1 Day	3 Days
TCXO Pt No 180BC000N	$1.5x10^{-8}$	$2x10^{-9}$	$2x10^{-9}$	$5x10^{-10}$	$5x10^{-10}$	$6x10^{-11}$	$1x10^{-12}$	<2 ms	$<2.0x10^{-8}$	$<3.0x10^{-8}$
OCXO Pt No 180BC000S	$1.2x10^{-10}$	$3x10^{-10}$	$3x10^{-10}$	$3x10^{-12}$	$4x10^{-10}$	$5x10^{-11}$	$1x10^{-12}$	<60 µs	$<2x10^{-9}$	$<4x10^{-9}$
Rubidium Pt No 180BC000R	$7x10^{-12}$	$3x10^{-11}$	$8x10^{-12}$	$3x10^{-12}$	$3x10^{-12}$	$2x10^{-12}$	$8x10^{-13}$	<1 µs	$<1.0x10^{-11}$	$<1.5x10^{-11}$

TCXO : Temperature Compensated Crystal Oscillator , OCXO : Oven Controlled Crystal Oscillator, Rubidium : Rb Atomic Clock

SYSTEM OPTIONS - POWER SUPPLIES

Two power supply variants are available to best suit the application. A universal mains power supply is typically specified while a +/- 48V DC variant provides a common option for Telecom applications.

The smaller M210 (1U) may be configured for dual mains power supply redundancy while the larger M211(3U) may be configured for any combination of mains or DC power supply redundancy.

For operation in the event of total power loss, Brandywine & TFS recommend the use of a proprietary UPS.

POWER SUPPLY OPTIONS	
AC UNIVERSAL	**Specification**
Input voltage range	90-132 / 180-264 VAC 50/60Hz 60W
Recommended fusing	3A anti surge
Approvals	VDE, UL - IEC950, EN60950, UL1950
MTBF	> 100,000 hrs
DC	
Input voltage range	+/- 48VDC +/- 10% @ 5A
MTBF	> 100,000 hrs
Notes	
Combined dual redundant power supply combinations provide visual indication of power supply utilisation, where mains input is prioritised over DC supply. All power supply units provide a BITE (Built In Test Equipment) function to indicate operational status.	

M210/M211 - Systems Antennas

SYSTEM OPTIONS - ANTENNA & RECEIVER MODULES

All variants can be configured to accept one or more antenna receiver modules. Typically a GNSS/GPS receiver provides a Stratum 1 time reference in either a single or dual redundant configuration.

The primary timing reference can be optionally supported by other timing transmissions such as MSF or DCF which may be configured to automatically take over in the event of GPS loss.

Where long distance exist between the master clock equipment and the antenna placement, Head End units can be used to buffer the GPS signal over several kilometres.

GNSS/GPS ANTENNA & MODULES

Active GPS receiver module

Pt No : 0210HZ000G

The GPS Receiver Module receives and decodes GPS transmissions, allowing the timing system to accurately synchronise to Universal Coordinated Time (UTC).
Local time can be derived from UTC by user selection through the intuitive equipment menus which also provide examination of time, position and satellite status information.

The GPS Receiver Module includes alarm changeover contacts, which indicate loss of GPS synchronisation, power fail and failure of the timing system. These alarms allow external monitoring of system performance.

GPS Module Performance : 0210HZ000G		
Metric	**Output**	**Notes**
Time Accuracy (when GPS signal available)	15 ns RMS to UTC	16 Channel GPS Receiver
Time Accuracy (if GPS signal unavailable)	System time	Auto selection of best quality timing signal
Time to first GPS fix		Less than 2 minutes from cold start (90% probability).
GPS Satellite Data Storage		All key parameters (eg. Satellite Almanac, Antenna position) are stored in non-volatile memory ensuring an optimum restoration of performance following loss of input power.
Inputs		
50 Ohm BNC socket	GPS Signal	GPS broadcast signal from Antenna
Outputs		
50 Ohm BNC socket	On Time	System (On-time) 1PPS output @ 5V
15 Way 'D' Type socket	Alarms & RS232	Alarm Outputs (Power fail/Signal Fail/System Fail)
Active Antenna Power	+12V DC	
GPS Data Display	UTC or Local Time and Date (Hours, Minutes,Seconds, Day, Month, Year), Latitude, Longitude, Altitude, Satellite status & satellite count. Oscillator disciplining status, last updates time.	

Passive GPS receiver module

Pt No : 0210HZ000H

For use in intrinsically safe environments where a powered (Active) antenna is not practical, this module provides GPS reception with a passive antenna. All functions and features match those of the 0210HZ000G.

M210/M211 - Systems Antennas

Active GPS antenna unit

Pt No : 012000002

Actively powered with 5V DC, this universal mount, IP67 active antenna provides 40dB gain and is connected with a TNC connector. Consumption is 15mA @ 5.5 VDC

Passive GPS antenna unit

Pt No : 0210AF000M

For use in intrinsically safe environments where a powered (Active) antenna is not practical, this module provides GPS reception with no need for power.

