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brandywine communications

Precision Time and Frequency Solutions

Short Form Catalog

ISO 9001:2008 + AS9100C Compliant

brandywine communications

Brandywine Communications is the premier supplier of ultra-precise Time and Frequency products. Offering next generation solutions for telecom, government/aerospace & defense, power utilities, and public safety, Brandywine has a solution for your critical timing need. Based in Tustin, CA, our staff of dedicated professionals strive to provide the newest technology customized to fit your needs, with excellent before and after sales service.

Products from Brandywine Communications range from components such as Oven Controlled Oscillators to complete systems such as the top of the line Modular Master Clock (MMC).

Please visit our website at www.brandywinecomm.com or call one of our regional offices for more information.

Military Programs

Brandywine timing equipment is widely deployed across land, sea, and airborne platforms on many military programs such as the AN/BSQ-9(V) Time and Frequency Distribution System, which is deployed in all US Navy submarines. Brandywine supports the environmental testing and specific interface standards needed for simple integration with military hardware.

Electronic warfare

Brandywine has developed precise time and frequency products that are tailored specifically to the needs of the Electronic Warfare community. Low phase noise frequency references that are coherently locked to precise time of day and position from GPS allow ultra high performance signal detection and processing. Brandywine systems are embedded in major shipboard and airborne electronic warfare systems.

Tactical Timing

Brandywine has developed a customized, rugged timing assembly used to provide precise timing signals for a US Marine Corps ground based tactical radar system.

Launch Facilities/ Countdown

Brandywine has supplied a comprehensive Master Clock / Countdown System to an East Coast Rocket Launch facility. The system provides for multiple simultaneous countdown sequences, as well as the generation of a wide variety of standard and custom time code formats. This system is supported by a Network Management System that allows remote control and monitoring of equipment located across the entire test range.

Strategic Communications

Brandywine is the Frequency and Time Subsystem supplier on a major upgrade program for US Army satellite ground stations. Brandywine's ability to offer an innovative network-centric architecture with outstanding availability was a key factor in being selected for building this critical communication infrastructure.

Battlefield Communications

Brandywine has fielded over 1500 low phase-noise GPS8 frequency standards to support battlefield satellite communication nodes. Brandywine's expertise in building low noise frequency standards provides our customers with exceptional performance in a low cost product.

Test Ranges

Brandywine's test range products include GPS time code generators, time code translators, portable timing units, video transmission equipment and time displays. A unique time measuring instrument, TimeSpy, is an essential tool for quality control and troubleshooting on test ranges.

Air Traffic Control

Brandywine offers a family of FAA approved Network Time Servers for synchronization of Air Traffic Control Systems.

Power Utilities

Brandywine supplied a redundant master clock system for a major Pacific Northwest hydropower utility. This system provides network time synchronization as well as system-wide frequency and time deviation measurement in a hardened, high-availability system. The network management system for this hydropower facility enables remote management of systems installed at multiple locations.

NEXT GENERATION NETWORK SOLUTIONS

The demand for more bandwidth at lower costs is increasing each year. Brandywine offers wireline and wireless telecommunication solutions for this fast paced growing need. Brandywine has joined forces with Oscilloquartz, a world-wide leader in telecom equipment, to offer the latest technology and excellent service for the telecommunications world.

Back Haul Synchronization

Brandywine offers a full suite of products that bring the critical accuracy and speed needed for backhaul synchronization over IP, using IEEE-1588 precise time protocol.

Wireline Solutions

Brandywine offers Carrier Class Synchronization solutions with a family of Timing Signal Generators that are scalable from small edge devices to CO equipment with up to 1000 protected outputs. Our TSG's are supported by world class Enterprise Network Management solutions.

Network Edge Synchronization

Brandywine supplies OEM time and frequency modules for LTE base stations, the 4th generation of wireless networks.

BUS LEVEL TIMING

Brandywine Communications indisputably offers the widest range of timing plug-in board form factors in the business. From the classic PCI to our advanced conduction cooled PMC model these boards offer the latest technology as well as the most extensive list of standard features and options available. Most boards include IRIG, NASA, and 1PPS sync inputs as well as optional GPS synchronization. Zero latency time to the microsecond, external event time capture to 100ns, and three programmable rate generators are standard on most models.

A variety of options are available. Some of the more common options are: GPS Synchronization, extended temperature range, eight external event inputs, TCXO and OCXO time bases, multiple output codes.

