

CW12-TIM GPS Receiver

Timing and Navigation Applications

Description

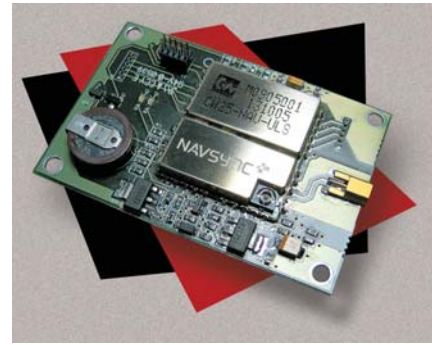
The CW12-TIM GPS receiver module is an integrated timing module powered by NavSync's CW25 GPS receiver. It has been specifically designed for use in synchronization and timing applications,

The CW12-TIM has an on-board programmable NCO oscillator that outputs a synthesized frequency up to 10 MHz that is steered by the GPS receiver.

The CW12-TIM has a self survey mode of operation that allows the receiver to enter a position hold mode to allow accurate timing to be continue with only one satellite being tracked.

The output frequency is highly accurate and can achieve full PRC MTIE performance. It can also track satellites and provide GPS synchronization in weak signal areas such as indoor applications. This reduces the need for high antenna placement in many environments.

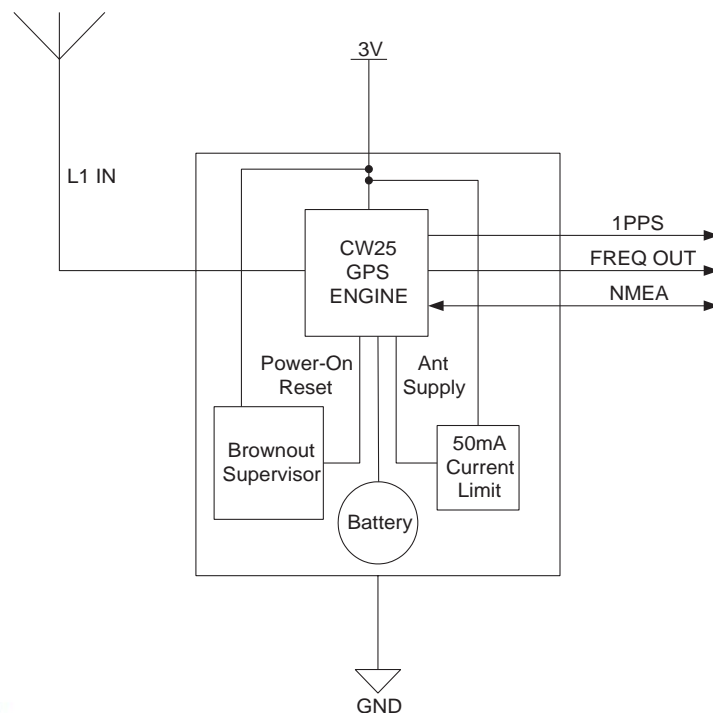
The CW12-TIM receiver module is a 40 x 60 x 10 package with 10 pin (2 x 5) interface for ease of placement.



Features

- 3 volt operation
- 12 channel simultaneous operation
- Fully calibrated to UTC at USNO
- 40 x 60 x 10 form factor
- 45 s typical cold start TTFF
- 38 s typical warm start TTFF
- 5 s typical hot start TTFF
- <0.5 s reacquisition
- Position hold for improved accuracy
- Antenna current sense direction.