Long distance GPS reception modules

Pt Nos : 0210KZ000A (Rx) & 100DH000C (Antenna + Tx)

Where distances > 100m (300ft) exist between the GPS antenna site and the master clock system, this long distance modulator/demodulator pairing of antenna and receiver provide a cost effective solution over distances up to 1km. The GPS Head End Antenna provides local GPS reception at the antenna site and then re-transmits the precision timing information using proprietary methods over a CAT5 cable to the receiving module. Accuracy to GPS derived UTC < 500ns.

LF ANTENNA & MODULES

MSF & DCF receiver modules

Pt No : 0210KJ000G (MSF) & 0210KJ000J (DCF)

These low cost low frequency receiver modules provide the full time decode of MSF 60KHz United Kingdom and DCF 77.5KHz Germany to an accuracy of better than 1ms to UTC. They are commonly used as an alternative time reference backup in support of system failure and redundancy modes.

MSF/DCF LOW FREQUENCY INTERFACE MODULE		
Metric	**Output**	**Notes**
Time Accuracy with MSF/DCF signal	< 1mS to UTC	
Time Accuracy without broadcast signal	Master System Time	Auto selection of best quality timing signal
Inputs		
50 Ohm BNC socket	MSF or DCF	MSF or DCF broadcast signal from Antenna
Outputs		
15 Way 'D' Type socket	Alarms & RS232	Alarm Outputs (Power fail/Signal Fail/System Fail)
Active Antenna Power	+12V DC	
MSF/DCF Data Display Information	UTC or Local Time and Date (Hours, Minutes,Seconds, Day, Month, Year), Distance to antenna time compensation, LF Signal strength indicator, AGC setting, Oscillator disciplining status, last updated time.	

MSF & DCF receiver antenna

Pt No : 0210AD000L (MSF) & 0210AD000N (DCF)

These active antenna units provide 32dB gain for reception of MSF & DCF low frequency time reference transmissions. Housed in an IP67 (IEC529) enclosure, these antenna devices can be sited up to 300m (1000ft) away from the master clock timing equipment.

Signal termination is via a 50 ohm BNC connector.
Operational temperature range : -20'C to +60'C

M210/M211 - Precision Frequency Reference Module

Pt No : 0210FM000C

Applications

The build flexibility of M210/211 timing system lends itself perfectly to the provision of a wide range of low phase noise reference frequency standards, all of which accurately and reliably derive from the precision disciplined system oscillator module.

The modular system build allows multiple signal types to be incorporated into one chassis while also allowing for future expansion potential.

Typical applications include radar sync timing and civil and military telecommunications.

Features & Benefits

This Standard Frequency Output Module is a general-purpose sine-wave reference frequency generator module, particularly relevant to Primary Reference Clock generation for Telecommunications applications.

The module provides four outputs that can be factory selected as 1MHz, 5MHz, 10MHz, 2.048MHz (E1) or 1.544MHz (T1). The four outputs are grouped as two pairs, with each pair of outputs being selectable from the frequencies described.

The module utilises the master clock system's precision disciplined oscillator module as a synchronising input thus ensuring that the oscillator is automatically calibrated and a precise frequency is available.

During periods where the synchronising input signal is unavailable or deemed to be unsuitable, the performance of the module reverts to the oscillator specification. The Standard Frequency Output Module is ideally suited for use in applications where a high stability traceable frequency source is required. Furthermore, the automatic re-calibration of this module from the received time broadcast carrier eliminates the need for regular re-calibration of the frequency source by field engineers with transfer standards.

The module is suitable for two main types of Telecoms application; Primary Reference Clock (defined by G.811) and Synchronization supply unit (defined by G.812).
It meets the original CCITT Recommendation G703 section 13.

Each output is independently monitored with the status indicated by a rear panel LED and via the SNMP system interface.

Standard Frequency Module Outputs		
2 x 2 Pairs Sine Wave Outputs	**Signal Level**	**Frequency**
Opt A : 50 Ohm BNC sockets	1V RMS into 50 Ohms	1MHz, 5 MHz or 10MHz
Opt B : 75 Ohm BNC sockets	1.5V to 3V pk-pk	2.048 MHz or 1.544 MHz
Phase Noise		
-95 dBc / Hz @ 1Hz	-120 dBc / Hz @ 10Hz	Better than -135 dBc / Hz @ 100Hz

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - Octal Serial Interface Modules

Pt Nos : 0210KD000E / 0210KD000F / 0210HB000E

Applications

Octal serial modules are commonly used to send master system time information to drive serial based display clocks and other equipment over RS-232 or RS-422 in a highly robust fashion.

The RS-422 differential Rx/Tx mode provides a high speed and noise tolerant means of time data exchange over distances up to 2km and hence finds common application in rail networks, airports & ATC.

