Serial Number_____

GLOBAL TIME AND POSITION UNIT OPERATION MANUAL

Introduction

The Global Time and Position unit (GTP) is a combination GPS receiver and IRIG-B timecode generator. The differential ready GPS receiver tracks up to twelve satellites and outputs RS232/NMEA 0183 messages containing navigation and tracking information. The IRIG-B generator is a crystal controlled IRIG-B source which will synchronize to GPS receiver outputs when available, otherwise reverting to coast or fail-safe mode. Aside from synchronization, the GPS receiver and IRIG-B generator are independent and are described separately in this manual.

Power and Start Up

The GTP is powered by the supplied wall transformer or by any source of 7-15 VDC at 300 milliamps. Optional 9-32 VDC power is available. The power connector is a special long thread version which will accept a locking plug. The center pin is positive and reverse polarity protection is built-in. On power-up the GTP immediately begins to generate IRIG-B timecode, but it will take several seconds for the GPS receiver to acquire and track. Acquisition time depends on how long power has been off and how far the unit has been moved while the power has been off. Until track is achieved, or anytime track is lost, the LED indicator will alternate between one second on and one second off. During track the indicator will be on full time. Additional receiver status information is contained in a receiver status digit which occupies the four unused bits in the IRIG-B timecode after Julian date.

GPS Receiver Section

(**Caution**: Never use a generic cable to connect the GTP to a computer or other device, as there are many special purpose inputs and outputs on the DB25F connector.)

General

The GPS section of the GTP contains an embedded GARMIN GPS 25 receiver. This manual contains basic information relevant to the GTP. For additional information on the receiver contact GARMIN International at (800)-800-1020.

Performance

Position Accuracy:	(Differential) 3-10 meters RMS
	(Non-differential) 15 meters, SA off, 100 meters SA on
	Velocity Accuracy: 0.2 m/s, subject to SA
Dynamics:	1000 knots velocity, 3g's acceleration

Antenna

The antenna connection is a 50 ohm BNC. The center conductor supplies +5VDC at 15 milliamps to an active pre-amp antenna which returns a 1.57542 GHz signal. It is recommended that less than 60 feet of RG-59 cable be used to separate the GTP from an active antenna. The swivel-stub antenna is passive and cannot be cable extended.

Inputs

Differential GPS (DGPS) real-time pseudo-range correction data in RTCM SC-104 format can be input to the GTP on Pin 16 of the DB25F connector with ground reference on Pin 7. Baud rates of 300, 600, 1200, 2400, 4800, or 9600 will automatically be accepted. An additional RS232 serial input on Pin 4 is used for initialization and baud rate selection. It is recommended that this input not be used as the IRIG-B generator requires the default baud rate of 4800. Pin 3 is an auxiliary RS232 input not currently used.

GPS Receiver Section (continued)

Outputs

A pulse-per-second timing pulse with 1 microsecond accuracy is available on Pin 15 of the DB25F connector. The pulse goes high on the second and remains high for approximately 10 milliseconds. This pulse can be used to trigger the event time output described in the IRIG-B generator section of this manual.

The following NMEA 0183 messages are output once per second unless otherwise stated. These messages can be monitored on an RS232 COM port set for 4800 baud. 8 data bits, 1 stop bit, no parity. Output is on Pin 2 of the DB25F connector and ground is on Pin 7. A second serial output on Pin 5 is not currently used.

$GPGGA,<12 comma delineated fields>,<checksum>, <CR>,<LF>

Field	1	UTC Time of position fix
	2	Latitude
	3	Hemisphere, north or south
	4	Longitude
	5	Hemisphere, east or west
	6	Status, 0=fix not available, 1=non-differential fix, 2=differential fix
	7	Number of satellites in use, 00 to 08
	8	Horizontal dilution of precision, 1.0 to 99.9
	9	Antenna height to mean sea level, -9999.9 to 99999.9 meters
	10	Geoidal height, -999.9 to 9999.9 meters
	11	Differential (RTCM-SC104) data age, seconds since last update
	12	Differential Reference Station ID, 0000 to 1023

$GPRMC,<11 comma delineated fields>,<checksum>,<CR>,<LF>

Field	1	UTC time of position fix
	2	Status, A=valid position, V=invalid
	3	Latitude
	4	Hemisphere, north or south
	5	Longitude
	6	Hemisphere, east or west
	7	Ground speed, 0.0 to 999.0 knots
	8	Ground course, 000.0 to 359.9 degrees, true
	9	UTC date of position fix
	10	Magnetic variation, 000.0 to 180.0 degrees
	11	Magnetic variation direction, E or W, (W adds to true course)

IRIG-B Timecode Generator Section

(**Caution**: Never use a generic cable to connect the GTP to a computer or other device, as there are many special purpose inputs and outputs on the DB25F connector.)