Block Diagram



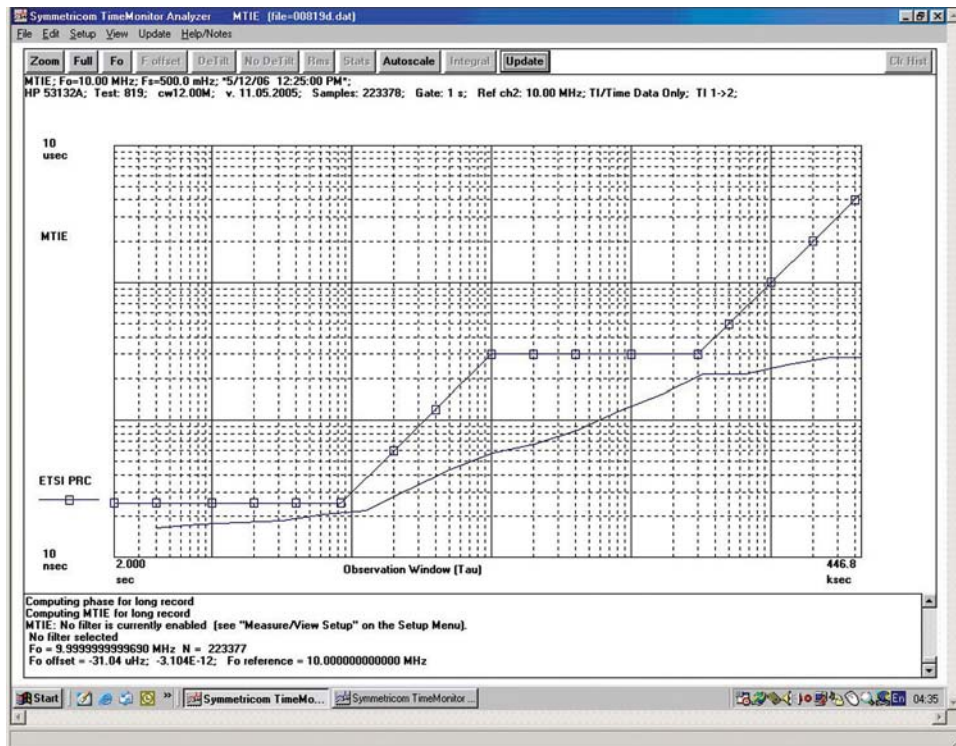
CW12-TIM GPS RECEIVER SPECIFICATIONS

SPECIFICATIONS¹

Physical	Module dimensions	60mm (D) x 40mm (W) x 10mm (H)
	Supply voltages	3V (Digital I/O), 3V (RF), 1V8 (Core option), 3V (Standby Battery)
	Operating / Storage Temp	-40°C to +75°C / -55°C to +125°C
	Humidity	5% to 95% non-condensing
	Max Velocity / Altitude	515ms ⁻¹ / 18,000m
	Max Acceleration / Jerk	4g / 1gs ⁻¹ (sustained for less than 5 seconds)
	Datum	WGS-84 Default
	Connector	Data/Power: 10 pin (2 x 5) unshrouded header on 0.050 inches centers. RF: right angle MMCX (subminiature snap-on)
Sensitivity	Acquisition/Tracking	-185dBW / -185dBW
Acquisition Time	Stand Alone (Outdoor)	Cold: <45s
		Warm: <38s
		Hot: <5s
		Re-acquisition: <0.5s (90% confidence)
Accuracy	Position: Outdoor / Indoor	<5m rms / <50m rms
	Velocity	<0.05ms ⁻¹
	Latency	<200ms
	Raw Measurement Accuracy	Pseudorange <0.3m rms, Carrier phase <5mm rms
	Tracking	Code and carrier coherent
Power	1 fix per second	0.55W typically ²
	Sleep/Standby Current	1mA/1uA
Interfaces	Serial	3 ports, CMOS levels; USB v1.1
	Multi-function I/O	1PPS and Frequency Output
		Event Counter/Timer Input
		4 x GPIO (multi-function)
		2 x LED Status Drive
		I2C, External Clock (on special build)
	Protocols	Network Assist, NMEA 0183, Proprietary ASCII and binary message formats
	1pps Timing Output	30ns rms accuracy, <5ns resolution
		User selectable pulse width
	Event Input	30ns rms accuracy, <10ns resolution
Frequency Output	10 Hz to 10 MHz	
Receiver Type	12 parallel channel x 32 taps up to 32 point FFT. Channels, taps and FFT can be switched off to minimize power or simulate simpler designs.	
General	Processor	ARM 966E-S on a 0.18 micron process at up to 120 MHz.

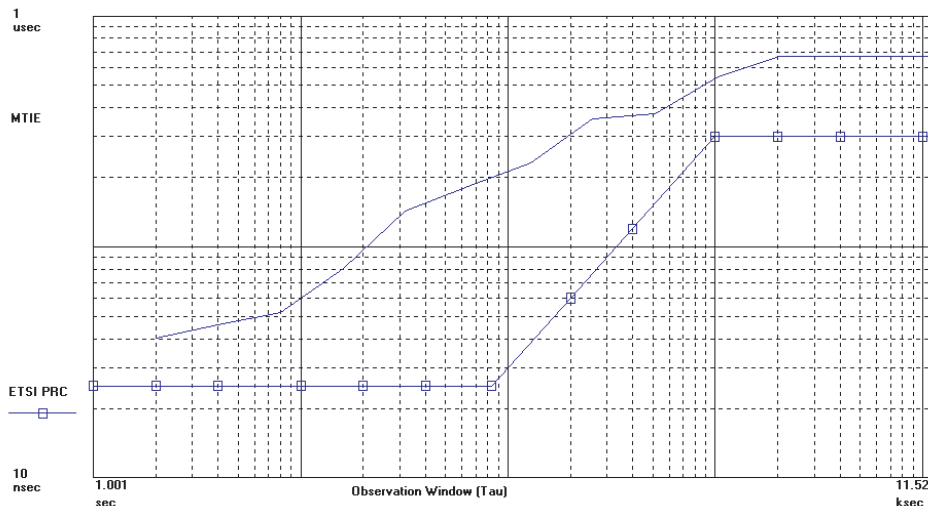
CW12-TIM GPS MTIE PERFORMANCE

The graph below demonstrates the MTIE performance of the CW25-TIM output frequency relative to a Caesium atomic clock, with the CW12-TIM GPS operating with a clear view of the sky.