PCI Express

PCIe-1588 Universal Timing Board

The PCIe-1588 Universal Timing Card provides an ultra-flexible means of providing precise time synchronization to a host computer, or a variety of external equipment. The PCIe-1588 is unmatched in the industry for its flexibility and features, while maintaining a compact ½ height PCIe form factor. The PCIe-1588 supports operation as a PTP Grand Master and/or Slave. http://bwine.me/pcie1588

Mini PCIe SyncClock32

Ideal for mobile and small form factor installations, the Mini PCIe SyncClock32 provides precision time with low latency to the host in the mini PCIe form factor. Capable of receiving time from 1PPS, IRIG or NASA time codes. http://bwine.me/pciesyncclock

PC-104 Family

PC104-SG

Ideal for engineer's that want hardware and software design control. 16-bit ISA interface.

http://bwine.me/pc104sgsyncclock32

PC104 Plus

ROHS Compliant Latest PC104 offering features 32 bit universal PCI performance in PC/104 form factor. GPS available and maintains single slot configurations. Many options available.

http://bwine.me/pc104plussyncclock32

Legacy Busses

VME-SyncClock32

Tried and true hardware & software, easy to program, many features including on-board GPS option.

http://bwine.me/vmesyncclock32

PCI Family

PCI-SyncClock 32

Models are available to support all PCI bus variants. Time code synchronization is standard, GPS sync is optional. http://bwine.me/pcisyncclock3266

PMC-SyncClock32

PMC Models support all variants of PMC form factors. A version is available that supports onboard GPS. http://bwine.me/pmcsyncclock32gps

Conduction Cooled PMC-GPS Clock

Latest conduction cooling technology and many of the same features and options as the other PMC products, including on-board GPS.

http://bwine.me/pmcsyncclock32cc

CPCI-SyncClock32 3U

Supports all standard SyncClock features and options in both 3U and 6U form factors, including onboard GPS. Compliant with RoHS.

http://bwine.me/cpcisyncclock323u

BOARD LEVEL OPTIONS

There are over 300 options for Brandywine's board level products to customize each product to fit our customers' needs. Below is a list of the most frequently used options on our boards. Check with your sales manager for valid option combinations and to get a price quote.

Description	Part Number
INPUT OPTIONS	
12 CHANNEL GPS RECEIVER	012000009
TRANSFORMER COUPLED INPUT	012000024
IRIG G INPUT	012000055
IRIG B DC LEVEL SHIFT INPUT	012000061
DC CODE I/P @ RS422 LEVELS	012000074
GPS-ICD-150 TM 3 INPUT	012000173
STANAG4430 TIME CODE INPUT	012000048
HAVE QUICK TIME CODE INPUT	012000013
HAVE QUICK TIME CODE I/P (RS422)	012000065
EXTERNAL 10MHZ SINEWAVE INPUT	012000220
IEEE-1344 INPUT	012000179
TD1 TIMECODE INPUT	012000256
OSCILLATOR OPTIONS	
DISCIPLINED CSAC OSC	012000270
DISCIPLINED EXTERNAL RUBIDIUM OSC	012000005
DISCIPLINED OCXO	012000006
DISCIPLINED TCXO	012000026
OUTPUT OPTIONS	
MODULATED IRIG B OUTPUT	012000004
6OUTPUTS, 1PPS, HQ, BCD TIME CODE	012000000
HAVE QUICK TIME CODE OUTPUT	012000019
STANAG4430 TIME CODE OUTPUT	012000049
IRIG H DC LEVEL SHIFT OUT	012000054
IRIG G OUTPUT	012000058

Description	Part Number
OUTPUT OPTIONS	
10 MHZ SINE OUTPUT	012000080
10 MHZ SQUARE WAVE OUTPUT ON BNC	012000139
IRIG A,B,G NASA 36 OUTPUT	012000149
50 BIT/S BCD PER ICD-GPS-060 OUTPUT	012000207
GENERATE IRIG B CONTROL FUNCTIONS	012000032
TIME TAG/EVENT OPTIONS	
8 CHANNEL TIME TAG INPUT	012000028
8 CH TIME TAG W/ INDEPENDENT REG.	012000122
20 CHANNEL TIME TAG W/FIFO	012000096
3 CH TIME TAG W/ RS422 INPUTS	012000135
8 EXTENDED MATCH REGISTERS.	012000072
VIDEO OPTIONS	
VIDEO ANNOTATOR - TIME ONLY	012000021
VIDEO ANNOTATOR MATRIX OVERLAY	012000022
TIME /POS INSERTION FOR PC/104 PLUS	012000232
VIDEO ANNOTATOR OVERLAY PC104PLUS	012000233
BUILD OPTIONS	
ON BOARD BATTERY BACKUP RTC	012000034
37 BIT BINARY TIME REGISTERS	012000075
INDUSTRIAL TEMPERATURE RANGE	012000140
ADD CONFORMAL COATING	012000171
ROHS COMPLIANT SOLDER	012000199