The Octal independent channel design gives a compact connection point for a network of independent time display clocks and other time code driven equipment.

Build variants of the module allow reception of serial precision time code information for re-transmission via the remaining channels.

Features & Benefits

- 8 fully independent serial output channels for time data and status
- Each can be configured to provide either an RS232 or RS422 interface via a 62 way density and a half socket.
- Precision time input option : 0210KD000F - An additional independent serial input specifically configured for the receipt of accurate time synchronisation messages, leaving 7 serial outputs for transmission.

These modules provide 8 (or 7) fully independent serial outputs. The 0210KD000F version additionally provides a single independent serial input that has been specifically configured for the receipt of accurate time synchronisation messages, leaving 7 channels for output.

Each output channel provides time data and status over a pre-configured user selectable RS-232 or RS422 interface which is provided via a 62-way density and a half socket. The single serial input can also be configured for RS-232 or RS-422 standard and it is also provided via the 62-way density and a half socket

The 0210HB000E variant is specifically designed for use with M842 full dual redundancy systems. In this configuration the 8 output channels also carry an On Time 1PPS signal that may configured for 1PPS, 10PPS or 100PS with 80:20 duty cycle.

Electrical Module Connections

All channels are connected via a 62-way density and a half socket. Interface Cables (either DCE or DTE) are available for connection to this socket which provide breakout leads to 25-way D type Sockets or Plugs.

Interface Standards

Each channel is factory selected to be either EIA RS232 or RS422 standard, specified at time of ordering.

Interface Configuration

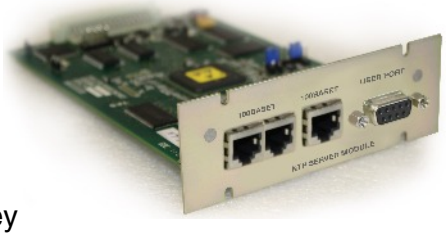
A range of standard protocols are available for selection via the M210/M211 front panel keyboard of the Timing System, the selection of which is stored in non-volatile memory. Interface configuration is performed via user menus which are available through the intuitive user front panel of the Timing System.
Each output can be independently configured for protocol and communication attributes (e.g. baud rate).
For further details of the available protocols, consult the Sales Office.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - 3 PORT NTP TIME SERVER Module

Pt No : 0210LA000A

Applications



This 10/100 Base-T Network Time Protocol (NTP) server module delivers high integrity, cyber secure Stratum 1 based time information across 3 system separated network ports to better than 50µs accuracy.

Common applications include high availability networks such as those used in key commercial and civil installations.

These NTP modules are also commonly used to provide time information to Network Display Clocks and network switches.

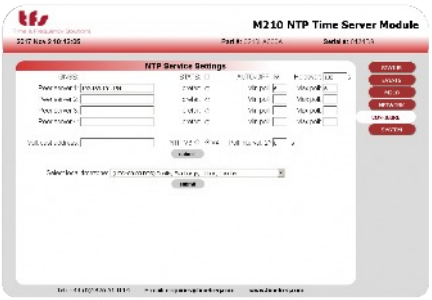
• The module is market differentiated by a cyber robust architecture allowing true separation and independence of each port, permitting up to 3 separate networks access to NTP time information.

• Each module can handle up to 512 packets per second, equating to a theoretical 512 x 64 (32,000+) clients assuming standard NTP operation, although good NTP network design practise typically restricts this to a recommended maximum of 1000 clients.

• Multiple modules may be used in both the M210 & M211 systems, hence a significant number of separate networks can be served time from a single Stratum 1 master clock. (M210 - 6 networks / M211 - 24 networks). For network boundaries, these modules can be switched to a peer to peer mode simplifying system expansion and time referencing.

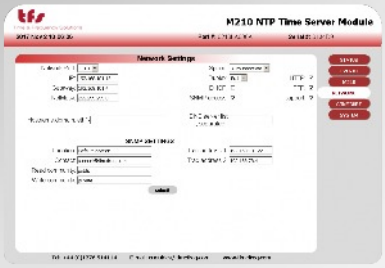
The module can be configured via a built in web client based setup and monitoring tool. Additional monitoring and logging of the NTP network and general clock management configuration can be achieved using a system Clock Management System.

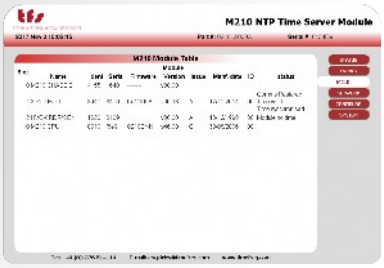
The **CMS Clock Management System** is a sophisticated Linux-based application and hardware platform that allows the user to monitor and control TFS Master Clock products from a remote or central location via an Ethernet network.

