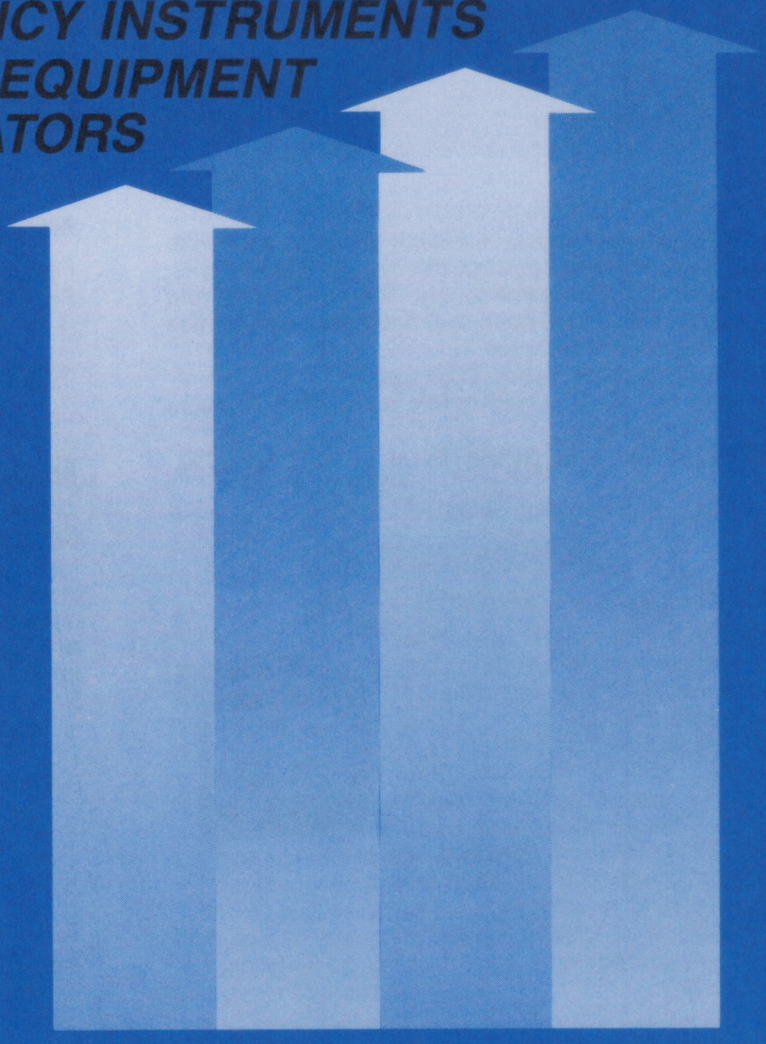
U.S. DOMESTIC

SHORT FORM CATALOG

INTEGRATED SYSTEMS
TIME & FREQUENCY INSTRUMENTS
TIME CODE EQUIPMENT
CRYSTAL OSCILLATORS



AUSTRON INC.

CRYSTAL OSCILLATORS

MODEL 1100

Combines high stability with low power drain in a small, lightweight, plug-in package. This hermetically sealed crystal oscillator finds application whenever space is at a premium and performance cannot be compromised.

OUTPUT FREQUENCY: 5 MHz Standard

AGING RATE: 5, 2 or 1×10^{-9}/24 Hrs. after 72 hours continuous operation

AMBIENT TEMPERATURE STABILITY: $<2.5 \times 10^{-8}$ from −20°C to +65°C

MECHANICAL: Size: 1.25 x 1.75 x 3.25 inches

MODEL 1105

A low profile solid-state crystal oscillator designed to provide a highly stable 1 MHz logic output for IC applications. Operates from a 5 volt power supply. The size, weight and stability performance have been packaged in a configuration for the IC instrument designer.

OUTPUT FREQUENCY: 1MHz; TTL Logic

AGING RATE: 10, 5, 2, or 1×10^{-9}/24 hours after 72 hours operation

AMBIENT TEMPERATURE STABILITY: $<2 \times 10^{-8}$ from 0°C to +55°C

MECHANICAL: Size: 1.25 x 1.75 x 3.25 inches

MODEL 1111 — NEW PRODUCT

A compact, fast warm-up, low phase noise oscillator specifically developed for both mechanical and electrical replacement of the discontinued HP10811.

OUTPUT FREQUENCY: 10 MHz

AGING RATE: $<5 \times 10^{-10}$/24 hours after warm-up with less than 24 hours off time

AMBIENT TEMPERATURE STABILITY: $<4.5 \times 10^{-9}$ (−55°C to +71°C) $<2.5 \times 10^{-9}$(0°C to +71°C)

MECHANICAL: Size: 2.06 x 2.83 x 2.45 inches

MODEL 1115

5 MHz Oscillator specifically designed for undersea applications where high stability and minimal power drain are of prime importance.

OUTPUT FREQUENCY: 5 MHz

AGING RATE: 3×10^{-9}/24 hours after 72 hours operation 1×10^{-9}/24 hours after 30 days operation

AMBIENT TEMPERATURE STABILITY: $<5 \times 10^{-9}$ from −2°C to +25°C

NOTE: Higher temperature models available

MECHANICAL: Size: Cylinder 2'' diameter, 5.5'' long

MODEL 1120

A compact, rugged crystal oscillator designed for a wide range of applications. This unit is available at many different frequencies, input voltages, and mechanical configurations.

OUTPUT FREQUENCY: 1MHz thru 10 MHz

AGING RATE: 5, 2 or 1×10^{-9}/24 Hrs. after 72 hours continuous operation

AMBIENT TEMPERATURE STABILITY: $<2 \times 10^{-8}$ from −20°C to +65°C

MECHANICAL: Size: 2.27 x 2.14 x 4 inches

MODEL 1120L

Features extremely low phase noise performance.

PHASE NOISE (5 MHz Output): −135 dB, 10 Hz
(1 Hz BW) −155 dB, 100 Hz
−160 dB, 1 kHz

(NOTE: For 10 MHz Output add 6 dB degradation.)

MODEL 1150

A very rugged, high precision crystal oscillator which was specifically developed for use in satellite navigation systems. Has application whenever system requirements demand a precise time base or frequency reference. Technical features include an ultimate aging of 5×10^{-11}/day, low phase noise, and a standard frequency of 5 MHz.

OUTPUT FREQUENCY: 5 MHz Standard

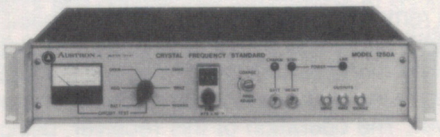
AGING RATE: 5×10^{-10}/24 hrs after 72 hours operation 1×10^{-10}/24 hrs after 30 days operation Ultimate drift is typically 5×10^{-11} after 90 days operation

AMBIENT TEMPERATURE STABILITY: $<2 \times 10^{-9}$ from −55°C to +60°C $<5 \times 10^{-10}$ from 0°C to +50°C

MECHANICAL: Size: 2.37 x 3.18 x 5.0 inches

FREQUENCY STANDARDS

MODEL 1250A
CRYSTAL FREQUENCY STANDARD



Provides the user with 5 MHz, 1 MHz, and 100 kHz sine-wave outputs. The instrument also supplies a 1 MHz or 100 kHz clock output. The Model 1250A offers ultimate long term stability of 5×10^{-11}/day. The unit includes front panel frequency adjustments and a meter for monitoring critical functions including condition of internal standby battery.

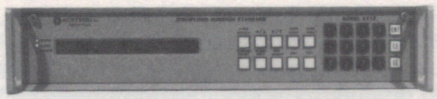
MODEL 1250B
CRYSTAL FREQUENCY STANDARD

Provides sixteen 5 MHz outputs with a long-term stability of 5×10^{-11}/day. The output frequencies have extremely low phase noise, therefore, well suited for SATCOM applications. The instrument was designed with no front panel controls that could interrupt operation. An internal standby battery supply is included.

MODEL 2110
DISCIPLINED FREQUENCY STANDARD

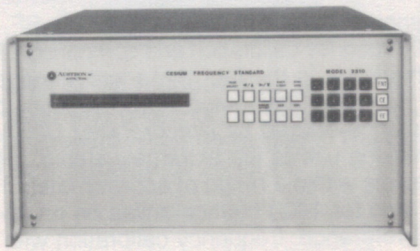
A state-of-the-art, microprocessor controlled system that automatically locks the frequency of its precision ovenized crystal oscillator to that of an externally applied reference having superior long-term stability. With the use of a third-order servo technique, the instrument is able to correct the frequency offset and aging of the internal oscillator. If the externally applied reference is removed or fails, the Model 2110 will continue to apply corrections to the internal oscillator in an effort to eliminate its aging and thereby hold it on frequency. Typically the unit can limit the frequency offset to parts in 10^{11} for several days following reference loss.

MODEL 2112—NEW PRODUCT
DISCIPLINED RUBIDIUM STANDARD



Similar to the Model 2110, the Model 2112 Disciplined Rubidium Standard takes advantage of the slower aging rate of the rubidium oscillator. Microprocessor controlled, the Model 2112 uses a third order servo technique to correct the frequency offset and aging of the rubidium oscillator. If the external reference is removed, the Model 2112 will continue to apply corrections to account for aging and to maintain frequency stability.

MODEL 2310—NEW PRODUCT
DISCIPLINED CESIUM STANDARD



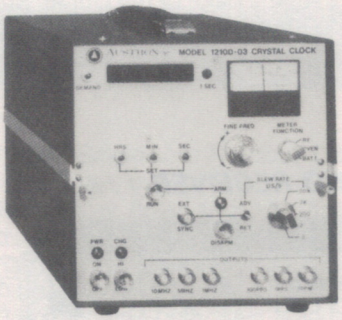
Combines the convenience of microprocessor control with the accuracy and stability of its internal atomic standard. The Model 2310 can precisely adjust its output frequency without changing the magnetic field of the cesium beam. This nonmagnetic settability feature allows the Model 2310 to automatically match its output frequency to that of an external reference. Should this reference be non-atomic, the Model 2310 will calculate and display its aging rate.

PORTABLE CRYSTAL CLOCKS

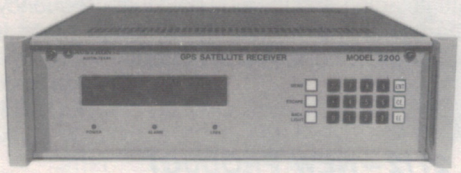
MODEL 1210D SERIES

Clocks used to transfer precise time from one geographic location to another. They are packaged in a rugged carrying case approximately 8½ inches high, 8½ inches wide and 14 inches long, permitting upright storage under the passenger seat found in most commercial aircraft.

