HP 55300A GPS Telecom Primary Reference Source

Technical Data

Figure 1. HP 55300A GPS Telecom Primary Reference Source with HP 55310A GPS NEBS/EIA Rack Mount Shelf.

Figure 2. HP 55300A GPS Telecom Primary Reference Source with HP 55320A/HP 55322A GPS ETSI Rack Mount Shelf.

The HP 55300A GPS Telecom Primary Reference Source (PRS) Module provides highly accurate frequency outputs of 1544 kbps and 1544 kHz (Figure 1) or 2048 kbps and 2048 kHz (Figure 2), and 10 MHz, which is used as a synchronization source for all office levels in a telecommunication network.

The detailed technical specifications for the HP 55300A module and its associated rack mount shelves (HP 55310A, HP 55320A, and HP 55322A) are contained in the following pages.

Specifications and Characteristics of HP 55300A GPS Telecom Primary Reference Source Module

Primary Reference Source (PRS) Features:

- Cesium-like (Stratum 1) performance at one-tenth the cost meets the requirements of GR-2830-CORE, ITU-T G.811, and ANSI T1.101-1994
- Highly reliable quartz oscillator with HP SmartClock technology
- Six-channel, parallel tracking GPS engine with HP Enhanced GPS technology
- Time-of-day (TOD) features to synchronize computer systems using Network Time Protocol

Performance Specifications

Description	Specification
Stratum 1/Level 1 – Accuracy	$< 1 \times 10^{-12}$ when locked to GPS (24 hour average)
Holdover Stability	$< 1 \times 10^{-10}$/day (See Notes 1 and 2.)
Outputs Available (as specific options)	Opt 104, 1544 kbps, 100 balanced, D4 Opt 105, 1544 kbps, 100 balanced, ESF Opt 220, 2048 kbps, 120 balanced, CCS Opt 221, 2048 kbps, 120 balanced, CAS Opt 222, 2048 kbps, 120 balanced, CCS-CRC4 Opt 270, 2048 kbps, 75 unbalanced, CCS Opt 271, 2048 kbps, 75 unbalanced, CAS Opt 272, 2048 kbps, 75 unbalanced, CCS-CRC4
Standard Outputs	1544 kHz or 2048 kHz, 1 PPS and 10 MHz
MTBF of HP Oscillator (Typical Characteristic)	> 500,000 hours
Cold Startup	Achieves GPS lock in less than 30 minutes (assumes "normal" view of sky)
Time of Day (TOD) – Standard connector	RS-232 UNIX Network Time Protocol or IRIG-B
Port 1 (local access port – front of module)	DE-9S, DCE female
Monitor Port (front of module)	Standard telecommunication bantam jack
Weight of HP 55300A module	3.7 lbs (1.7 kg)

Note 1. This specification has a 95% probability, and is based on the availability of four or more GPS satelliltes during three days of locked operation with a fixed antenna location. The temperature must remain within a 10° range between 10°C and 40°C.

Note 2. When a quartz crystal oscillator has not been operated for a period of time, or if it has been subjected to severe thermal or mechanical shock, as might be encountered during product shipment, the oscillator may take some time to stabilize. In most cases, the oscillator will drift and then stabilize at or below its specified rate within a few days after being turned on. In isolated cases, depending upon the amount of time the oscillator has been off and the environmental conditions it has experienced, the oscillator may take up to one week to reach its specified aging rate and to operate without significant frequency "jumps.''

A Hewlett-Packard GPS Receiver, when it is initially turned on and locked to the GPS satellite system, will achieve GPS lock within 30 minutes of operation. The longer the GPS Receiver (and its quartz oscillator) operates, the better its stability and unlocked (holdover) performance becomes.