Driver Support

Operating System	ISA Bus	PCI-bus	PCI-Express	VME	PCI-Express + Ethernet
Product Family	PC/104SG,	PCI-Syncclock, cPCI-Syncclock, PMC-Syncclock, PMC Conduction Cooled, PMC GPS	PCI-Express,	VME-Syncclock	PCIe-1588
DOS	yes	no	no	no	no
Windows 64 Bit	no	yes	yes	no	yes
Windows 32 Bit	no	yes	yes	no	yes
VX Works	no	third party license ($)	third party license ($)	third party license ($)	no
Linux 32 bit Linux 64 bit	no	yes yes	yes yes	no no	yes yes

GPS TIME & FREQUENCY REFERENCES

NFS-220 & NFS-220 Plus

The NFS-220 is a low cost precision time and frequency standard for use in WI-FI, Wi-Max, satellite communications, telecommunications, and military communications. This unit utilizes a high performance 16 channel GPS receiver with automatic position-averaging that enables the best use of GPS when operating in a fixed location. The NFS220 includes 4 low phase noise 10MHz outputs, 3 1PPS outputs with individual propagation delay compensation, IRIG, Have Quick, and NTP outputs. The NFS-220 can also be synchronized to an external GPS receiver using 1PPS and/ or Have Quick time code. While the OCXO is standard a variety of internal oscillator options are available.

http://bwine.me/nfs220

http://bwine.me/nfs220plus

TIME AND FREQUENCY REFERENCES TRU-CA, FRU-CA

The Time Reference Unit TRU-CA and Frequency Reference Unit (FRU-CA) are complete master clocks containing a GPS Disciplined Oscillator in a 1U housing. The FRU offers a full suite of low phase noise outputs, including: 10MHz and 1PPS. The TRU offers multiple IRIG B, HaveQuick, and 1PPS. Both units include dual network ports with Network Time Server function. A PC hosted application provides status information about the GPS system, monitoring of internal time errors and user access to a number of alarm thresholds.

http://bwine.me/fru

http://bwine.me/tru

PTS

The PTS is a state of the art frequency instrument using a disciplined atomic clock to offer a wide range of features and time and frequency outputs accurate to <20ns RMS to UTC (USNO) and $1x10^{-12}$ respectively. This product is both economic and very reliable, offering complete remote control and monitoring via a web-browser based interface. Applications include central time and frequency systems, satellite earth stations, military communications systems, and high availability network time servers. http://bwine.me/pts

RG-2100, RG-2110

The RG-2100 is a redundant reference frequency generator that uses Global Positioning System (GPS) to steer internal low phase noise OCXO. Each GPS Disciplined Module provides 3 low phase noise 10MHz, 1PPS, monitor and control interface. Dual redundant hot swappable power supplies make RG-2100 perfect for military communications, telecommunications and satcom telecommunications. The RG-2110 includes redundant NTP outputs and SNMP control.

http://bwine.me/rg2100

http://bwine.me/rg2111

PTP – IEEE1588 SOLUTIONS

PCIE-1588

The PCIe-1588 Universal Timing Card provides an ultra-flexible means of providing precise time synchronization to a host computer, or a variety of external equipment. The PCIe-1588 is unmatched in the industry for its flexibility and features, while maintaining a compact low-profile PCIe form factor. The PCIe-1588 can be configured as a grandmaster and a slave. http://bwine.me/pcie1588

PTP-8080 GM/Transparent/Boundary Clock

The PTP-8080 is a GPS Network Time Server (NTS) for NTP or PTP IEEE 1588 that provides secure, accurate and reliable time synchronization for networks and offers integrated fully managed switch capabilities for 8 (10/100/1000BASE) Gigabit Ethernet ports. The PTP-8080 can be used for data centers, test facilities, military installations, federal or municipal agencies, financial services and technology firms, and many other enterprises which need precision timing to support their network operations. http://bwine.me/ptp8080

PTP-80 Grandmaster Clock

The PTP-80 Grandmaster Clock uses PTP IEEE-1588v2 to distribute time to remote PTP clients and slaves over a network with accuracy of better than 100 nanoseconds to UTC. The PTP80 uses an internal oscillator (OCXO as standard, factory upgradeable to Rubidium) disciplined by an integral GPS receiver as a highly stable time base. With advanced hardware-generated time stamping and a large front LCD display, multiple output options are available to customize this to fit your PTP needs. http://bwine.me/ptp80gm

PTP-8 Slave Network Time Client

The PTP Slave provides a high performance synchronization clock solution over packet switched networks (PSN). The PTP Slave Network Time Client also provides time distribution using PSN, IRIG B and RS232. It is designed to operate with any PTP Grandmaster Clock. http://bwine.me/ptp80s

Modular PTP Solutions

MMC

The functionality of the an IEEE-1588 GrandMaster Clock is also available as a module for the Modular Master Clock.