The 1210D Series contain a precision quartz oscillator and a series of dividers which reduce the oscillator rate to one pulse per second. A digital phase shifter having 0.2 microsecond resolution is included at the head of the divider chain to allow the timing pulses to be synchronized to a master clock.



MODEL 2200 – NEW PRODUCT
GPS RECEIVER



Designed to capture the ultimate accuracy of the GPS NAVSTAR satellite Link 1, C/A code transmissions, this low cost receiver will provide the best possible time and frequency comparisons between two remote frequency standards and clocks which require synchronization to a common timebase. Synchronization of time to the Coordinated Universal Time (UTC) scale is possible through the GPS master clock system to accuracies better than 200 nanoseconds.

The receiver is fully microprocessor controlled and will permit the user to compare his local 1 PPS, using the internal time interval counter, to GPS time or UTC time. If a local 1 PPS is not present, the 2200 will generate a 1 PPS which is locked to GPS or UTC time while tracking a satellite. The 2200 will also accept input frequencies of 1, 5, or 10 MHz from the user's local frequency standard.

LORAN-C GROUNDWAVE

Today, engineers are universally familiar with RF, LF, and VLF methods of frequency calibration and comparison. Not yet widely known, however, is the fact that most standard frequency users may now take advantage of the superior performance and convenience offered by synchronized LORAN-C groundwave. By making use of the extremely stable, strong groundwave that exists within a range of approximately 1000 nautical miles over land (or 1400 nautical miles on an all-sea path) of a LORAN-C reference, frequency calibration with a resolution of better than 1×10^{-12} may be made when 24 hour averaging is employed. Unlike skywave, LORAN-C groundwave has no diurnal shift and troublesome "cycle skips" due to the mode interference. Thus, the skywave method of averaging for 24 hours when maximum accuracy is desired is not neccessary; measurements may be taken for most purposes without regard to time-of-day, with random noise due to atmospheric electricity and local man-made interference setting the principal limits on measurement resolution.

TRACEABILITY

Daily phase corrections are available to allow the user of synchronized LORAN-C groundwave to refer his frequency measurements to the time base of the United States Master Clock, maintained by the United States Naval Observatory (USNO) and the National Bureau of Standards (NBS).

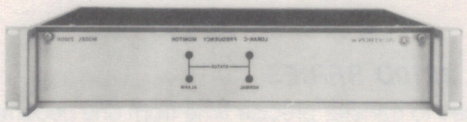
MODEL 2100
LORAN-C TIMING RECEIVER

An automatic acquisition, tracking and time synchronizing receiver providing a traceable reference for time recovery as well as frequency calibration and control. This state-of-the-art device has remotely programmable control capabilities. Those who are vitally interested in high resolution time determination and frequency management will appreciate the improved sensitivity, automated features and simplicity of operation of this new receiver. The operation of this receiver, using LORAN-C groundwave signals, will permit time epoch determination to an accuracy of one microsecond and frequency calibration measurements to within an accuracy of one or two parts in 10^{-12} for one-day averaging. The receiver allows the unskilled operator to obtain precise results for time measurement and frequency calibration by using an almost totally automatic approach with the most current equipment of the highest reliability.

MODEL 2100F
LORAN-C FREQUENCY MONITOR

An automatic acquisition and automatic tracking LORAN-C receiver, with remotely programmable control capabilities that provides a traceable reference for frequency management, calibration and control. Standards laboratories, atomic standards research groups, telecommunications groups, and others who are vitally interested in high resolution frequency measurement and intercomparison will appreciate the improved sensitivity and ease of operation of this automatic receiver. After the operator enters the Group Repetition Interval for the LORAN-C chain nearest his site, the Model 2100F automatically acquires a suitable station and settles to the track mode. The relative phase difference between the LORAN-C station and the local frequency reference is provided as a 0 to 1 volt analog signal to drive an external chart recorder for a permanent record, and in numerical form on the LCD display on the front panel. The frequency offset of the local reference with respect to the LORAN-C station is also calculated and can be displayed on the LCD display. Indicators on the front panel show at a glance the status of the receiver (acquire, track, or servo locked modes) and the status of the LORAN-C signal (station blinking or low signal-to-noise ratio). The front panel controls can also be locked out to prevent accidental interruption of service.

MODEL 2100R
LORAN-C REFERENCE RECEIVER



An automatic acquistion LORAN-C Receiver capable of tracking any LORAN-C station in the user's area for the purpose of comparing a local frequency source to the cesium standard used by the LORAN-C station. A modified version of the Model 2100F, the unit is designed to act as a stable reference frequency source for disciplined frequency standards in communications systems and other applications where a minimum of operator interface is desired.

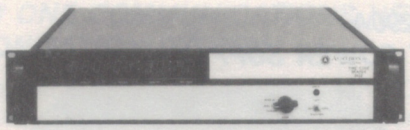
AUSTRON'S PRODUCT LINE

Austron's Time Code product line consists of a large variety of instruments and options that are capable of solving the most demanding Time Code applications. Computer interfaces and time distribution equipment are available as standard units with options.

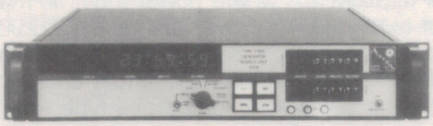
8100 SERIES

The 8100 Series of Austron Time Code Instruments are system oriented units requiring only 3½ inches of vertical space in a standard 19 inch rack.

The **Model 8120 Time Code Generator** is a precise digital clock which generates a serial time code for recording a time reference on magnetic tape or for timing distribution applications.



The **Model 8132 Time Code Reader** is designed to translate an IRIG B modulated time code format in terms of BCD hours, minutes and seconds. Decoded time information is supplied for use with a digital recorder or for computer interface applications.

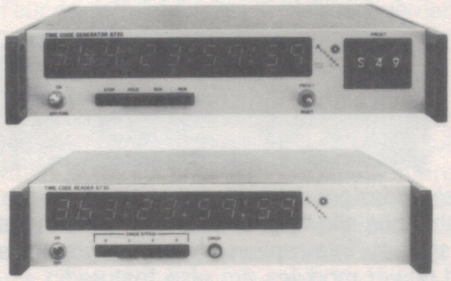


The **Model 8154 Time Code Generator / Reader / Tape Search and Control unit** is capable, with the appropriate options, of automatically performing a computer controlled magnetic tape search operation.

MODEL 8526 PORTABLE TIME CODE GENERATOR

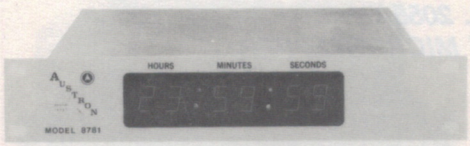
A MIL SPEC unit in an ATR configuration. Synchronization with WWV, IRIG B output code and AC/DC operation are standard features of the Austron Model 8526. Optional internal battery operation provides up to 25 hours continous use.

8700 SERIES

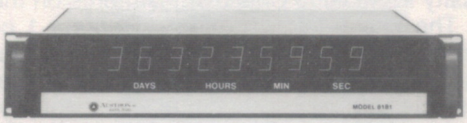


The 8700 Series of Time Code Instruments are 1¾" high by 8½" wide by 12" deep. The pictures above show a **Model 8720 Time Code Generator** and a **Model 8730 Time Code Reader** in bench mount configuration. They can also be mounted side by side in a standard 19" rack. This arrangement provides simultaneous generate and read with separate displays for each function. The units may be powered by 115/230 Vac, 48-440 Hz or 12 Vdc.

REMOTE TIME DISPLAYS

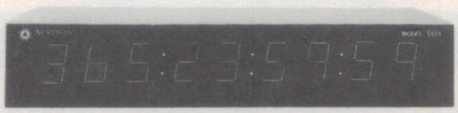


The **Model 8781 Serial Remote Display** decodes a modulated serial time code and presents the decoded time on six digit .55" high gas-planar discharge displays. The display can be easily read at a distance of 25 feet.



The **Model 8181 Single Line Readout / Display** operates directly from any time code generator supplying an IRIG A or IRIG B modulated time code. The nine-digit 1" high gas-planar discharge displays have a rated viewing distance of 50 feet.

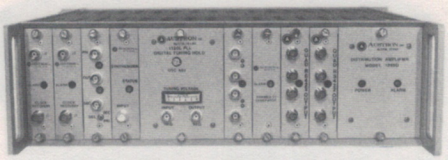
MODEL 5581/5582 SINGLE-LINE READOUT DISPLAY



The Model 5581 Single-Line Readout Display is a nine-digit (days, hours, minutes, seconds) time display. The Model 5582 is a five-digit display (total seconds in a day). The 2" gas discharge display segments are visible over long distances and either unit can read a standard IRIG A or IRIG B time code signal. Both displays have count-up, count-down capability using CFE 10 and 11 and both have leading zero blanking.

SIGNAL DISTRIBUTION

MODEL 1295D – NEW PRODUCT TIMING DISTRIBUTION SYSTEM

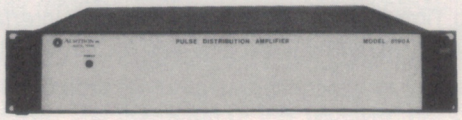


Completely redesigned, the Model 1295D features a new user configurable bus allowing for changes to be made to the bus without system interruption. New integrated and greatly simplified power modules are also featured.

Up to four different frequencies can be supplied to the outputs in multiples of four per each frequency. Output frequencies can be the input frequency, or, they can be scaled or synthesized from the input signal.

Input/Output modules are available for sine or square wave signals, balanced and unbalanced; RS422, time code, crystal or rubidium oscillators, and fiber optic transmitters or receivers. Any combination of I/O modules may be used to a total of 11 to provide up to 40 outputs.

MODEL 8190A PULSE DISTRIBUTION AMPLIFIER



Designed for applications requiring distribution of pulse rates from 1 pps to 5M pps. Card cage construction allows flexibility to configure the I/O to meet customer requirements.

The 8190A has 36 rear panel BNC connectors; 4 for inputs and 32 for outputs. Each output is independently buffered and adjustable.