Specifications for Outputs

Description	Specification
1544 kbps (DS1) Output (Options 104, 105)	Framed all 1s, ESF or D4, switch selectable AMI (B8ZS) Traceable to UTC ITU-T G.703, Table 4, Fig 10
Impedance	100 Balanced
MTIE & TDEV	Meets requirements of GR-2830 for PRS
1544 kHz Output	
Output Type	1544 kHz per ITU-T G.703, Table 10, Fig 21
Wave Form	75 : 1.5 V peak maximum, 0.75 V peak minimum
Wave Shape	Square Wave
Impedance	75 , unbalanced
10 MHz Output	
Frequency Accuracy – Locked	$< 1\times10^{-12}$, one day average
Holdover aging	$< 1 \times 10^{-10}$/day (See Notes 1 and 2.)
Frequency Stability (1 second averaging)	5×10^{-12} Root Allan Variance (RAV) @ 1 sec
Waveform	Sinewave, > 1 Volt pk-pk into a 50 load
Harmonic Distortion (Typical)	< –25 dBc (typical)
Non-Harmonic Signals (Typical)	< –60 dBc (typical)
Source Impedance (nominal)	50
Coupling	AC
1 PPS Output	
Jitter of leading edge	Pulse-to-pulse jitter of leading edge: <750 ps with at least one satellite in view.
Accumulated time error	< 8.6 µs per day unlocked, for 24 hours. (See Notes 1 and 2.)
Waveform – Pulse width	26 µs - 2.4 Volts minimum into 50 load (TTL compatible)
Time Accuracy	< 110 ns with respect to UTC with Selective Availability on – 95% probability when unit is properly installed, calibrated, and locked to GPS.
2048 kbps Output (Options 220, 221, 222, 270, 271, 272)	
Output Type	2048 kbps, framed per ITU-T G.703, Table 6; all 1s, CCS, CAS, CRC4 switch selectable AMI (HDB3)
Waveform	Options 270, 271, 272: 2.37 ± 0.237 Volts peak (75) Options 220, 221, 222: 3.0 ± 0.3 Volts peak (120)
Wave Shape	Rectangular, pulse width 244 ns ± 25 ns, pulse interval 488 ns per ITU-T G.703, Table 6, Fig 15
Impedance	Options 270, 271, 272: 75 unbalanced Options 220, 221, 222: 120 balanced
2048 kHz Output	
Output Type	2048 kHz per ITU-T G.703, Table 10, Fig 21
Wave Form	75 : 1.5 Volts peak maximum, 0.75 Volts peak minimum
Wave Shape	Square Wave
Impedance	75 unbalanced

Specifications and Characteristics for Alarm Output

Description	Specification
Alarms available	Critical, Major, and Minor; alarm causes are selectively assignable to alarms.
Alarm Relay Contact Ratings:	
Switching Power	60 W maximum
Switching Voltage	125 Vac or 220 Vdc maximum
Switching Current	2 A maximum
Alarm Relays (6):	
3 Critical, Major, Minor	Normally open and normally closed contacts
3 Critical, Major, Minor with alarm cutoff	Normally open and normally closed contacts
Alarm causes:	Power failure, Output failure, Oscillator failure, Synthesizer failure, Loss of GPS signal (holdover), Self-test failure

Commands/Status

Commands and status returns are compatible with TL1 as specified in GR-833-CORE, TR-NWT-000834, and GR-199-CORE.

Rack Mount Shelf Specifications and Characteristics

HP 55310A GPS NEBS/EIA Rack Mount Shelf — 100 Balanced Outputs (Used with HP 55300A Options 104, 105)

Description	Specification
Rack Mount Configuration	Compatible with standard NEBS 23" or EIA 19" racks
Size – W × H × D – in (mm)	16.73 × 3.35 × 11.19 (425 × 85.1 × 284.3)
Weight of Rack Mount Shelf	4.4 lbs (2.0 kg)
Power Requirements	Dual redundant power inputs (A and B) –48 Vdc, nominal
Connectors on back of rack mount:	
10 MHz Output	BNC, 50 nominal
1 PPS	BNC, 50 nominal
TOD IRIG-B	BNC, 50 nominal
1544 kHz Output	BNC, 75 nominal
GPS Antenna	Type N (female)
Power Inputs	Augat Snap-on pressure clamp
1544 kbps Output	Wire-wrap pins, 100 balanced
1 PPS (RS 422)	Wire-wrap pins
Alarms	Wire-wrap pins
Time of Day (TOD)	RS-232 DE-9P DTE, male (1 PPS DCD included)
Remote Access Port	RS-232 DB-25S DTE, female

HP 55320A GPS ETSI Rack Mount Shelf — 75 Unbalanced Outputs (Used for HP 55300A Options 270, 271, 272)