PTP Testing and Validation

See TimeSpy – page 15

AIRBORNE TIMECODE GENERATORS

Miniature Airborne Timecode Processor

Brandywine Communications' Miniature Airborne Time Code Processor (TCP-AM), is an extremely accurate and robust instrument that can be synchronized to a variety of external time sources and is a source of IRIG-B, GPS-Have Quick, NTP or IEEE 1588 time code. http://bwine.me/tcpam

Airborne Time Code Processor

This extremely accurate and robust instrument can be synchronized to a variety of external time sources and is a source of IRIG-B, GPS-Have Quick, NTP or IEEE 1588 time code. The Airborne Time Code Processor is Flight Qualified and tested to MIL-STD 810F and 461E CE102 and RE102. http://bwine.me/tcpas

MILITARY & RUGGED PRODUCTS

Modular Master Clock

The Modular Master Clock has been designed from the ground up for ruggedized and shipboard usage. The Modular Master Clock has dual-redundant hot-swappable power supplies to allow for high-reliability and high-availability usage. Every modular board is designed to be removed from the front, without disconnecting any cables from the rear of the unit, reducing wear and tear. Available Output Signal Modules for the Modular Master Clock include PTTI formats: (Have Quick, BCD, IPPS) low phase noise frequency, IRIG A, B, G, H and NASA 36, optical crosslink, NTP and IEEE-1588 PTP. http://bwine.me/mmc

Portable Timing Unit - PTU

Brandywine's Portable Timing Unit (PTU) is a low cost, battery operated, transportable timing system that is designed to provide precise time of day at point of use. The PTU may be automatically synchronized by means of either GPS signals, or a serial time code such as IRIG B or Have Quick. Outputs include: NTP, IRIG A, IRIG B, IRIG G, Have Quick, and 1PPS. Available oscillators include Rubidium, OCXO, or TCXO. Built in a rugged, weather-proof case, the PTU is easily transportable to any location and can be used in all weather conditions. http://bwine.me/ptu

ENTA-R

The GPS Time Distribution System (ENTA-R) is a high-availability time-distribution qualified for shipboard use. It receives time from two external GPS receivers as 1PPS and Have Quick, and it uses this over-determined time solution to both remove a faulty input reference and discipline an internal time base oscillator. The internal time base is used to re-generate multiple 1PPS and Have Quick signals to support other systems.

The ENTA-R has redundant, removable power supplies and dual Ethernet ports to support SNMP v1 and NTP time protocol. The unit has been qualified for shipboard use in the areas of EMI, shock and vibration. http://bwine.me/entar

Tactical Timing Unit

Brandywine's Rugged Military Qualified Tactical Timing Unit (TTU) is a battery backed portable timing system designed to provide precision time signals in any tactical environment. The TTU can be synchronized from an external GPS signal and provides 1PPS, NTP, and RS232 signals. System control can be implemented through either RS232 or SNMP making it ideal for military applications.

TFD8000 – AN/BSQ-9 (V)

The TFD8000 is a militarized time and frequency system that has been qualified to rigorous military standards and uses modular construction to ensure complete flexibility and easy maintenance. The TFD8000 is the US Navy's program of record Time and Frequency Distribution System (TFDS) and is fully supported by the Navy's supply system. Single, dual and triple redundant models are available. Over thirty standard options are available. Cesium, Rubidium, and Quartz time bases are available. Both types are disciplined to the GPS satellite system. http://bwine.me/tfd8000

MILITARY SATCOM

PTS-SAASM

The GPS Wing Approved PTS-SAASM is a complete master clock containing a GPS Rubidium Oscillator. This unit offers a full suite of low phase noise outputs including: 10MHz, 1PPS, IRIG B, Have Quick, serial time and navigation messages and provides a complete Network Time Server. The built-in web browser provides status information about the GPS system, monitoring of internal time errors and user access to a number of alarm thresholds. Both single and dual redundant models are available. http://bwine.me/pts-saasm

FRU-SAASM

The GPS Wing Approved FRU-SAASM is a complete master clock containing a GPS Disciplined Oscillator in a 1U housing. This unit offers a full suite of low phase noise outputs, including: 10MHz, 1PPS, IRIG B, HaveQuick, serial time and navigation messages, and a complete Network Time Server. A PC hosted application provides status information about the GPS system, monitoring of internal time errors and user access to a number of alarm thresholds. Frequency outputs are compliant with MIL-STD-188-164A. http://bwine.me/fru