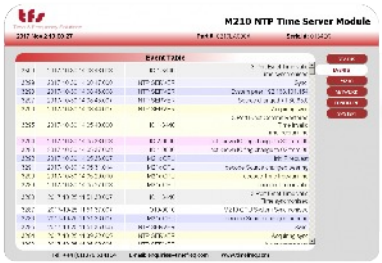


- Centralised or remote monitoring and control of TFS Timing System and constituent parts such as Submaster Clocks and time displays.
- User-friendly graphical interface, accessible by web browser, allows monitoring in overview or detail mode
- Multiple access via web browser interface allows many users to simultaneously access the CMS
- Web browser interface allows user access CMS from any location with Ethernet connectivity to CMS
- Visual representation of equipment controls
- Monitoring Status e.g. Equipment identity, Equipment configuration, Alarms, Software and Hardware Faults, Errors, and many other details
- Fault log reporting on errors occurring in the Timing System
- Delivered on a pre-configured PC.
- SMS text alerts when alarms are triggered

M210/M211 - 3 PORT NTP TIME SERVER Module







Features & Benefits

- Stratum 1 based NTP time server with high accuracy hold over determined by master clock oscillator
- NTP Time accuracy better than 50µs.
- Separated and cyber attack hardened discrete network ports - Fully independent port configuration
- User selectable Peer to Peer Mode
- Non volatile system parameter and event log storage - Access via SNTP, RS232 or Telnet
- Built in intuitive web client server for easy setup and configuration
- SNTP driven Clock Management System - Trap selection, logging and filtering

Electrical Module Connections

3 x RJ45 - 100 BaseT Network Port connection with built in status LED
1 x 9 Way 'D' Type connector providing factory setup and low level serial port configuration

Interface Standards

- NTPv3 [RFC 1305], NTPv4 [RFC5905] also SNTP compatible [RFC2030]
- SNMPv1 & SNMPv2c Enterprise MIB (RFC1155, RFC1157, RFC1213)
- Daytime Protocol (RFC867), Time Protocol (RFC868)
- HTTP Ethernet/IEEE802.3 Ipv4 (IPv6*ready) TCP/UDP/IP ICMP

Network Configuration

Configuration of network parameters including IP Address, Sub-net Mask, Gateway Address, SNMP Trap Address and SNMP Read/Write community names via built in web browser or via the front panel keyboard and display. All such details are stored in non-volatile memory.
User specific network parameters can be factory configured upon request.

NTP Extensions

There are a number of extensions to NTPv3 /NTPv4 that the module provides:

Automatic disable :
The NTP service can be stopped after a period where there has been loss of sync or an internal error.

Authentication :
The module supports the optional shared secret key authentication strategy specified in RFC1305.

Broadcast :
The module can configured and operated as an NTP broadcast server.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - Combo Timecode Serial/Analogue/Relay Module

Pt Nos : 0210HX000C

Applications

This module finds application where analogue Time code Outputs are required to provide time data for Audio Tape Recorders.
The Serial Outputs provide time for Computer Networks and/or Time Stamps and the Analogue Impulse Output is used for Wall Clocks.

A variety of user selectable Timecode types are available and the serial data outputs are fully independent.

The module also includes two relay channels with programmable on-off times to allow the synchronisation of external devices such as found in SCADA and energy management equipment. Relay contacts are dry voltage free type.

Features & Benefits

- 2 output channels for time data via RS232 or RS422
  Each channel also provides an on-time signal giving a Time Reference edge [TTL or RS232, at rates of 1pps or 1ppm]. A comprehensive range of serial protocols is available by user menu selection.

- Range of Timecode outputs available via 50 ohms BNC socket
- Analogue clock driver pulse outputs at impulse rates of 1 minute, ½ Minute, or 1 per second intervals.
- 2 relay channels with programmable on-off times (voltage-free contact).

The Timecode Output supported formats include **IRIG-B, IRIG-E, XR3, 2137 and AFNOR** .

A one impulse circuit is provided, which can supply standard 24V DC reverse polarity impulses either once per second, once per half minute or once per minute. These impulses are used to drive standard analogue impulse clocks.

Module Connections

Timecode output : 50 Ohm BNC socket.
Serial & Relay outputs : 25 way D type socket. Analogue Drive output : 9 way D type socket.

Time Code Formats

IRIG-B, IRIG-E, XR3, 2137, AFNOR : Supplied at 1V pk-pk into 600 ohms.
Selection of the required timecode is made by means of the equipment front panel keyboard and is non volatile.
For other timecodes, please consult the Sales Office.

Serial Interface

Factory configured for either RS232 or RS422 levels, a comprehensive ranges of industry standard protocols are available for non volatile selection via the front panel keyboard of the timing system. Each output can be independently configured for protocol and communication attributes (e.g. band rate).