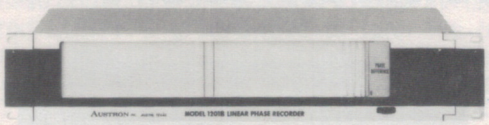
The Quad Input Buffer board follows the incoming signal, maintaining the characteristics (duty cycle) of the pulse and, via one of four signal busses, drives one or more Quad Output Buffer boards. The output board provides the drive and level capabilities to provide 4 outputs. Up to 32 outputs can be provided from a single input.

AUXILIARY EQUIPMENT FOR PRECISION TIME & FREQUENCY USERS

MODEL 2055A PHASE MICROSTEPPER

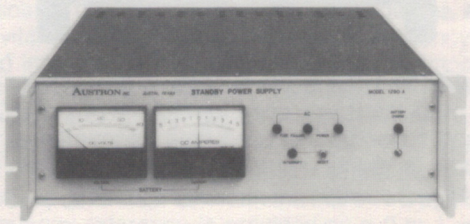
Designed to provide a mechanism for correcting small errors in atomic frequency standards, the device will allow the operator of an atomic clock system to make small phase and frequency corrections at a regular rate in order to preclude the necessity for making C field adjustments on the atomic standard. The Phase Microstepper accepts a 1 or 5 MHz standard time base signal and shifts its phase in accordance with a digitally programmed instruction. The phase change may be a single step, or may occur at an essentially uniform rate. Digital control of the phase step or rate is effected by setting a six-digit thumbwheel switch, or by means of a six-decade BCD input. Phase equivalent rate span of the Model 2055A extends from 0.00000 ns/second to ±9.99999 ns/sec. Digitally exact time base frequency adjustments having a resolution of 1×10^{-14} may be made.

MODEL 1201B LINEAR PHASE RECORDER



Produces a chart record that is directly proportional to the phase difference between two sinusoidal or square wave inputs from 100 Hz — 5 MHz. Consider, for example, a system containing two 1 MHz frequency standards and the Model 1201B. If the frequency standards remain at exactly the same frequency, the chart record of phase vs time will be a straight line having zero slope. If there is any frequency offset the time gained or lost may be read directly with a resolution of about 100 nanoseconds. Full scale deflection of the recorder will correspond to 360° or 1 microsecond. The slope of the chart recording is proportional to the frequency offset.

MODEL 1290A STANDBY POWER SUPPLY



Intended for applications where power must be maintained in the event of extended AC power failure. The 1290A will provide 24 Vdc at a maximum current of three amperes with a total capacity of 19 ampere-hours with fully charged batteries. Internal batteries are of the sealed cell type and require no periodic maintenance. Electronic circuits provide automatic transient free switchover from AC line to standby power and back to AC. In addition to the internal batteries, provision is also made for use of an external DC power source of 24 to 28 Vdc. If use is made of this feature, the internal batteries would only be used in the event of failure of both AC and external DC. Up to six back panel connectors are available for supplying power to several equipments.

MODEL 2084 MULTIFILTER

The Austron Model 2080 Multicoupler and Model 2084 Multifilter distribute Loran-C signals to as many as four separate receivers. The 2080 provides three, and the 2084 provides eight, notch filters to reduce CW interference. The filters are individually switch selectable and independently adjustable from 70—170 kHz. These compact units require only 3.5" of vertical (19") rack space and offer low power consumption. DC standby power can be provided by the 1290A above.

In recent years, the normal requirements in time and frequency measurement and calibration have become so complex that in many applications an assemblage of general purpose instruments is no longer adequate. To meet the more demanding situations, Austron offers complete systems—groups of instruments fully integrated to provide a total solution to a specific time and frequency management need. During the past ten years Austron has been developing systems to solve the most complex customer requirements. Whether your need is to synchronize a data communications system, provide precise time and frequency for radar ranges, missile test ranges, or control the frequency and phase of communications sites spread all over the world, Austron has a system that will do the job.

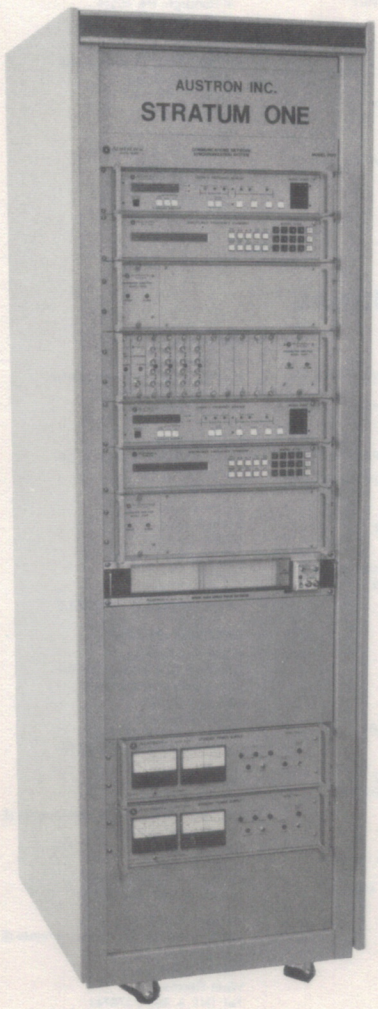
What does it take to become one of the leading suppliers of frequency and timing systems? You start with ten years of experience in the design of electronic time and frequency measurement and dissemination equipment. To this you add the knowledge of how to integrate a system with the highest order of precision while preserving and sometimes enhancing the performance characteristics of the individual devices. You also work closely with the Precision Time and Time Interval community, commercial and Government laboratories worldwide. Your equipment assists in the management of time and frequency in virtually every major clock system in use today.

But technical excellence is not enough! You must listen carefully to your customer's needs, create basic systems with broad usefulness, then build an engineering/manufacturing facility capable of tailoring these systems to meet your customer's specific, unique needs. You also create fast responding sales and service facilities so that your customer will help you sell future systems because he remains satisfied before, during, and after the sale.

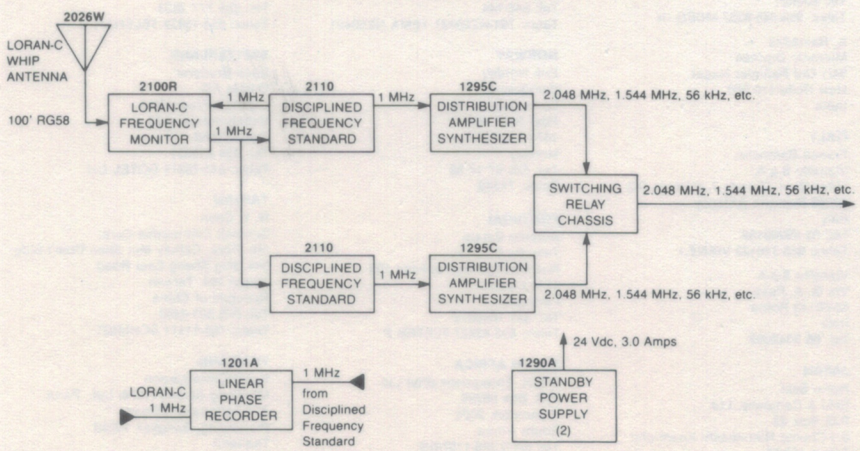
When you have done these things and are continuing to make major contributions to the state-of-the-art for the industry, you are one of the world's leading suppliers of time and frequency management systems and equipment. Austron welcomes the opportunity to discuss your systems requirements and the opportunity to make a contribution in solving your systems needs.

MODEL 3150
STRATUM ONE COMMUNICATIONS NETWORK SYNCHRONIZATION SYSTEM

Designed to automatically receive the LORAN-C Navigation System's carrier signal and utilize it as a reference through which the system's disciplined frequency standard(s) may automatically synchronize itself. The disciplined frequency standard is capable of providing a phase-stable clock source to operate the system's clock synthesizer/distribution amplifier. The clock output frequencies depend upon the particular needs of the network. A few examples include 1.544 MHz, 2.048 MHz, 308 kHz and 56 kHz. There are several system configurations available primarily based on redundancy requirements. A fully redundant system is available which includes dual LORAN-C receivers, disciplined frequency standards and distribution amplifiers. Austron also provides standby power via the Austron Model 1290A Standby Power Supply.



Typical System Configuration



Redundant Communications Network Synchronization System with one LORAN-C Receiver

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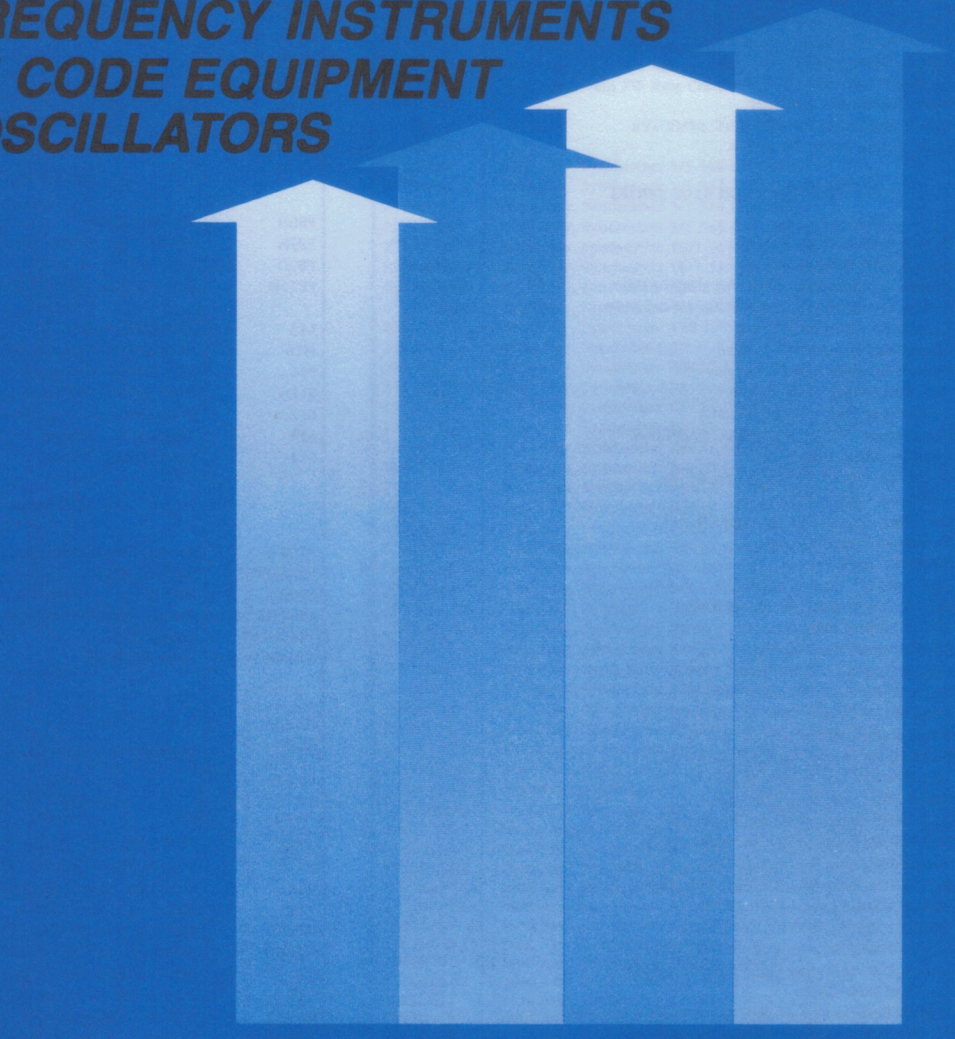
U.S. DOMESTIC