HPTS

Brandywine Communications High Performance Timing System is the most accurate system currently available, with inherent 10ns accuracy. This next generation, dual redundant, network-centric, modular system includes a novel architecture that allows automatic compensation of propagation delay. Input synchronization sources include GPS, SAASM GPS, Have Quick, 1PPS, IRIG A, IRIG B, IRIG G, 10MHz, and NTP. Outputs include Have Quick, 1PPS, IRIG A, IRIG B, IRIG G, 10MHz, and NTP. The HPTS is fully qualified for airborne, shipboard, and land mobile applications.
http://bwine.me/hpts

Satellite Ground Stations

Typical of Brandywine's expertise in the field of Satellite terminal timing and frequency references is the system Brandywine supplies the U.S. Army's Modernization of Enterprise Terminals (MET) program, managed by the project Manager, Defense Communications and Army Transmission Systems (PM DCATS) in Fort Monmouth, NJ. Brandywine's network-centric advanced time and frequency subsystem provides the U.S. army with a hardened, high reliability, high availability source of ultra accurate frequency and time. The FTSS utilizes redundant cesium frequency standards that are automatically calibrated and synchronized by comparison to a SAASM GPS receiver (Brandywine PTS-SAASM).

These Primary Reference Standards (PRS) in turn are used to drive an advanced modular distribution system, based on Brandywine's High Performance Timing System (HPTS). This frequency and time distribution amplifier provides hitless reference switching and generates a wide variety of low phase noise outputs to the customers' specifications.

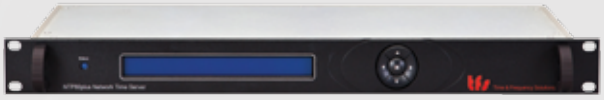
NTP SERVERS

NTV-100RG

Brandywine Communications Network Time Device provides a low cost convenient and flexible means to accurately time synchronize computers, time displays, PBX's, and a wide variety of other equipment. The NTV-100RG is a small, rack mounted Network Time Server with integrated 8 channel GPS receiver. The NTV-100RG can also output serial time messages for synchronizing external devices such as time displays.

ENTA II - Dual port network Time Server

Brandywine's Enhanced Network Time Appliance (ENTA) is a full function Master Clock that offers the user precision time and frequencies in addition to the GPS synchronized Network time server. This unit is fully compliant with the NENA requirements of a Master clock and includes dual network ports. The ENTA has multiple time code outputs available: IRIG B, IRIG E, and Have Quick. Five independently programmable serial ports provide flexibility in synchronizing external equipment. Four independent timing channels may be configured to drive user equipment. The ENTA II is based on Brandywine's proprietary IXO technology, providing the highest performance and technology at an affordable price. Includes IRIG B synchronization source option.



NTP-80 PLUS

The NTP80 Plus is a 3 port highly accurate yet economic time distribution over local area networks (LAN) using Network Time Protocol (NTP), the industry-standard means of time distribution over networks. It is available with different oscillator options

http://bwine.me/enta2

Modular Master Clock

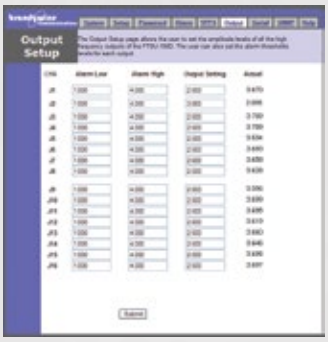
Available for the Modular Master Clock, is the NTP Server Module; this module enables the Modular Master Clock to act as an NTP server over an Ethernet network. Designed with security in mind, the NTP server module uses a custom network stack that enables it to function as a dedicated NTP server, without introducing network vulnerabilities. Multiple NTP Ports can be added for network segregation. The MMC NTP Module supports NTPv4 and IPv6 with full authentication and privacy, including HDB5, and SHA-1. http://bwine.me/mmc