Impulse and relay drives

Relay Characteristics : 2 relays are provided by the module. 1A @ 30V DC ; 0.5A @ 125V AC
Impulse Output Voltage : +24V DC @ 2 Amps typical : Output current is dependent on capability of equipment Chassis
Impulse Output Protection:-
Each output is short circuit protected and the module automatically compensates for missed pulses due to short circuits.
Programmable Impulse and Relay Repetition: Once per second (pulse duration typically 400ms),
Once per half minute (pulse duration typically 1 second) or
Once per minute (pulse duration typically 1 second).
The repetition rate is selectable via the front panel keyboard of the equipment. and stored in non-volatile memory.

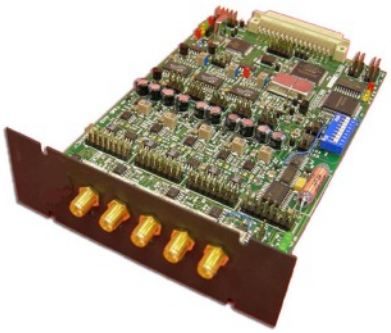
Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - 5 Channel Intelligent Timecode Module

Pt Nos : 0210KF000F

Applications

The 5 Channel Intelligent Timecode generator provides a compact multi-channel solution for precision multi-format Timecode distribution derived from a Stratum 1 Master Clock source.



The five independently programmed Timecode outputs are each buffered and available simultaneously with continuous monitoring and fault detection features.

Typical applications are distributed master time systems.

Features & Benefits

A choice of configuration options is available with up to 4 separate channels :

Configurable with :

- Havequick [I, II & IIa]
- Quickfox
- SATURN

The Havequick Interface Module is versatile and it can be easily configured for either:

1. Transmission of TOD to radio subsystem
2. Reception of TOD from external source.

The Havequick Interface Module is optimised for connection to a number of specified radio subsystems, ensuring that integration of the requirement for TOD information is easily achieved.

The module can also be configured for operation with Havequick (I, II, and IIa), Quickfox and SATURN formats.

Module Connections

The data connections to the radio subsystem are provided by a 15 way D type socket and a 15 way D type plug. The 15 way D type socket is configured for use with a specific radio subsystem, whilst the 15 way D type plug provides all the required signals for use with any radio subsystem. Through the use of both a socket and a plug, incorrect connections are eliminated.
The Havequick Interface Module is capable of providing Time Of Day for up to 20 radios.

Time Code Formats

The data interfaces conform to the Havequick I, Havequick II, Havequick IIa, Quickfox, and SATURN standards and specifications. When used in conjunction with the 800kHz Disciplined Oscillator Module, the Havequick Interface module also provides a highly stable 800kHz frequency output for use with the radio subsystem. This signal is capable of driving up to 20 radios.

User Configuration

The module is fully configurable for the required interface protocol by means of the user menus on the timing system. For reception of TOD information, either channel A (15 way D type plug) or channel B (15 way D type socket) can be selected, again by means of the user menus. All such configuration details are stored in non-volatile memory.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - Intelligent Timecode Reader Module

Pt Nos : 0210KG000D

Applications

The Intelligent Timecode generator module provides a simultaneous Timecode reader and generation function for common Timecode formats along with an On Time 1PPS reference output for precision sync to the master clock system. Outputs can be configured for DCLS or 1KHz carrier modulation.

Timecode processing is on board the module, thereby maintaining a precise throughput and conversion rate. The module provides built in monitoring for output failures with local and global warning indicators for system fault detection. Typical applications are distributed master time systems.

Features & Benefits

- Reads and generates a selection of popular Timecodes : IRIG-B, AFNOR, 2137, NASA34 : *(DCLS & AC)*
- Timecode and pulsed output (1PPS) included as standard
- Timecode output modulated 1kHz carrier or DC Timecode
- Output failure detection on all outputs
- Global module failure indicator

Option 1 : 600 ohm transformer isolated outputs :
Transformer coupled maximum output levels 1kHz: 6Vpp into 600R / 4Vpp into 50R

Option 2 : Pulsed output at 1kpps : Other options are available, please contact our sales team

Module Connections - Time Code Reader Input

- Timecode input with error bypass [BNC connector]
- Reads both DCLS and modulated IRIG-B, AFNOR, 2137, NASA36 timecodes
- Isolated transformer coupled input : Max input level 3Vpp, min input 30mVpp : [AGC 40db]
- Accuracy: 10 microseconds

Module Connections - Time Code Reader Outputs

- **Time Code Output** : Modulated 1kHz carrier or DC timecode output [BNC].
  Amplitude adjustable from 0 to 20Vpp from 50R
- **Pulsed output** : 1pps output included as standard [BNC]
- DC Timecode output and pulsed output is 0 to 5V from 50R (TTL compatible into 50R terminated load)
- Timing stability accuracy and holdover of outputs are as per host system.
- Jitter of modulated timecode output carrier <1%.
- Output failure detection on all outputs.

Timecode Formats Selections

IRIG B / AFNOR / 2137 / NASA36
Each Timecode is selectable via the master clock front panel keyboard .

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - AC Measurement Module

Pt Nos : 0210KL000X

Applications

The AC Measurement module can be used for monitoring, analysing and adjusting power generation systems through the real time comparison of phase and frequency AC information versus a Stratum 1 time reference.