PRICE LIST
October 1988

INTEGRATED SYSTEMS
TIME & FREQUENCY INSTRUMENTS
TIME CODE EQUIPMENT
CRYSTAL OSCILLATORS



AUSTRON INC.
a DATUM company

TIME CODE INSTRUMENTS

MODEL	DESCRIPTION	UNIT PRICE
5281	Remote Display, D/H/M/S UP/DN .43″ Digit	$1,140.00
5282	Remote Display, Total Seconds UP/DN .43″ Digit	$1,140.00
5483	Remote Display, D/H/M/S and Total Seconds UP/DN .43″ Digit	$2,160.00
5581	Remote Display, D/H/M/S UP/DN 2″ Digit	$2,640.00
5582	Remote Display, Total Seconds UP/DN, 2″ Digit	$2,575.00
	8100 SERIES	
8110	Digital Clock	$2,565.00
8120	Time Code Generator	$3,180.00
8132	Time Code Reader	$3,650.00
8134	Time Code Reader/Tape Search Unit	$5,940.00
8152	Time Code Generator/Reader	$4,315.00
8154	Time Code Generator/Reader/Tape Search	$7,565.00
8155	Synchronized Time Code Generator	$4,995.00
8180	Remote Display, H/M/S 1″ Digit	$1,695.00
8181	Remote Display, H/M/S 1″ Digit	$1,505.00
8190A	Pulse Distribution Amplifier	$1,920.00
10308672	Quad Input Buffer for 8190A	$ 600.00
10308673	Quad Output Buffer for 8190A	$ 600.00
	OPTIONS FOR 8100 SERIES	
A12A	Type A Slow Code (H/M/S)	Note: Prices
A12B	Type B Slow Code (D/H/M/S)	available
A15	Buffers, Input/Output, H/M/S for Model 8180	upon
A15A	Buffers, Input/Output, D/H/M/S for Model 8180	request.
A16	Control Bit Insertion (45 Bits)	
A16C	Control Bit Translation (45 Bits)	
A16D	Control Bit Translation & Display	
A17	Coincidence Out, 6 Digit, H/M/S	
A17B	Coincidence Out, 9 Digit, D/H/M/S	
A17C	Coincidence Out, 12 Digit, D/H/M/S/Millisec	
A21	Computer Read Command	
B11	Oscillator, Crystal (Except Model 8154)	
B12	Oscillator, Crystal (8110)	
B13	Oscillator, Crystal (Except Model 8154)	
B14	Oscillator, Zero Warm-up	
B17	Flywheel Oscillator	
C11	IRIG A/10 kHz in Lieu of IRIG B	
C11Q	IRIG A Output Code for Model 8155	
C12A	IRIG B/17-Bit Binary Seconds	
C12B	Parallel Binary Seconds Out	
C12Q	IRIG B Output Code for Model 8155	
C17	NASA 28-Bit Code in Lieu of IRIG B	
C17Q	NASA 28-Bit Output Code for Model 8155	
C18	NASA 36-Bit Code in Lieu of IRIG B	
C18Q	NASA 36-Bit Output Code for Model 8155	
C26	XR3 250 Hz Code in Lieu of IRIG B	
C26A	XR3 1 kHz Code in Lieu of IRIG B	
C26P	XR3 1 kHz Output Code for Model 8155	
C26Q	XR3 250 Hz Output Code for Model 8155	
C41	Switch Selectable IRIG A/B Codes	
C47	Switch Selectable XR3 250 Hz/1 kHz Codes	
C48	IRIG H 100 Hz Code in Lieu of IRIG B	
C48A	IRIG H 1 kHz Code in Lieu of IRIG B	
C48P	IRIG H 1 kHz Output Code for Model 8155	
C48Q	IRIG H 100 Hz Output Code for Model 8155	
C49	Universal IRIG Codes	
C50	WWVB Code in Lieu of IRIG B for Model 8155 Input	
D11	Parallel BCD Output H/M/S (For Model 8181)	
D11D	Parallel BCD Output D/H/M/S (For Model 8181)	
D14-X	20-Bit Buffer Register	
D15	BCD Outputs, H/M/S	
D15A	BCD Outputs, Days/ID	
	IEEE-488 INTERFACE, TIME ON DEMAND	
D20	Hr, Min, Sec	
D21	Hr, Min, Sec, & Millisec	
D22	Day, Hr, Min, & Sec	
D23	Day, Hr, Min, Sec, & Millisec	
	RS232 INTERFACE, TIME ON DEMAND	
D30	Hr, Min, & Sec	
D31	Hr, Min, Sec, & Millisec	
D32	Day, Hr, Min, & Sec	
D33	Day, Hr, Min, Sec, & Millisec	
E13	Days/ID Number	
E14	Parallel BCD Output—Millisec	
E14A	Parallel BCD Output—Millisec for Model 8134 & Model 8154	

TIME CODE INSTRUMENTS (Continued)

MODEL	DESCRIPTION	UNIT PRICE
	RS232 INTERFACE, TIME ON DEMAND (Continued)	
E14	Search to Millisec For Model 8134 & Model 8154	
E16	Remote Tape Speed Select	
E17	Simultaneous Generate/Read, 6-Digit	
E17A	Simultaneous Generate/Read, 9-Digit	
E19	Search for TOD/DOY/Both (Must Have Opt E13)	
E20	Days for Model 8155	
E22	Generate Preset for Model 8155 (H/M/S)	
E22A	Generate Preset for Model 8155 (D/H/M/S)	
E25	Calendar Clock for Model 8110	
	COMPUTER INTERFACE, SEARCH (SPECIFY COMPUTER I/O ARRANGEMENT)	
FC6H	Hr, Min, & Sec	
FC9H	Hr, Min, Sec, & Millisec	
FC9D	Day, Hr, Min, & Sec	
FC12D	Day, Hr, Min, Sec, & Millisec	
	IEEE-488 INTERFACE, SEARCH	
FE6H	Hr, Min, & Sec	
FE9H	Hr, Min, Sec, & Millisec	
FE9D	Day, Hr, Min, & Sec	
FE12D	Day, Hr, Min, Sec, & Millisec	
L13	20–50 Vdc Power	
M16	Ceiling/Wall Mount for Model 8180 & Model 8181	
S11	EXT Synchronization	
S11A	WWV SYNC, W/Prop Delay	
S12	Propagation Delay for Model 8155	
S13	Analog Filter, Manual	
S14	Analog Filter, Remote	
	ACCESSORIES FOR 8100 SERIES	
8198-4	Battery Pack, 4 Amp Hrs	$2,380.00
8198-0401	Battery Pack	$2,515.00
8198-8	Battery Pack, 8 Amp Hrs	$2,960.00
8198-12	Battery Pack, 12 Amp Hrs	$3,525.00
11400453	Chassis Slides	$ 160.00
11008613-( )	Mounting Plate	$ 190.00
	8500 SERIES	
8526	Portable Time Code Generator	$5,255.00
	OPTIONS FOR 8526 SERIES	
A11E	IRIG E DC Code Output	Note: Prices
A12B	Type B Slow Code, One Rate	available
B14	Oscillator, Zero Warm-up	upon
C11	IRIG A in Lieu of IRIG B	request.
C26	XR3/250 Hz in Lieu of IRIG B	
C26A	XR3/1 kHz in Lieu of IRIG B	
C41	IRIG A/IRIG B Sw. Select	
C48	IRIG H 100 Hz in Lieu of IRIG B	
C48A	IRIG H 1 kHz in Lieu of IRIG B	
E14	Parallel BCD Output, Millisec	
E15	Parallel BCD Output, D/H/M/S	
L14A	Internal Battery	
L14B	Dual Internal Battery	
M13	Airborne Package	
S11	Advance Retard Control	
S19A	IRIG B Synchronize	
	8700 SERIES (SPECIFY TIME CODE AND MOUNTING ARRANGEMENT)	
8720	Compact Time Code Generator	$2,190.00
8730	Compact Time Code Reader	$2,190.00
8720/8730	Time Code Generator/Reader	$4,160.00
8781	Serial Remote Display	$ 995.00
	OPTIONS AND ACCESSORIES FOR 8700 SERIES	
A17	Coincident Outputs	
D15	Parallel BCD Output, D/H/M/S	
E14	Parallel BCD Output, Millisec	
L14	Internal Battery Pack for Model 8720	