Description	Specification
Rack Mount Configuration	Compatible with standard ETSI 535 mm or EIA 19" racks
Size – W × H × D – mm (in)	425 × 168.4 × 257.3 (16.73 × 6.63 × 10.13)
Weight of Rack Mount	6.1 lbs (2.8 kg)
Power Requirements	Dual redundant power inputs (A and B) – 48 Vdc nominal
Connectors on Rack Mount	
10 MHz Output	BNC, 50 nominal
1 PPS	BNC, 50 nominal
TOD IRIG-B	BNC, 50 nominal
2048 kHz Output	BNC, 75 nominal
GPS Antenna	Type N (female)
Power Inputs	Augat Snap-on pressure clamp
2048 kbps Output	BNC 75 unbalanced
1 PPS	BNC (2) RS-422 (differential pair)
Alarms	DB-25P, male
Time of Day (TOD)	RS-232 DE-9P DTE, male (1 PPS DCD included)
Remote Access Port	RS-232 DB-25S DTE, female

HP 55322A GPS ETSI Rack Mount Shelf — 120 Balanced Outputs (Used for HP 55300A Options 220, 221, 222)

Description	Specification
Rack Mount Configuration	Compatible with standard ETSI 535 mm or EIA 19" racks
Size – W × H × D – mm (in)	425 × 168.4 × 257.3 (16.73 × 6.63 × 10.13)
Weight of Rack Mount	6.1 lbs (2.8 kg)
Power Requirements	Dual redundant power inputs (A and B) – 48 Vdc nominal
Connectors on Shelf	
10 MHz Output	BNC, 50 nominal
1 PPS	BNC, 50 nominal
TOD IRIG-B	BNC, 50 nominal
2048 kHz Output	BNC, 75 nominal
GPS Antenna	Type N (female)
Power Inputs	Augat Snap-on pressure clamp
2048 kbps Output	DE-9S, 120 balanced
1 PPS	DE-9S (2) RS-422
Alarms	DB-25P, male
Time of Day (TOD)	RS-232 DE-9P, DTE male (1 PPS DCD included)
Remote Access Port	RS-232 DB-25S DTE, female

Environmental Specifications

Description	Specification
Power Requirements	–48 Vdc nominal, 700 ma startup; 350 ma steady state
	–37 to –60 Vdc operating range, –46 Vdc required to start
Temperature Range	Operating: 0°C to +50°C
	Storage: –40°C to +80°C

Specifications for GPS Antenna & Antenna Cable

Description	Specification
Active Antenna	30 dB (typical) active gain with dielectric filter
Antenna Power Requirements	5 V (nominal); 50 ma maximum (supplied by HP 55300A)
Temperature Range	Operating: –30°C to +80°C Storage: –40°C to +85°C
Antenna Cable Types	RG-213 cable is recommended for lengths up to 175 ft (53 m). A line amplifier is required with RG-213 cable when lengths exceed 175 ft (53 m). LMR-400 cable is recommended for lengths greater than 175 ft (53 m); it is a lower loss cable. A line amplifier is required with LMR-400 for distances greater than 377 ft (110 m).
Cable connectors	Type N male connector at the HP 55300A Type TNC male at the antenna

Antenna Installation

For optimum performance, the antenna should be installed in a location which gives it a clear view of the entire sky. All GPS receivers require at least four satellites to be visible in order to determine latITU-Tde, longITU-Tde, elevation and time.

Up to 377 feet (110 meters) of LMR-400 cable may be used between the antenna and the HP 55300A before an antenna line amplifier is required (if using RG-213 cable, one is needed at 175 feet/53 meters). For applications which require longer cable runs, please consult your Hewlett-Packard representative. Lower loss cable and antenna line amplifiers are available to meet most needs.

Bellcore CLEI # BSMTBBOARA and CPR # 134051

Accessories Available:

HP 58504B	GPS Antenna
HP 58510A	Environmental Cover/Ground Plane (for GPS Antenna)
HP 58513A	Antenna Assembly (Assembled unit includes: HP 58504A GPS Antenna, 4-foot cable, HP 58510A cover and ground plane, and 1-foot stainless steel mast for mounting)
HP 58505B	Lightning Arrester. Two recommended for cable distance from lightning arrester to receiver module greater than 100 ft (30 m).
HP 58509A	Antenna Line Amplifier (recommended for distances greater than 175 ft/53 m for RG-213 cable, 377 ft/110 m for LMR-400 cable)

Note: The HP 58505B Lightning Arrester and the HP 58509A Line Amplifier may require the addition or the mixing of various lengths of cables.

Antenna Cables and Configuration Guide

For details concerning cables, connectors, and other accessories see:

Designing Your GPS Antenna System — Configuration Guide
(Available from your local HP Sales Office)

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