Time and frequency variations over time can be used to compute and correct for AC mains transmission phase losses and hence save significant costs.

The AC measurements can also be used as a mains referenced time clock system which is supported by the master clock system during power outages. All measurements are readily available via a flexible interface.

Features & Benefits

- AC Line monitor with fully isolated inputs
- Real time computation of :
  - Rate of Change (ROC) of line frequency
  - Line Frequency Time
  - Time Deviation relative to UTC (Time receiver module required)
- System Time Deviation is synchronised to UTC by user command, with an offset specified by the user in the range ±9.999s.
- The system time preset accuracy is ±1ms.

Electrical Module Connections

- 15 pin D type - Alarms
- RJ45 - Communication port
- Fischer multipole - 2 x Mains Input signal

Frequency Measurement system

Frequency measurements are made at the rate of 10 per second allowing for a frequency deviation of ±9.999Hz with an accuracy of ±0.001Hz averaged over 0.1 to 1.0s intervals

Time Measurement system

Deviation ±99.999s with an accuracy of ±1ms is possible.

Module Inputs

- The module has 2 inputs selectable by software command (for example from a network management system).
- The inputs do not connect directly to the line supply, but are connected via external isolating transformers.
- The nominal input level to the module is 4V AC pp to 10V ACpp with a nominal system frequency of 50Hz or 60Hz, again user programmable.

Module Outputs

- System time output, frequency deviation output & time deviation output with the last two parameters represented by proportional DC voltages.
- Serial output port that provides a fixed format serial message containing time deviation, frequency deviation and status information.
- There is also an output alarm for any on-board fault detected or lack of module synchronisation or loss of selected AC source.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - Video Insertion Module

Pt Nos : 0210DR000C

Applications

The video insertion module is commonly used for CCTV and other video based security systems where an accurate, traceable and continuous time stamp is required to be permanently superimposed on a video signal.

The high accuracy, referenced based time traceability is especially useful where evidence based video may be required.

Features & Benefits

- The video output of time and date information is suitable for superimposition on a video signal.
- The resulting combined video signal therefore permanently includes time information making it suitable for recording of key events.
- Using this module, video with accurate time and date stamps is provided for future reference.

Electrical Module Connections

A through video connection is provided via two 75 ohm BNC sockets.

Interface Standards

CCTV Composite video

Video Input Levels	Video Output Levels
A standard Video Signal Input is provided for sync extraction. The Video Input level is 0.5V to 2V peak to peak.	The module provides a video output of nominally 1.0 V peak to peak (including sync) into a 75 ohm load.

Video Information format	Video Attributes
The following video data is selectable by means of the front panel menu structure: - Time (hours, minutes, seconds, subseconds) - Time (hours, minutes, seconds) - Time (hours and minutes only) - Date (day of month, month, year) - Day of week - Time and Date together - Time, Day of week and Date together - Day of week and Date together	The following video attributes are selectable using the front panel menu structure: - Black characters on a white background - White characters on a black background - Character size - Character position on screen

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - SDH E1/T1 Timecode Module

Pt No : 0210FK000A

Applications

The SDH E1-T1 Interface Module provides the capability for the transmission and reception of time data across either E1 or T1 in new or existing telecommunications applications where effective Time code transmission and reception is required..

Features & Benefits

The primary feature of this module is for the transmission and reception of time data across either:

E1 Megastream link at 2.048MHz, or

T1 Megastream link at 1.544MHz.

Available across 4 independent and configurable channels.

The module features drop and insert multiplexing and de-multiplexing for four 64 kbit channels, each of which can be independently configured for either transmit or receive. These channels can also be configured to any one of the available user channels.

Electrical Module Connections

The E1/T1 Interface connections are provided by :-

Two BNC connectors for 75 ohms connection
Plus One fully screened RJ45 female connector for a 120 ohm connection

Interface Standards

The interfaces provided on this module conform to CCITT Recommendation G.703.

Interface Configuration

A range of standard protocols and Interface configurations are selected via user menus available through the intuitive M210/M211 user front panel of the Master Timing System, all of which are stored in non-volatile memory.

Each of the four data ports on the module can be configured for transmit or receive channel number.
The four data ports can be individually configured for any one of the 30 available user channels.

For further details of the available protocols, consult the Sales Office.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - Audio Output Module

Pt Nos : 0210FF000X / 0210FR000X

Applications

The audio output module is commonly used for automatic accurate time annunciations that are derived from the master clock system. Typical applications include automatic audible time announcements at public locations such as railways.

TFS provide accurate audio time announcing equipment for the UK speaking clock service.

Features & Benefits

- Speech output of time, day of week & date.
- This info can be recorded onto audio tape as a time stamp of the data contained on the tape.
- Two audio outputs are provided allowing the signal output to be monitored whilst in use.

Electrical Module Connections

Two outputs are provided.