The graph below demonstrates the ability of the CW12-TIM GPS to continue to provide a GPS disciplined output frequency with the GPS aerial located completely inside a building (the degradation of MTIE performance is due to the effects of signal multi-path)

MTIE: Fo=10.00 MHz; Fs=999.0 MHz; 2/12/04 02:38:18 PM, 2/12/04 05:50:27 PM,
HP 53132A; Test 589; CW25_indoor_tim; Samples: 11506; Gate: 1 s; Ref ch2: 10.00 MHz; TI/Time Data Only; TI 1>2



CW12-TIM-Application Notes

Migrating from Motorola M12+ to NavSync CW12-TIM

The CW12-TIM was designed to meet the form and functionality of the M12 as closely as possible using NavSync's CW25 receiver module. The information contained in the following application notes identifies key similarities between the two products as well as advantages offered by the CW12-TIM. This document will also offer guidelines on how to replace the M12 with the CW12-TIM, as well as how to design in the CW12-TIM to a new application.

Key features of the products are highlighted in the following table.

Feature	M12+	CW12-TIM
12-Channel	✓	✓
High Sensitivity	✗	✓
1PPS	✓(500nS)	✓(30nS)
Variable Freq Output	✗	✓
Antenna Current Sense Circuitry	✓	✓
Voltage	3V	3V
Positional Accuracy (3D)	25m	10m
Optional On-Board Battery	✓	✓
T-RAIM	✓	✓
RTCM Input	✓	✓
Data Output Format	NMEA 0183 (4800) or Motorola Binary (9600)	NMEA 0183 Variable Baud Rate Motorola Binary

Table: Differences between NavSync CW12-TIM and Motorola M12+.

Check table for list of supported Binary commands.

Motorola Binary Commands supported by NavSync's CW12-TIM

Motorola Binary Command	Description	Notes
@@Be –	Almanac Data Output	
@@Bd –	Almanac Status	
@@Cb –	Almanac Data Input	
@@Cf –	Set to defaults	
@@Cj –	Receiver ID	No unique serial or manufacture data
@@Eq –	ASCII Position	
@@Ga –	Combined Position	GPS only
@@Gb –	Combined Time	
@@Gc –	1PPS Control	
@@Gd –	Position Control	
@@Ge –	T-RAIM Select Message	
@@Ha	Position/Status/Data	
@@Hn –	12 Channel T-RAIM Status	
@@Ia –	Self Test	Only FLASH and ROM tested. No support for antenna status.

CW12-TIM Application Notes continued

The CW12-TIM offers access to a subset of the CW25 interface pins. The following Diagram shows the layout of interface connector, and Table 2 gives a signal description for each pin.

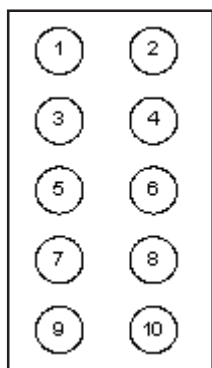


Figure 1: Layout of I/O connector on the CW12-TIM

Pin	Name	I/O	Description
1	TXD	O	NMEA 0183 output from GPS Core. Refer to CW25 User manual for description of proprietary messages. Motorola binary interface.
2	RXD	I	NMEA 0183 input to GPS Core. Refer to CW25 User manual for description of proprietary commands. Motorola binary interface.
3	VCC	PWR	Voltage Supply input. 3.3VDC to be supplied here.
4	1PPS	O	1 Pulse Per Second output. Pulse is 100uS in duration and rising edge signifies top of second.
5	GND	PWR	Power supply return to Ground.
6	VBATT	PWR	~3V needs to be supplied here to keep the real time clock alive while the receiver is powered off.
7	BOOTSEL	I	Boot Select pin allows Firmware to be upgraded when pulled low.
8	RTCM	I	Not Supported in this version.
9	ANT_SUPPLY	PWR	Power supply for Active antenna used. The voltage applied here needs to reflect the voltage needed by the antenna. This supply is limited to ~50mA on the CW12-TIM.
10	FREQ_OUT	O	Programmable synchronized frequency output from GPS core, this frequency is 10MHz by default but may be changed by sending a NMEA command. See CW25 User manual for details.

Table 2: Signal Description of IO Connector on the CW12-TIM

The CW12-TIM is closely based on the NavSync CW25 GPS Receiver, many of the design considerations apply equally to both parts. Please refer to the CW25 User Manual for details.



CW12-TIM GPS Receiver

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