NTP SERVER COMPARISON MATRIX

Our Wide Range of Products that Offer NTP

Model	Speed	Form Factor	Display	Setup	SNMP	Input Reference	IRIG out	No. of ports	Osc. Options	Special Features
IDC-100	100 BaseT	1U	Yes	RS232 Console	Yes V.1	IRIG B	No	1	Xtal	Low cost
NTV100RG NTV100DC	100 BASE-T	1U Desk Mount	Yes	Browser	Yes V.1	GPS RS232 IRIG B (opt)	No	1	Xtal	Low Cost
ENTA II	100 BASE-T	1U	Yes	Browser Telnet	Yes V.1	GPS IRIG B	Yes	2	OCXO	Dual NTP Servers
M210 M211	10 or 100 BASE-T	1U 3U Modular	Yes	Keypad Terminal	Yes V.1	GPS or IRIG B or Have Quick	Yes (opt)	up to 2 (M210) up to 18 (M211)	TCXO OCXO Rb	Multiple time servers in 1 chassis
PTS, PTS-SAASM	100 BASE-T	2U ½ Rack	No	Browser	Yes V.1	GPS GPS (SAASM) Have Quick IRIG B (opt)	Yes	1	Rb	Various Configurations SA-ASM (opt)
NTP80	10 or 100 BASE-T	1U	Yes	Browser SNMP Keypad	Yes V.1	GPS IRIG B MSF, DCF-77 WWVB	Opt	3	TCXO (St) OCXO Rb	Ruggedized Configurable Distribution SAASM (opt)
FRU-SAASM	100 Base-T	1U	No	SNMP, Windows app.	Yes V.1	GPS/HaveQuick	Opt	2	OCXO, Rb	Frequency Reference with NTP capability
Modular Master Clock NTP Module	100 BaseT	2U Module	Touch Screen	SNMP, Touch Screen	Yes V.3	GPS, IRIG, HaveQuick, Optical	Opt	Up to 24	OCXO, CSAC, Rb	Ultra Flexible Modular System. Enhanced Stability

INTELLIGENT DISTRIBUTION AMPLIFIERS



Online screen shot of FTSU-100D

FTSU-100D

The FTSU-100D is Brandywine's advanced network enabled distribution amplifier. The FTSU-100D will accept 1PPS and a reference frequency such as 10MHz from two sources. A second output frequency can be synthesized internally. 8 channels each of the 10MHz reference, the synthesized frequency and 1PPS are generated. Input reference failure results in hitless switchover. The output frequencies have programmable amplitude and PPS propagation delay compensation.

http://bwine.me/ftsu100d

FDU-160i

The FDU-160i is the first in a line of Brandywine's next-generation distribution amplifiers, bringing the distribution amplifier into the internet of things. The FDU-160i uses Brandywine's next-generation HTML5 web interface to enable the unit to be monitored and controlled from any PC, smartphone, or tablet. The FDU-160i accepts frequency inputs from two sources and can automatically switch over to a secondary input if the primary fails. The unique web interface allows for each frequency output to be individually set and adjusted, without affecting the other outputs. With dual-redundant power-supplies standard, the FDU-160i is designed for high-reliability and high-availability applications, such as satellite ground stations, secure military communications, facility reference distribution, and range timing. http://bwine.me/fdu160i

FDU-180i

Built on the FDU-160i, the FDU-180i expands the capabilities of the FDU-160i by incorporating a clean-up oscillator, reducing phase noise while allowing the unit to maintain frequency synchronization. A high-performance tracking loop ensures phase continuity of the outputs when switching references for true hitless switching.

IBU-160i

Bringing the next-generation of distribution amplifiers to time code distribution is the IBU-160i. Converting dual-redundant IRIG A, B or G time code inputs into 16 isolated outputs, the IBU-160i fits into a 1U chassis. The IBU-160i incorporates Brandywine's next-generation HTML5 interface to allow it to be monitored and controlled from any PC, tablet or smartphone.

http://bwine.me/ibu160i

FDA-160i

The FDA-160i is Brandywine's newest wideband frequency distribution unit, built on the versatile platform of Brandywine's FDU-160i, the FDA-160i distributes dual-redundant wideband frequency signals between 1 and 30MHz across sixteen outputs. Each output is individually adjustable for voltage level.

http://bwine.me/fda160i

Tactical Have Quick/ 1PPS Distribution Amplifier

The Model HQS is capable of accepting Have Quick and 1PPS inputs (single ended or differential) and outputting up to two signals per each input for a maximum of four signals total (single ended or differential). All signals are per ICD-GPS-060. Brandywine will pre-configure for customers at the time of order.

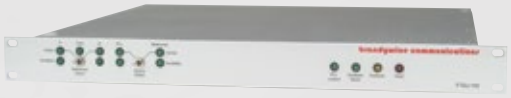
The voltage range is 18-36VDC, 36-72VDC or 145-162VDC. The HQS uses no more than 5 watts of power. The unit is approximately 4"h x 4"w by 4"d with MIL-DTL-38999, Series III Connectors. The unit has a calculated MTBF of over 1,000,000 hours. The unit has been tested for ship board use and is qualified to MIL-STD-461, MIL-STD-167-1, MIL-STD-810.