Each of the two audio outputs is provided via a ¼" audio jack socket - 0210FF000X
or optionally via an XLR connector. - 0210FR000X

Interface Standards

Each output provides an audio output of 0 to 2V RMS into a 600 ohm load.
The output level is adjustable by means of an on board potentiometer.

Output Format	Output Frequency
The following audio data output is selectable by means of the front panel menu structure: - Time (hours, minutes, seconds) - Time (hours and minutes only) - Date (day of month, month, year) - Day of week - Time and Date together - Time, Day of week and Date together - Day of week and Date together	The selected audio output can be provided at the following repetition rates by front panel menu selection. - once every 10 seconds - once every 30 seconds - once every minute - once every 30 minutes - once every hour - upon hardware request from external equipment

Output Level

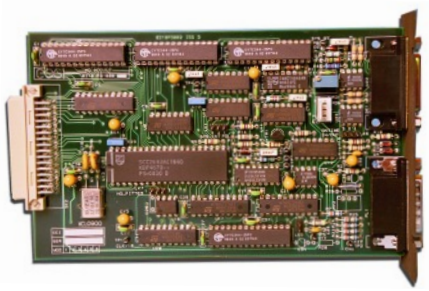
The Time code outputs are provided at a level of 2V peak to peak each into a 50 ohm load.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - HAVE QUICK Interface Module

Pt Nos : 0210KE000A

Applications



This module specifically addresses the Have Quick secure radio system requirements commonly found in military applications, providing a secure means of Time of Day information transmission and reception.

Up to 20 radio systems may be connected when synchronised to the stable 800KHz reference signal.

Other secure protocols include : SATURN & QUICK FOX

Features & Benefits

A choice of configuration options is available with up to 4 separate channels :

Configurable with :

- Havequick [I, II & IIa]
- Quickfox
- SATURN

The Havequick Interface Module is versatile and it can be easily configured for either:

1. Transmission of TOD to radio subsystem
2. Reception of TOD from external source.

The Havequick Interface Module is optimised for connection to a number of specified radio subsystems, ensuring that integration of the requirement for TOD information is easily achieved.

The module can also be configured for operation with Havequick (I, II, and IIa), Quickfox and SATURN formats.

Module Connections

The data connections to the radio subsystem are provided by a 15 way D type socket and a 15 way D type plug. The 15 way D type socket is configured for use with a specific radio subsystem, whilst the 15 way D type plug provides all the required signals for use with any radio subsystem. Through the use of both a socket and a plug, incorrect connections are eliminated.
The Havequick Interface Module is capable of providing TOD for up to 20 radios.

Time Code Formats

The data interfaces conform to the Havequick I, Havequick II, Havequick IIa, Quickfox, and SATURN standards and specifications. When used in conjunction with the 800kHz Disciplined Oscillator Module, the Havequick Interface module also provides a highly stable 800kHz frequency output for use with the radio subsystem. This signal is capable of driving up to 20 radios.

User Configuration

The module is fully configurable for the required interface protocol by means of the user menus on the timing system. For reception of TOD information, either channel A (15 way D type plug) or channel B (15 way D type socket) can be selected, again by means of the user menus. All such configuration details are stored in non-volatile memory.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - EBU/SMPTE Timecode Module

Pt Nos : 0210HM000X

Applications

For time code transmission applications within the Broadcast Industry requiring synchronised time, the EBU/SMPTE Time code Module provides 2 simultaneous outputs in standard EBU (European Broadcast Union) format.

Features & Benefits

- Two simultaneous outputs
- Available Timecode formats : SMPTE (The Society of Motion Picture and Television Engineers)
  : EBU (European Broadcast Union)

Electrical Module Connections

Two outputs are provided.

Each Timecode output is via a 50 ohm BNC Socket.

One input is provided for a standard video signal via a 75 Ohm BNC Socket.

Interface Standards

- EBU
- SMPTE

Time codes are selectable by the front panel keyboard of the Master Timing System and stored in non-volatile memory.

Input Level

A standard video signal input is provided for genlocking the time code output.

The video input level is 0.5V to 2V peak to peak.

Output Level

The Time code outputs are provided at a level of 2V peak to peak each into a 50 ohm load.

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - REAL TIME Clock Module

Pt Nos : 0210DV000B

Applications

The real time clock module is often specified for applications where rapid GPS acquisition and lock are required following periods of extended power outage or equipment storage.

The module keeps accurate time while power is removed and on power up, immediately restores the system time parameters for GPS oscillator disciplining, avoiding the need for time data entry at the user interface.

Features & Benefits

• Immediate update of the Master Clock Timing System's time and date information upon restoration of power following an outage.

• Validation of incoming synchronised time by comparison of Real Time Clock time and date to information from the synchronizing source.

• Synchronisation of the Timing System if the synchronized time source is unavailable.

Module Connections

None - Interfacing is via internal backplane

Real Time Clock Specification

The Real Time Clock can be manually set or automatically updated depending upon the application.