1295D DISTRIBUTION CHASSIS

PART NUMBER	DESCRIPTION		UNIT PRICE
	MAINFRAMES		
30411392	Mainframe With AC/DC Single Regulator		$2,155.00
30411392-1	Mainframe With DC-Only, Negative Ground		$1,995.00
30411392-2	Mainframe With AC/DC Dual Regulator		$2,820.00
30411392-3	Mainframe With DC-Only, Dual Regulator, Negative Ground		$2,660.00
30411392-4	Mainframe With DC-Only, Positive Ground		$1,995.00
30411392-5	Mainframe With DC-Only, Dual Regulator, Positive Ground		$2,820.00
	ADDITIONAL POWER/REGULATOR/ALARM MODULES FOR MAINFRAMES ABOVE		
23411342	Regulator Module		$ 665.00
23411350	AC/DC Power Input Module		$ 630.00
23411355	DC-Only Power Input Module, Negative Ground		$ 525.00
23411355-1	DC-Only Power Input Module, Positive Ground		$ 525.00
10911487	Alarm Indicator Assembly		$1,155.00
10911487-1	Alarm Indicator Assembly for Dual Supply		$1,155.00
	OUTPUT MODULES		
23499396	Mod Assy, Quad WB Amplifier (100k-10 MHz) (BUS/BNC)	1–3	$ 635.00
23499396-1	Mod Assy, Quad WB Amplifier (Lo Freq) (BUS/BNC)	4–6	$ 570.00
23499396-2	Mod Assy, Quad WB Amplifier (BUS/TWX)	7–Up	$ 505.00
23499396-3	Mod Assy, Quad WB Amplifier (BUS/TWX)		
23499396-4	Mod Assy, Quad WB Amplifier (BUS/BNC)		
23499396-10	Mod Assy, Quad WB Amplifier (BUS/WW)		
23499396-12	Mod Assy, Quad WB Amplifier (BUS/WW)		
23499396-13	Mod Assy, Quad WB Amplifier (BUS/WW)		
23410093	Mod Assy, Quad Time Code Output (BUS/BNC)		
23410140	Mod Assy, Quad RS422 Output (BUS/TWX)		
23410140-1	Mod Assy, Quad RS422 Output (BUS/WW)		
23411085-1	Mod Assy, Composite Clock Out (BUS/TWX)		
23411085-2	Mod Assy, Composite Clock Out (BUS/WW)		
23411123	Mod Assy, Quad V.35 Output (BUS/TWX)		
23411123-1	Mod Assy, Quad V.35 Output (BUS/WW)		
23411560	Mod Assy, Quad High Isolation (SMA/SMA)		
23411589	Mod Assy, Quad G.703 (BUS/TWX)		
23411589-1	Mod Assy, Quad G.703 (BUS/WW)		
23411589-2	Mod Assy, Quad G.703 (BUS/BNC)		
23411632	Mod Assy, Quad TTL (BUS/BNC)		
	INPUT MODULES		
23498935	Mod Assy, Low Noise Wideband Input (BNC/BUS)		$ 510.00
23498935-1	Mod Assy, Dual Low Noise Wideband Input (BNC/BUS)		$ 685.00
23499757	Mod Assy, Time Code Input (BNC/BUS)		$1,030.00
23499757-1	Mod Assy, Time Code Input Non-AGC (BNC/BUS)		$ 685.00
23499880	Mod Assy, 10dB Combiner (BNC/BNC)		$ 535.00
	CONVERTER/BUFFER MODULES		
23410774-1	Mod Assy, Converter/Buffer (BI-P/422) (BNC/BUS)		$ 685.00
23410774-2	Mod Assy, Converter/Buffer (AMI/422) (TWX/BUS)		$ 685.00
23410774-3	Mod Assy, Converter/Buffer (422/422) (TWX/TWX)		$ 685.00
23410774-4	Mod Assy, Converter/Buffer (BI-P/BI-P) (BNC/BUS)		$ 685.00
23410774-5	Mod Assy, Converter/Buffer (AMI/BI-P) (TWX/BUS)		$ 685.00
23410774-6	Mod Assy, Converter/Buffer (422/BI-P) (TWX/BUS)		$ 685.00
23410774-7	Mod Assy, Converter/Buffer (BI-P/AMI) (BNC/BUS)		$ 685.00
23410774-8	Mod Assy, Converter/Buffer (AMI/AMI) (TWX/BUS)		$ 685.00
23410774-9	Mod Assy, Converter/Buffer (422/AMI) (TWX/BUS)		$ 685.00
	SCALER/BUFFER MODULES		
23498217	Mod Assy, 1/.1 MHz Scaler (BNC/BUS)		$ 685.00
23498441	Mod Assy, 5/5 & 1 MHz Scaler/Buffer (BNC/BUS)		$ 685.00
23498448	Mod Assy, 5/10 & 5 MHz Scaler/Buffer (BNC/BUS)		$ 685.00
23498612	Mod Assy, 1.544 MHz Buffer (BNC/BUS)		$ 685.00
23498619	Mod Assy, 5 & 1 MHz Dual Buffer (BNC/BUS)		$ 685.00
23498644	Mod Assy, 5/10 & 1 MHz Scaler/Buffer (BNC/BUS)		$ 685.00
23498661	Mod Assy, 10 & 1 MHz Dual Buffer (BNC/BUS)		$ 685.00
23498774	Mod Assy, 1 MHz Buffer (BNC/BUS)		$ 685.00
23498778	Mod Assy, 5 MHz Buffer (BNC/BUS)		$ 685.00
23498870	Mod Assy, 10 MHz Buffer (BNC/BUS)		$ 685.00
23498874	Mod Assy, 10/1 MHz Scaler (BNC/BUS)		$ 685.00
23498878	Mod Assy, 1 MHz/1 kHz Scaler (BNC/BUS)		$ 685.00
23498886	Mod Assy, 10/10 & 1 MHz Scaler (BNC/BUS)		$ 685.00
23410478	Mod Assy, 10/5 MHz Scaler (BNC/BUS)		$ 685.00
23411444	Mod Assy, 1 MHz/2 MHz Scaler (BNC/BUS)		$ 685.00
	GENERATOR/CLOCK RECOVERY MODULES		
23410947	Mod Assy, Composite Clock Generator (BUS/BUS)		$1,030.00
23410947-1	Mod Assy, Composite Clock Generator (BNC/BUS)		$1,030.00
23410947-2	Mod Assy, Composite Clock Generator (TWX/BUS)		$1,030.00
23411072	Mod Assy, Framed T1 Generator (TTJ/BUS)		$1,030.00
23411072-1	Mod Assy, Framed T1 Generator (BNC/BUS)		$1,030.00
23411072-2	Mod Assy, Framed T1 Generator (TWX/BUS)		$1,030.00
23411072-3	Mod Assy, Framed T1 Generator (BUS/BUS)		$1,030.00
23411078	Mod Assy, Clock Recovery (TTJ/BUS)		$1,030.00
23411078-1	Mod Assy, Clock Recovery (TTJ/BNC)		$1,030.00
23411078-2	Mod Assy, Clock Recovery (TTJ/I/O)		$1,030.00
23411078-3	Mod Assy, Clock Recovery (TWX/BUS)		$1,030.00
23411078-4	Mod Assy, Clock Recovery (TWX/TWX)		$1,030.00
23411078-5	Mod Assy, Clock Recovery (TWX/BNC)		$1,030.00
23411078-6	Mod Assy, Clock Recovery (BRIDGED BANTAMS)		$1,030.00
23411078-7	Mod Assy, Clock Recovery (BRIDGED TWXs)		$1,030.00

1295D DISTRIBUTION CHASSIS (Continued)