LEGACY DISTRIBUTION AMPLIFIERS

TDU-310

The TDU-310 is a high output count, high performance time signal distribution amplifier. Designed to distribute the precise time signals generated by military GPS receivers compliant with ICD-GPS-060, the TDU-310 provides 10 output channels of each of three signals – 1PPS, Have Quick, and 50 bit/sec BCD time code.

http://bwine.me/tdu310



IBU-240

The IBU-240 is a dual input to 24 output low frequency distribution amplifier that is designed for distributing IRIG A, B, E, G modulated time codes in a 1U 19" rack mount chassis. Each of the 24 outputs is a faithful reproduction of the time code input. All outputs are transformer isolated. Applications include satellite ground stations, secure military communications and range timing.

http://bwine.me/ibu240

FDU-240

The FDU-240 is a high output count and high performance frequency distribution amplifier. The FDU-240 provides 24 output channels of 5 MHz or 10 MHz with very low phase noise.

http://bwine.me/fdu240

PDU-240

The PDU-240 is a high output count and high performance pulse distribution amplifier. The PDU-240 provides 24 output channels of a single reference pulse, typically 1 PPS.

OEM PRODUCTS (EMBEDDED MODULES)

GPS Disciplined Oscillator Module (GPSDO)

The GPS Disciplined Oscillator Module is a small Commercial Off-the-Shelf (COTS) GPSDO that has been designed to meet military requirements such as MIL-STD-188-164A. At only 4.1" x 2.75" x 1" (104.0 x 70.0 x 26.0 mm) in size, the unit provides Stratum 1 performance. The GPSDO supplies three isolated, low noise precision10 MHz frequency reference signal outputs. These outputs are accurate to $1x10^{-12}$ when slaved to a timing supply from an internal GPS tracking receiver.

This frequency standard is also able to slave to an external 1PPS signal to steer and hold the internal oscillator and clock system precisely in time. Time and frequency information maintains its high accuracy with the internal oscillator even when no satellites can be tracked. A serial data port is provided to report time, date, position, and GPS satellite health and signal strength. The GPSDO module also has dual power supply inputs and can operate off either supply input. Optional capabilities include automatic interface to an external military GPS receiver such as the Defense Advanced GPS Receiver (DAGR), Ethernet Interface for NTP time service and SNMP status monitoring. Standard frequency output is 10 MHZ, but other frequencies are possible. http://bwine.me/gpsdo

Miniature GPS Disciplined Oscillator

Brandywine's miniature GPS Disciplined Oscillator combines the power of our existing disciplined oscillators in a footprint the size of an OCXO. Designed with interoperability in mind, the Miniature GPS Disciplined Oscillator meets military requirements such as MIL-STD-188-164A. The GPSDO supplies a low noise, precision 10 MHz frequency reference signal output. This output is accurate to $1x10^{-12}$ when slaved to a GPS source.

http://bwine.me/gpsdomini

PUBLIC SAFETY & AIR TRAFFIC CONTROL

ENTA II - Dual port network Time Server

Brandywine's Enhanced Network Time Appliance (ENTA) is a full function Master Clock that offers the user precision time and frequencies in addition to the GPS synchronized Network time server. This unit is fully compliant with the NENA requirements of a Master clock and includes dual network ports. The ENTA has multiple time code outputs available: IRIG B, IRIG E, and Have Quick. Five independently programmable serial ports provide flexibility in synchronizing external equipment. Four independent timing channels may be configured to drive user equipment. The ENTA II is based on Brandywine's proprietary IXO technology, providing the highest performance and technology at an affordable price. http://bwine.me/enta2

IDC-100

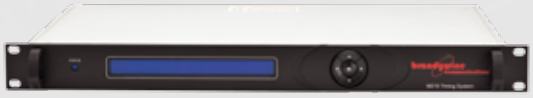
Brandywine Communications Network Time Device provides a convenient and flexible means to accurately time synchronize computers, time displays, PBX's, and a wide variety of other equipment. The IDC-100 is a small, rack mounted Network Time Server with IRIG B reader.
http://bwine.me/idc100

M210 and M211

The M210 and the M211 Time & Frequency Systems are high capacity flexible timing systems designed for use in any application where reliable time information is required.

http://bwine.me/m211

These are most suitable where synchronisation of many different output interfaces is required as you can build your own system. Choose from a wide range of modules to fill the 3 module slots in the chassis for the M210, or for greater flexibility, choose the M211, which accommodates up to 9 output modules.



http://bwine.me/m210

The M211 Modular Time & Frequency System is also used as an integral part of our High Resilience Dual Redundant System - essential in mission critical applications such as Air Traffic Control.