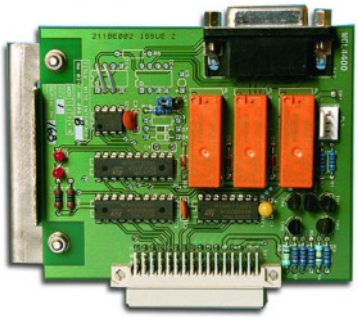
Accuracy	: ± 1 Minute per month at 25°C
Standby Power Down Time Keeping	: > 10 Years

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - BITE - Built In Test Equipment Module

Pt Nos : 0210BE000B

Applications



The BITE module provides volt free contact alarm status conditions as well as self test and self diagnostic functions.

The module monitors internal fault/error codes and conditions within the master clock system, providing a convenient interface to external equipment and systems.

For dual redundant systems, an enhanced version of the module provides automatic changeover functions in the event of a clock error.

Features & Benefits

3 x Voltage free changeover alarms are available to the user :

Alarm 1 relay is used to indicate AC Power Fail.

Alarms 2 & 3 are dependent on the configuration of the module.

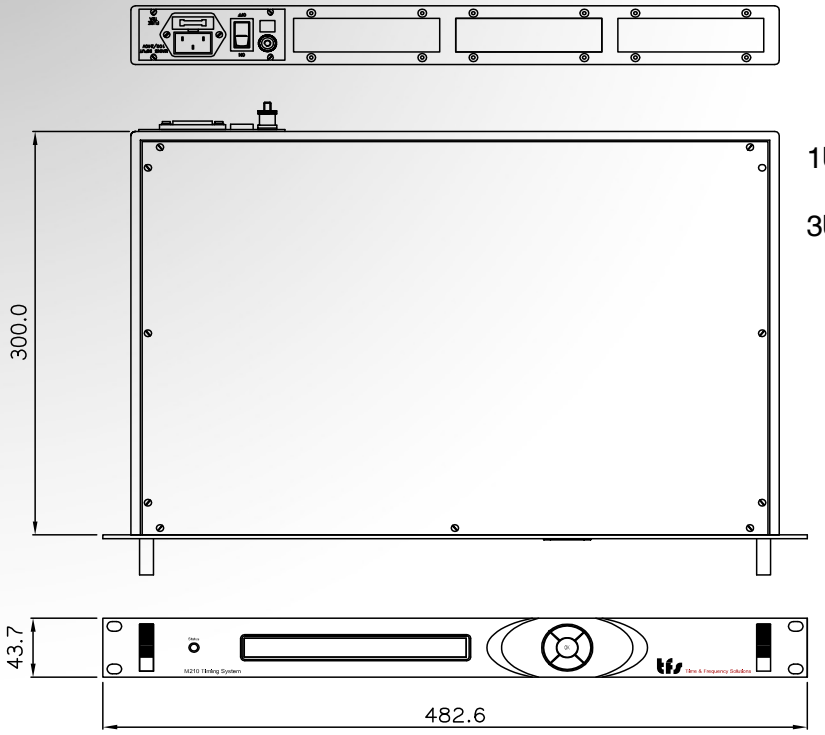
These can either be configured to indicate DC Power Fail, and a global alarm indicating that a BITE error has occurred,
OR
configured for user defined conditions using the front panel keyboard and display of the master clock system.

Module Connections

15 Way D Type Socket Connector

Ambient Operating Temperature	Ambient Operating Humidity	Approvals
0°C - 50°C	Up to 95% RH (non-condensing)	CE

M210/M211 - Mechanical Information



1U : M210 : 43.7 mm High Weight 1.4 Kg

3U : M211 : 131.1 mm High Weight 2.7 Kg

Front Panel Display : 40 x 2 Blue LCD

Front Panel Keypad : 5 Button (4 scroll, 1 Select).

Power Status LED : Tri colour LED indicating power input status

Company overview

Time and Frequency Solutions Limited is privately owned and operated by Brandywine Communications based in Tustin, California. The TFS factory based in Essex, U.K. provides an engineering, production, design and support function for TFS and Brandywine products sold and distributed throughout Europe, Australasia and the Far East.

Brandywine Communications own and operate a state of the art surface mount & conventional PCB manufacturing and assembly factory Santa Ana near the the Tustin Sales & R&D headquarters in California.

Both companies have a highly respected and long standing history in the design and development of precision time and frequency measurements products and systems.

The combined strengths of both businesses give TFS & Brandywine an unrivalled portfolio and capability in the delivery of quality and value for their customers.

All product is manufactured and quality controlled to the aerospace enhanced version of ISO9001 - AS9100D

NSF-ISR Registered to AS9100 (with ISO 9001)

ANAB ACCREDITED ISO/IEC 17025 ANSI/NCSL Z540-1

AS9100D Certificate Number : C0210021-AS3

JOSCAR

Satisfied customers include..

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