PART NUMBER	DESCRIPTION		UNIT PRICE
	AUTO SWITCHOVER MODULES		
23410202	Mod Assy, Auto Switchover (BNC/BNC)		$ 505.00
23410202-1	Mod Assy, Auto Switchover (BNC/BUS)		$ 505.00
23410202-2	Mod Assy, Auto Switchover (BUS/BUS)		$ 505.00
23410202-3	Mod Assy, Auto Switchover (BUS/BNC)		$ 505.00
23410202-4	Mod Assy, Auto Switchover Balanced Line (TWX/TWX)		$ 505.00
23410202-5	Mod Assy, Auto SW Balanced (BUS/BUS)		$ 505.00
23410202-6	Mod Assy, Auto SW Balanced (TWX/BUS)		$ 505.00
23410202-7	Mod Assy, Auto SW Balanced (BUS/TWX)		$ 505.00
23410836	Mod Assy, Auto Switchover/Remote Control (BNC/BNC)		$ 685.00
23410836-1	Mod Assy, Auto SW Rmt Control (BNC/BUS)	2 Slots	$ 685.00
23410836-2	Mod Assy, Auto SW Rmt Control (BUS/BUS)	2 Slots	$ 685.00
23410836-3	Mod Assy, Auto SW Rmt Control (BUS/BNC)	2 Slots	$ 685.00
23410836-4	Mod Assy, Auto SW Rmt Control Bal (TWX/TWX)	2 Slots	$ 685.00
23410836-5	Mod Assy, Auto SW Rmt Control Bal (BUS/BUS)	2 Slots	$ 685.00
23410836-6	Mod Assy, Auto SW Rmt Control Bal (TWX/BUS)	2 Slots	$ 685.00
23410836-7	Mod Assy, Auto SW Rmt Control Bal (BUS/TWX)	2 Slots	$ 685.00
	SYNTHESIZER MODULES		
23498882	Mod Assy, Synthesizer 1/1.544 (BNC/BUS)		$1,030.00
23498882-1	Mod Assy, Synthesizer 1/1.544 DS1-AMI (BNC/BUS)		$1,030.00
23499033	Mod Assy, Synthesizer 5/1.544 (BNC/BUS)		$1,030.00
23499033-1	Mod Assy, Synthesizer 5/1.544 DS1-AMI (BNC/BUS)		$1,030.00
23499034	Mod Assy, Synthesizer 10/1.544 (BNC/BUS)		$1,030.00
23499034-1	Mod Assy, Synthesizer 10/1.544 AMI (BNC/BUS)		$1,030.00
23499035	Mod Assy, Synthesizer 308 kHz/1 (BNC/BUS)		$1,030.00
23499401	Mod Assy, Synthesizer 1/564 kHz (BNC/BUS)		$1,030.00
23499793	Mod Assy, Synthesizer 128 kHz/5 (BNC/BUS)		$1,030.00
23499871	Mod Assy, Synthesizer 1/1.024 (BNC/BUS)		$1,030.00
23410125	Mod Assy, Synthesizer RS422 1/12.928 (BNC/BUS)		$1,030.00
23410125-1	Mod Assy, Synthesizer RS422 1/9.696 (BNC/BUS)		$1,030.00
23410125-2	Mod Assy, Synthesizer RS422 1/6.464 (BNC/BUS)		$1,030.00
23410125-3	Mod Assy, Synthesizer RS422 1/3.232 (BNC/BUS)		$1,030.00
23410125-4	Mod Assy, Synthesizer RS422 1/5 (BNC/BUS)		$1,030.00
23410125-5	Mod Assy, Synthesizer RS422 1/2.048 (BNC/BUS)		$1,030.00
23410125-6	Mod Assy, Synthesizer RS422 1/1.544 (BNC/BUS)		$1,030.00
23410125-7	Mod Assy, Synthesizer RS422 10/2.048 (BNC/BUS)		$1,030.00
23410125-8	Mod Assy, Synthesizer RS422 10/1.544 (BNC/BUS)		$1,030.00
23410125-9	Mod Assy, Synthesizer RS422 5/2.048 (BNC/BUS)		$1,030.00
23410125-10	Mod Assy, Synthesizer RS422 5/1.544 (BNC/BUS)		$1,030.00
23410125-11	Mod Assy, Synthesizer RS422 10/1.024 (BNC/BUS)		$1,030.00
23410125-12	Mod Assy, Synthesizer RS422 10/512 kHz (BNC/BUS)		$1,030.00
23410125-13	Mod Assy, Synthesizer RS422 10/772 kHz (BNC/BUS)		$1,030.00
23410125-14	Mod Assy, Synthesizer RS422 10/1.536 (BNC/BUS)		$1,030.00
23410125-15	Mod Assy, Synthesizer RS422 10/1.152 (BNC/BUS)		$1,030.00
23410236	Mod Assy, Synthesizer RS422 1/64 kHz (BNC/BUS)		$1,030.00
23410236-1	Mod Assy, Synthesizer RS422 1/56 kHz (BNC/BUS)		$1,030.00
23410236-2	Mod Assy, Synthesizer RS422 1/19.2 kHz (BNC/BUS)		$1,030.00
23410236-3	Mod Assy, Synthesizer RS422 1/16.8 kHz (BNC/BUS)		$1,030.00
23410236-4	Mod Assy, Synthesizer RS422 1/14.4 kHz (BNC/BUS)		$1,030.00
23410236-5	Mod Assy, Synthesizer RS422 1/9.6 kHz (BNC/BUS)		$1,030.00
23410236-6	Mod Assy, Synthesizer RS422 1/256 kHz (BNC/BUS)		$1,030.00
23410236-7	Mod Assy, Synthesizer RS422 1/4 kHz (BNC/BUS)		$1,030.00
23410236-8	Mod Assy, Synthesizer RS422 1/128 kHz (BNC/BUS)		$1,030.00
23410236-9	Mod Assy, Synthesizer RS422 1/4.8 kHz (BNC/BUS)		$1,030.00
23410236-10	Mod Assy, Synthesizer RS422 1/2.4 kHz (BNC/BUS)		$1,030.00
23410236-11	Mod Assy, Synthesizer RS422 1/1.2 kHz (BNC/BUS)		$1,030.00
23410236-12	Mod Assy, Synthesizer RS422 1/224 kHz (BNC/BUS)		$1,030.00
23410236-13	Mod Assy, Synthesizer RS422 1/280 kHz (BNC/BUS)		$1,030.00
23410382	Mod Assy, Synthesizer 1/2.048 (BNC/BUS)		$1,030.00
23410382-1	Mod Assy, Synthesizer 1/2.048 AMI (BNC/BUS)		$1,030.00
23410432	Mod Assy, Synthesizer 56 kHz/1 (BNC/BUS)		$1,030.00
23410432-1	Mod Assy, Synthesizer 56 kHz/5 (BNC/BUS)		$1,030.00
23410434	Mod Assy, Synthesizer 1.544/1 (BNC/BUS)		$1,030.00
23410434-1	Mod Assy, Synthesizer 1.544/5 (BNC/BUS)		$1,030.00
23410796	Mod Assy, Synthesizer RS422 5/56 kHz (BNC/BUS)		$1,030.00
23410796-1	Mod Assy, Synthesizer RS422 5/8 kHz (BNC/BUS)		$1,030.00
23410796-2	Mod Assy, Synthesizer RS422 5/60 kHz (BNC/BUS)		$1,030.00
23410812	Mod Assy, Synthesizer 8 kHz/5 (BNC/BUS)		$1,030.00
23411037	Mod Assy, Synthesizer RS422 10/64 kHz (BNC/BUS)		$1,030.00
23411037-1	Mod Assy, Synthesizer RS422 10/56 kHz (BNC/BUS)		$1,030.00
23411037-2	Mod Assy, Synthesizer RS422 10/256 kHz (BNC/BUS)		$1,030.00
23411037-3	Mod Assy, Synthesizer RS422 10/9.6 kHz (BNC/BUS)		$1,030.00
23411037-4	Mod Assy, Synthesizer RS422 10/224 kHz (BNC/BUS)		$1,030.00
23411037-5	Mod Assy, Synthesizer RS422 10/280 kHz (BNC/BUS)		$1,030.00
23411096	Mod Assy, Synthesizer Framed T1 (TTJ/BUS)		$1,030.00
23411096-1	Mod Assy, Synthesizer Framed T1 (BNC/BUS)		$1,030.00
23411096-2	Mod Assy, Synthesizer Framed T1 (TWX/BUS)		$1,030.00
23411096-3	Mod Assy, Synthesizer Framed T1 (BUS/BUS)		$1,030.00
23411106	Mod Assy, Synthesizer T2 (6.312 MHz) (BNC/BUS)		$1,030.00
23411321	Mod Assy, Synthesizer 10/768 kHz (BNC/BUS)		$1,030.00
23411322	Mod Assy, Synthesizer 1/308 kHz (BNC/BUS)		$1,030.00
23411644	Mod Assy, Synthesizer 10/64 kHz (BNC/TWX)		$1,030.00
23411644-1	Mod Assy, Synthesizer 10/56 kHz (BNC/TWX)		$1,030.00
23411644-2	Mod Assy, Synthesizer 10/256 kHz (BNC/TWX)		$1,030.00
23411644-3	Mod Assy, Synthesizer 10/9.6 kHz (BNC/TWX)		$1,030.00
23411644-4	Mod Assy, Synthesizer 10/224 kHz (BNC/TWX)		$1,030.00
23411644-5	Mod Assy, Synthesizer 10/280 KhZ (BNC/TWX)		$1,030.00
23411645	Mod Assy, Synthesizer RS422 10/2.048 (BNC/TWX)		$1,030.00
23411645-1	Mod Assy, Synthesizer RS422 10/1.544 (BNC/TWX)		$1,030.00

1295D DISTRIBUTION CHASSIS (Continued)

PART NUMBER	DESCRIPTION		UNIT PRICE
	OSCILLATOR/PHASE LOCKED LOOP MODULES		
23411419	Mod Assy, Rubidium Oscillator (BUS or BNC Output)	3 Slots	$5,040.00
23411532	Mod Assy, 10 MHz Digital Hold PLL (BUS or BNC Output)	3 Slots	$2,520.00
23411532-1	Mod Assy, 5 MHz Digital Hold PLL (BUS or BNC Output)	3 Slots	$2,520.00
23411532-2	Mod Assy, 6.312 MHz Digital Hold PLL (BUS or BNC Output)	3 Slots	$2,520.00
23411549	Mod Assy, Rubidium PLL (BUS or BNC Output)	4 Slots	$5,460.00
23411619	Mod Assy, 1.544 MHz 1121 PLL (BUS or BNC Output)	3 Slots	$2,850.00
23411619-1	Mod Assy, 2.148 MHz 1121 PLL (BUS or BNC Output)	3 Slots	$2,850.00
	FIBER OPTIC MODULES		
23411259	Mod Assy, Digital Fiber Optic Transmitter (BUS/FO)		$1,030.00
23411259-1	Mod Assy, Digital Fiber Optic Transmitter (BNC/FO)		$1,030.00
23411261	Mod Assy, Digital Fiber Optic Receiver (FO/BUS)		$1,030.00
23411261-1	Mod Assy, Digital Fiber Optic Receiver (FO/BNC)		$1,030.00
	FILTER MODULES		
23410127	Mod Assy, Filter 564 kHz (BUS/BUS)		$ 510.00
23410127-1	Mod Assy, Filter 308 kHz (BUS/BUS)		$ 510.00

TIME/FREQUENCY INSTRUMENTS

MODEL	DESCRIPTION	UNIT PRICE
1048	Converter, 50 to 60 Hz (for 1201A or 1201B Recorder Motor Only)	$ 820.00
1201B	Linear Phase Recorder, 60 Hz	$ 2,415.00
1201B	Linear Phase Recorder, 50/60 Hz	$ 2,975.00
1210D-( )	Portable Crystal Clock	$ 8,685.00
1250A	Crystal Frequency Standard	$ 6,285.00
1250B	Crystal Frequency Standard	$ 6,505.00
1270A	Alarm Panel	$ 1,735.00
1290A	Standby Power Supply	$ 4,410.00
1295D	Distribution Amplifier	See 1295D Price List
1324	DC/DC Converter	$ 3,310.00
1324-1	DC/DC Converter	$ 3,310.00
2000C	Loran-C Receiver	$13,440.00
2010B	Disciplined Frequency Standard	$ 7,530.00
2021L	Loran-C Loop Antenna	$ 335.00
2026W	Loran-C Whip Antenna	$ 430.00
2055A	Phase Microstepper	$ 7,825.00
2080	VLF/LF Multicoupler (Unbalanced)	$ 3,140.00
2084	LF Multifilter	$ 4,085.00
2100	Loran-C Automatic Timing Receiver	$11,550.00
2100F	Loran-C Automatic Frequency Monitor	$ 7,180.00
2100R	Loran-C Automatic Frequency Reference	$ 6,615.00
OPTIONAL	IEEE-488 Bus Option for 2100, 2100F, or 2100R	$ 605.00
2110	Disciplined Frequency Standard	$10,070.00
2112	Disciplined Rubidium Frequency Standard	$13,220.00
OPTIONAL	IEEE-488 Bus Option for 2110 & 2112	$ 605.00
OPTIONAL	Dual Reference Input Option for 2110 & 2112	$ 1,365.00
OPTIONAL	Internal Battery Backup Option for 2110 & 2112	$ 315.00
OPTIONAL	100 kHz Sine Wave Output Option for 2110 & 2112	$ 1,050.00
2310	Disciplined Cesium Beam Frequency Standard	$36,750.00
Option 001	Stand-By Power Supply	$ 1,050.00
Option 002	Low Phase Noise Option	$ 3,360.00
Option 003	RS232 Interface	$ 605.00
Option 004	IEEE-488 Interface	$ 605.00
Option 005	Special Frequencies	On Request
6014	Frequency Multiplier	$ 5,015.00
6014B	Frequency Multiplier	$ 8,715.00
6016	Frequency Multiplier	$ 4,925.00

HIGH STABILITY CRYSTAL OSCILLATORS

MODEL	DESCRIPTION	UNIT PRICE
1100-5	1 MHz or 5 MHz Compact 5×10^{-9} Aging	$ 705.00
1100-2	1 MHz or 5 MHz Compact 2×10^{-9} Aging	$ 750.00
1100-1	1 MHz or 5 MHz Compact 1×10^{-9} Aging	$ 825.00
1105-5	1 MHz TTL Logic Output 5×10^{-9} Aging	$ 705.00
1105-2	1 MHz TTL Logic Output 2×10^{-9} Aging	$ 750.00
1105-1	1 MHz TTL Logic Output 1×10^{-9} Aging	$ 825.00
1111	10 MHz, Compact, Low Phase Noise, Fast Warm-up	$1,575.00
1115	5 MHz Minimal Power Drain	$ 900.00
1120-5	1, 5, or 10 MHz Versatile 5×10^{-9} Aging	$ 705.00
1120-2	1, 5, or 10 MHz Versatile 2×10^{-9} Aging	$ 750.00
1120-1	1, 5, or 10 MHz Versatile 1×10^{-9} Aging	$ 825.00
1120FW	5 MHz Fast Warm-up 5×10^{-9} Aging	$ 880.00
1120L	5 MHz or 10 MHz Low Phase Noise	$1,150.00
1120PLL	5 MHz Phase Locked Loop	$ 880.00
1150	5 MHz Maximum Stability Crystal Oscillator	$2,590.00
1151	10 MHz Maximum Stability Crystal Oscillator	$1,325.00
	NOTE: These prices are for Austron standard frequency oscillators (1, 5, or 10 MHz) manufactured to Austron standard part number specifications. For any nonstandard frequency, wiring, size, environmental, or testing requirements, contact Product Marketing Manager for pricing.	