NETWORK TIME DISPLAYS

Brandywine Communications offers a full line of Network Time Displays that are synchronized over an Ethernet network using NTP protocol. These advanced technology displays eliminate the need for expensive coaxial cable installations, all that is needed is a network drop and power source. Using the browser interface simply enter the IP address of the time source, one of the Brandywine Network Time Servers, or any other source of NTP time and you are ready to go.

Outdoor High Visibility

Many different configurations and character heights are available for the Time and Message Displays from Brandywine Communications. Time (both HH:MM & HH:MM:ss), date, day of the month, year and various time zones are offered. Digit sizes from one-half inch to twenty inches are available. Brandywine Communications also offers analog clocks.

Indoor
http://bwine.me/displays

MODULAR MASTER CLOCK

Brandywine's Modular Master Clock System represents the next generation of modular timing systems. Built on the highly successful High Performance Timing System, the Modular Master Clock System is a leap forward in design.

FEATURES:

- Redundant design with multiple signal paths built in for high-availability.
- 12 expansion slots in the 2U version and 5 expansion slots in the 1U variant.
- Unique optical crosslink architecture for either Master-Slave hierarchical setups or Master-Master crosschecking and failover
- 2U version is operated by an intuitive touch-screen interface, a first for any master clock system.
- All components are hot-swappable and are dual redundant.
- The Output Signal modules are hot-swappable from the front and minimize the need to disconnect cables.

At the center of the system are Brandywine's powerful dual-redundant Master Clock Modules, which are capable of receiving time from a GPS signal, either from a SAASM or standard CA code receiver, or can be synchronized from a standard time code input such as IRIG-B or HaveQuick with 1PPS.

The output signals for the Modular Master Clock System are generated by up to 12 hot-swappable Output Signal Modules (OSM), and are ideal for custom solutions or future expansion. Available modules include NTP, low-phase-noise frequency, IEEE-1588 PTP, time code modules such as IRIG A, B, G, H, NASA 36 and pulse rate, as well as optical crosslink. http://bwine.me/mmc

RANGE TIMING SOLUTIONS

COUNTDOWN SYSTEMS

M211

The Brandywine Communications M211 High Capacity Modular Timing System where a large number of reliable time/frequency outputs are required. With nine option-module slots and over thirty standard options the M211 offers your Master Clock solution with multiple simultaneous countdown sequences, while it generates a wide variety of standard and custom time code outputs. The M211 offers the user a true COTS solution to most time and frequency problems. http://bwine.me/m211

Test Range Time Code Generator/ Translator

RTG-510

Brandywine's RTG-510 allows any timing input in (IRIG A, B, G, Have Quick, GPS, etc…) and simultaneously outputs IRIG A, B, G, Have Quick, 1PPS, dual NTP and RS232 to your system. This unit has a 9 digit time display, a built-in web browser for easy use, and has dual redundant power supply for reliability. Built with either TCXO or OCXO, the RTG-510 has the ability to track incoming time code over +/- 200ppm to allow timecode conversion from legacy tape playback systems. http://bwine.me/rtg510

TIME MEASUREMENT & CALIBRATION/VALIDATIONS

TimeSpy

The TimeSpy precisely measures the time accuracy of a wide range of inputs (such as: PTP, NTP, IRIG B, 1PPS, and ASCII) against an internal precision GPS-controlled oscillator, displayed on the large, full color windows-based touch screen. The TimeSpy can precisely measure the time error at the point of use for systems where time is distributed over large distances. The TimeSpy can also measure free-running clocks and timing systems which are synchronized from untraceable sources, such as television and radio broadcasts, electrical power lines and the internet.

OPTICAL SOLUTIONS

GPS Fiber Optic Antenna Solution

FOA-160

The Brandywine Communications Model FOA-160 is a specialized distribution amplifier system used to distribute GPS or GLONASS signals over fiber optic links to up to 16 receivers. The Model FOA-160 head–end unit connects to a standard GPS antenna/preamplifier which receives the GPS/GLONASS signals transmitted by from the satellites. The FOA-160 converts the received signal to an optical intensity modulated signal, and routes it through a passive optical splitter to 16 outputs. These signals are available at the rear panel for distribution throughout a building or campus over fiber optic cables. This removes the distance limitations that are typically a challenge for direct electrical distribution of low power GPS/GLONASS signals. A small companion converter at the far end allows use with any GPS receiver. http://bwine.me/foa160

Optical Time Code Generator

Brandywine's RTG-510 optionally can generate optically modulated IRIG Time code (IRIG A, B, E, G). http://bwine.me/rtg-510

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