General

The IRIG-B generator section of the GTP is a microprocessor driven, crystal controlled IRIG-B timecode source. Timing signals and serial data from the GPS receiver are monitored by the IRIG-B generator. When the GPS receiver is in track mode as indicated by the LED indicator being continuously lit, the IRIG-B output is synchronized to UTC time and to the IRIG-B outputs of other GTP units regardless of geographical separation. During track loss the IRIG-B timecode continues without interruption, subject to the 50 ppm accuracy of the internal crystal oscillator.

Performance

When the GPS receiver is in track mode, the IRIG-B output is synchronized to UTC time each second with an accuracy of one microsecond.

Standard IRIG-B Output

Standard 3 volt peak-to-peak IRIG-B is available on a BNC connector. The output is capacitively coupled and will drive four 600 ohm loads. Full date and GPS receiver status has been added to the standard IRIG-B format and can be displayed by the V-data Model VED-I Video Encoder/Decoder.

Event Input/Output

A 5-15 volt positive pulse applied to Pin 14 of the DB25F connector for at least one millisecond captures the current time, which is then output on Pin 5 as serial asynchronous data at 4800 baud, 8 data bits, no parity. The output format is DDMMYY,HHMMSS.SSS followed by a carriage return. Once triggered, the event input is disabled until output is complete. Ground reference is on Pin 1 or Pin 7. The event input can also be triggered by a Null (00Hex), @ (40Hex), or Space (20Hex) RS-232 character at 4800 baud, 8 data bits, 1 stop bit, no parity.

IRIG-B Timecode Generator Section (continued)

Digital IRIG-B Outputs

Pins 6 and 8 on the DB25F connector are two digital IRIG-B current source outputs suitable for driving chart recorder inputs, fiber-optic LED emitters, or cine camera film plane LED's. The output is high for 2,5, or 8 milliseconds for each IRIG-B bit depending on whether the bit is a zero, one, or sync bit. Ground is on Pin 1 or 7.

Jumper Selectable Options

Six jumpers inside the GTP enclosure allow options to the standard IRIG-B format. With all jumpers in position A, the format is seconds through hours, Julian date, GPS receiver status, day, month, year, and time of day in binary seconds.

Moving jumper six to position B causes the Julian date digits to sequence through day, month, year, GPS receiver status, and Julian date. The GPS receiver status digit also permanently occupies four unused IRIG-B bits after Julian date. A receiver status of 0 or 1 indicates a track condition. Status of 2 or 3 indicates track loss, and status of 4 or 5 indicates GPS not available. Status of 0, 2, or 4 indicates that jumper six is in place, while status of 1, 3, or 5 indicates that jumper six is in position B.

There are ten fields (0-9) in the IRIG-B frame, and each field contains ten bits. The last bit of each field is a sync bit, leaving nine bits for data (except for field 0 which has an additional sync in the first bit location.) Moving jumpers 1-5 to position B causes the last five fields, normally occupied by day, month, year, and binary time of day, to be filled with user data present at the DB25F connector. Pins 22-17 are inputs for the nine data bits when appropriate jumpers are moved to position B. Jumpers 1 through 3 correspond to fields 5-7 which are usually referred to as the 27 IRIG-B control bits. Jumpers 4 and 5 correspond to fields 8 and 9 which normally contain 18 bits of time of day in binary seconds. The external equipment is responsible for multiplexing inputs to Pins 22-17 during the appropriate field periods. Field periods for fields 5-9 are determined by monitoring Pins 9-13 for a low level indicating that the corresponding field is active. For instance, while Pin 9 is low, data applied to Pins 22-17 will appear in field 5, with jumper 1 in position B. If 9 user-controlled bits are sufficient, multiplexing or monitoring Pins 9-13 is not necessary as the inputs on Pins 22-17 will program only the field for which a jumper has been moved to position B.

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