CONNECTOR CODES

BNC = BNC
BUS = INTERNAL 1295D BUS
TWX = TWIN BNC
FO = FIBER OPTIC, SMA-TYPE
WW = WIRE WRAP
TTJ = BANTAM PHONE JACK

DELIVERY: F.O.B. Austin, Texas
TERMS: Net 30 Days (With Established Credit)
Effective October 15, 1988
Supercedes All Previous Price Lists
Subject To Change Without Notice

Standard Government Charges
DD250 Preparation: $100.00 Per Contract
Government Source Inspection: $250.00 Per Contract
Bar Code (Logmars): $75.00 Per Contract
Military Packaging (Barrier Bag): $20.00 Per Item

AUSTRON, Inc.
P.O. Box 14766
Austin, TX 78761-4766
(512) 251-2313
TWX (910) 874-1356
FAX (512) 251-9685

AUSTRON, Inc.
1930 Isaac Newton Sq.
Suite 111
Reston, VA 22909
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FAX (703) 689-4648

Represented by:

FREQUENCY AND TIME SYSTEMS, INC.
34 Tozer Rd.
Beverly, MA 01915-5510
Toll Free: 1-800-544-0233
(508) 927-8220

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October 4, 1984

NEW PRODUCTS

INSTRUMENTS

Frequency standard holds drift to 10^{-11}/day, can use 2 external references

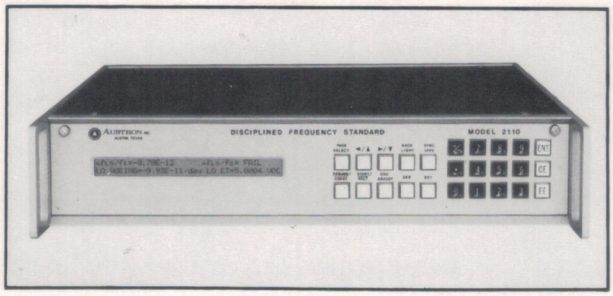
The first microprocessor-controlled frequency standard automatically locks the frequency of its ovenized quartz-crystal oscillator onto an externally applied reference of 1, 5, or 10 MHz (100 kHz optional) and drifts no more than 1 part in 10^{11} per day without an external reference.

Because it is microprocessor-controlled, the unit, called the 2110 disciplined frequency standard by its maker, Austron, offers several unique features. Probably the most important is the optional ability to make use of two references at the same time. Others are a third-order servo oscillator control system, an eight-character liquid-crystal display, continuous correction after the reference is removed, and an IEEE-488 interface.

Heather Bryce

By being able to handle two references at once, the 2110 ensures greater reliability than other frequency standards, since its ability to deal with noise is enhanced. For example, the primary/secondary mode uses the primary reference until a fault is perceived, at which time the 2110 will lock onto the secondary reference. In the statistical combination mode, both references are used at all times and statistical computations determine by weight which reference should be followed more closely. These modes also increase the overall reliability of the system.

Thanks to its highly precise ovenized crystal-controlled oscillator, the standard also has impressive open-loop performance. Its guaranteed drift rate of 1 part in 10^{11} per day after the external reference fails or is removed contrasts sharply with a guaranteed rate of less than 5 parts in 10^{11} per day for other units.



The microprocessor performs third-order integration, creating a third-order servo oscillator control system. Other systems stop at first- or second-order integration control. (This system accuracy is the key to continuous correction of the oscillator frequency even with the external reference removed.)

The LCD, which replaces the traditional meter, shows such information as statistical measurement and status parameters, making it easy to detect a failure. It also prompts the user for the inputs required and shows multiple pages that the user may scroll up and down. Function switches and a front-panel keyboard program the display.

The frequency standard is available in 120 days and costs $8700. The dual-reference input costs $1300, and the 100-kHz sine-wave output option $1000.

Austron Inc., PO Box 14766, Austin, Texas 78761; (512) 251-2313.

Oscillator offers reference retrofit

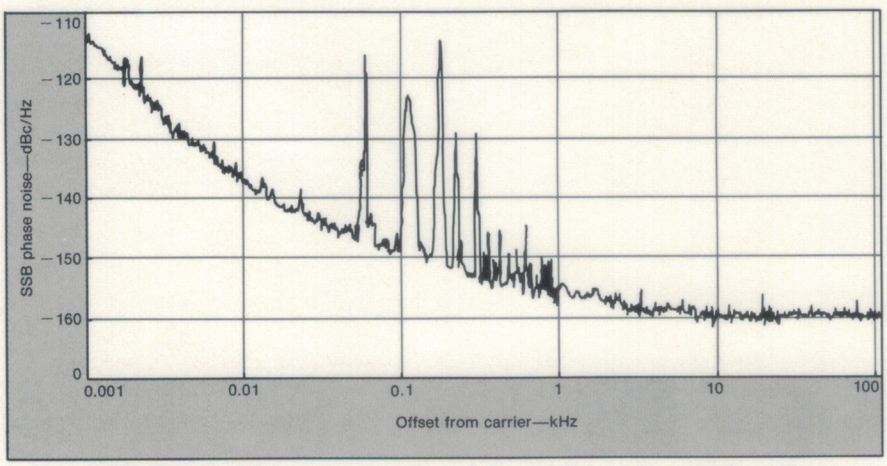
This 10-MHz crystal oscillator replaces the old HP 10811A reference source with improved SSB phase-noise performance.

THE model 1111 reference oscillator from Austron, Inc., is an excellent replacement for the discontinued Hewlett-Packard HP 10811A. The new oscillator combines advanced crystal technology with an efficient oven design for fast warmups and good frequency stability with temperature. A standard model 1111 operates at 10 MHz, although other frequencies are optional. It stabilizes to within 5×10^{-9} of its final frequency after only a 10-min warmup.

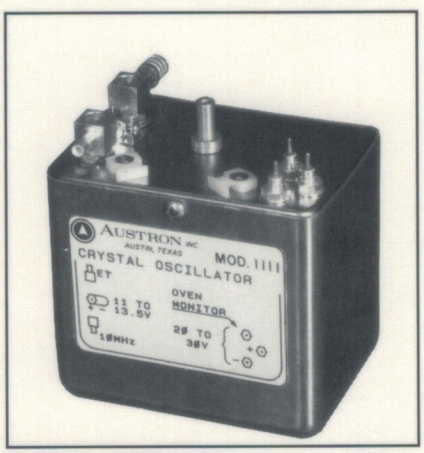
The crystal oscillator has superb SSB phase-noise performance (as measured on the Hewlett-Packard HP 3047A test set), even at offsets as close as 1 Hz (Fig. 1). The manufacturer specifies the phase noise as −120 dBc/Hz for 10-Hz offsets and −160 dBc/Hz for 10-kHz offsets.

The model 1111 generates output voltages of 0.55±0.50 V RMS into a 50-Ω load and 1.0±0.2 V RMS into a 1-kΩ load, exactly matching the voltage specifications of the HP 10811A. The aging rate of the 1111 is better than 5×10^{-10} after a 24-hr warmup period. The 10-MHz frequency changes less than 1×10^{-10} for a 1-percent variation in the oscillator supply voltage. The frequency stability is rated as less than 5×10^{-10} for a 10-percent variation in the oven supply voltage. The frequency stability with temperature is better than 4.5×10^{-9} from −55 to +71°C and better than 2.5×10^{-9} from 0 to +71°C. The oscillator's output frequency changes less than 5×10^{-10} for a ±10-percent load change into 50 Ω.

The reference source requires an oscillator supply of 11.0 to 13.5 VDC at 22 mA (30 mA maximum) and an oven supply of +20 to +340 VDC maximum, with 15-W power consumption during warmup and 2-W power consumption when operating at +25°C after warmup. The oscillator is equipped with an 18-turn control for mechanical tuning over a ±10-Hz range. P&A: $1500; 60 days. **Austron, Inc., P.O. Box 14766, Austin, TX 78761-4766; (512) 251-2313, TWX: 910-874-1356.**



1. The SSB phase noise *characteristics of the model 1111 crystal oscillator are specified at −120 dBc/Hz for 10-Hz offsets and −160 dBc/Hz for 10-kHz offsets.*



2. The model 1111 *measures 2.06 × 2.83 × 2.45 in. and provides a precise electrical and mechanical retrofit for the discontinued HP 10811A source.*

Ron Myers, Product Manager, Austron, Inc., P.O. Box 14766, Austin, TX 78761-4766; (512) 251-2313, TWX: 910-874-1356

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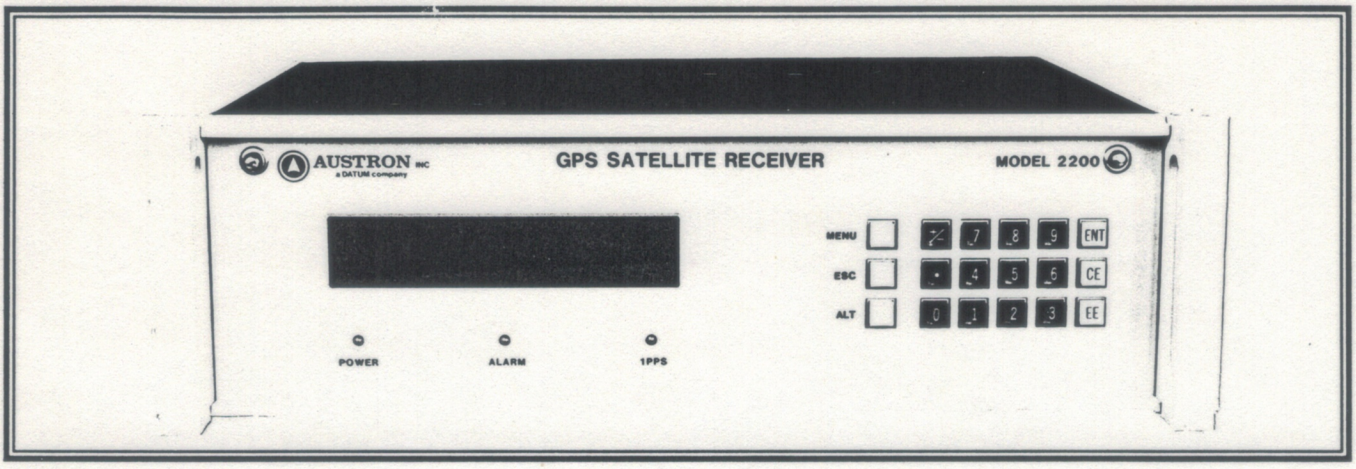


INTRODUCING THE AUSTRON MODEL 2200 GPS SATELLITE RECEIVER

The Austron Model 2200 GPS Satellite Receiver captures the ultimate accuracy of the GPS NAVSTAR satellite L_1, C/A code transmissions. This state-of-the-art receiver provides the best possible time and frequency comparisons between two remote frequency standards and clocks which require synchronization to a common time base. Synchronization of time to the Coordinated Universal Time (UTC) scale is possible through the GPS master clock system to accuracies better than 140 ns*.

State-of-the-art GPS Receiver provides ultimate salellite-driven accuracy in a flexible, user-friendly package.

The Austron Model 2200 GPS Receiver utilizes two 16-bit microprocessors to derive maximum accuracy from the GPS satellite, providing ease of use and flexibility for the operator. Data input/output and receiver set-up are by menu selections from the front panel keyboard or through optional data busses. The user can set up the receiver for fully automatic or semiautomatic operation.

The Model 2200 internal oscillator is either an ovenized quartz crystal oscillator or a rubidium oscillator (optional). An external reference of 1 MHz, 5 MHz, or 10 MHz from a more stable source may be connected to the receiver for increased timing stability.

The accuracy of the external 1 pps signal as compared to UTC or GPS is measured and displayed by the receiver.

APPLICATIONS

- Metrology: Used in combination with Austron Frequency Monitoring Equipment, the Model 2200 provides stable frequencies to parts in 10^{12} accuracy traceable to the National Bureau of Standards (NBS) and United States Naval Observatory (USNO).
- Clock Systems: The Model 2200 acts as an accurate, stable clock for timing applications providing a 1 pps signal synchronized to within 140 ns of UTC.
- Communications Systems: The Model 2200 acts as a frequency source providing reliable timing signals to drive high speed digital communications.

FEATURES

- Global reception of NAVSTAR GPS date, time and correction parameters
- Two 16-bit microprocessors
- Internal ovenized high-stability oscillator
- 4-line X 40-character alphanumeric LCD, programmable via front panel keyboard and function switches
- 1 pps/1 ppm outputs accurate to within 100 ns of GPS, to within 140 ns of UTC (based on undegraded C/A code transmissions)
- Front-panel displays accuracy of external 1 pps vs UTC/GPS
- TTL compatible square wave outputs of 0.1 MHz, 1 MHz, 5 MHz, 10 MHz
- LED indicators provide power, alarm and 1pps status

OPTIONAL FEATURES

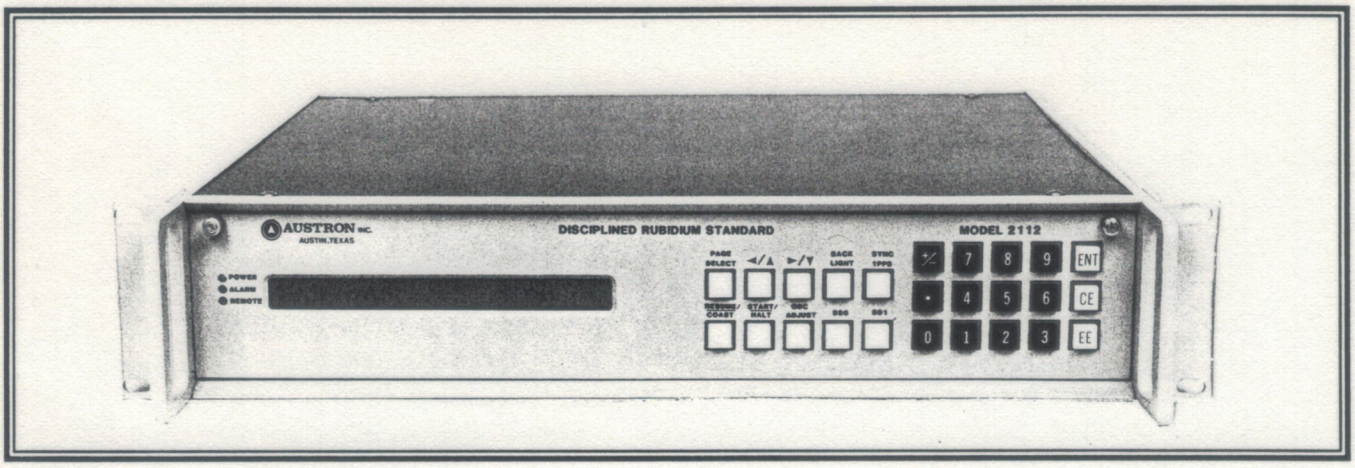
- Remote control via IEEE-488 bus, RS-232 bus, and/or 1200 baud modem port
- Long-term, high-stability Rubidium oscillator package
- Centronix-compatible parallel port

*C/A code not degraded.

AUSTRON, Inc.
a DATUM company

P.O. Box 14766
Austin, Texas 78761

TEL (512) 251-2313
FAX (512) 251-9685



INTRODUCING THE AUSTRON MODEL 2112 DISCIPLINED RUBIDIUM FREQUENCY STANDARD

The Austron Model 2112 Disciplined Rubidium Standard is a state-of-the-art, microprocessor-controlled system that automatically locks the frequency of its precision Rubidium oscillator to that of an externally applied reference having superior long-term stability. With the use of a second order servo technique, the instrument is able to correct the frequency offset and aging of the internal oscillator. If the externally applied reference is removed or fails, the Model 2112 freezesg the electronic tuning voltage to the internal oscillator thereby holding its last frequency. Typically the unit can limit the frequency offset to parts in 10^{11} for several weeks following reference loss.

APPLICATIONS

Metrology: When used in combination with Austron Frequency Monitoring Equipment, the Model 2112 will provide stable frequencies to parts in 10^{12} accuracy traceable to the National Bureau of Standards (NBS) and United States Naval Observatory (USNO).

Clock Systems: The Model 2112 acts as an accurate, stable clock for timing applications requiring accuracies to 100 ns, providing an accurate and stable 1 PPS synchronizable to an external atomic clock or an Austron timing receiver.

Communications Systems: The Model 2112 allows selection of either of two stable sources without phase or frequency perturbation in the output and provides a backup frequency on loss of reference.

Rubidium Frequency Standard beats quartz-based standards providing better overall performance, faster warm-up, better retrace characteristics and long-term stability.

FEATURES

- Microprocessor-controlled
- 80-character alphanumeric liquid crystal display, programmable via front panel keyboard and function switches
- Long-term, high-stability internal rubidium oscillator
- Front panel selectability of TTL outputs of 1 MHz, 5 MHz, 10 MHz or 100 kHz
- Sinewave output signals of 1 MHz, 5 MHz and 10 MHz
- Internal ability to measure frequency offset of the external reference vs the internal oscillator
- 1 PPS clock output (externally synchronizable)
- Second order servo oscillator control system
- Frequency and phase offsettability
- Alarm signal and LED for unit monitoring

OPTIONAL FEATURES

- Dual reference input: front panel selectable primary/secondary or statistically combined modes
- IEEE-488 Bus interface
- Internal battery back-up

AUSTRON, Inc.
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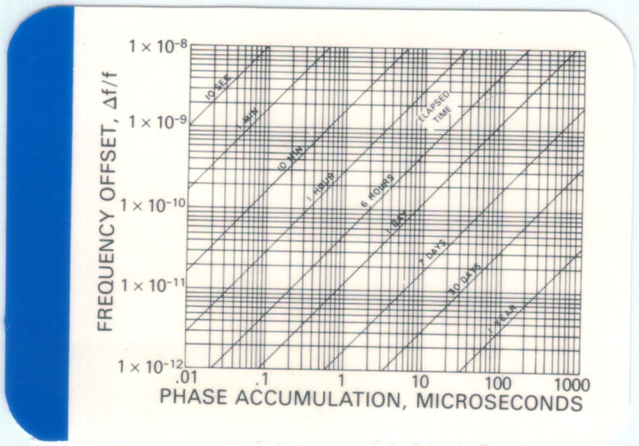
FAX (512) 251-9685


FREQUENCY OFFSET, Δf/f
1 × 10⁻⁸
1 × 10⁻⁹
1 × 10⁻¹⁰
1 × 10⁻¹¹
1 × 10⁻¹²
.01
.1
1
10
100
1000
PHASE ACCUMULATION, MICROSECONDS
ELAPSED TIME
10 SECS
1 MIN
10 MINS
1 HOUR
6 HOURS
1 DAY
3 DAYS
10 DAYS
30 DAYS

FREQUENCY CONVERSION FACTORS

1 min = 60 sec = 6×10^7 μs
1 hr = 3600 sec = 3.6×10^9 μs
1 day = 8.64×10^4 sec = 8.64×10^{10} μs
1 microsecond/min = 1.667×10^{-8}
1 microsecond/hr = 2.78×10^{-10}
1 microsecond/day = 1.16×10^{-11}

Fractional Frequency error, $\frac{\Delta f}{f} = \frac{\Delta t}{t} =$

$\frac{\text{difference in microseconds}}{\text{elapsed time in seconds}} \times 10^{-6}$

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