



TECHNICAL DESCRIPTION

**Model 6155D
GPS SYNCHRONIZED
IRIG B TIME CODE GENERATOR**

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MODEL 6155D
GPS SYNCHRONIZED IRIG B TIME CODE GENERATOR

Table of Contents

| <u>Paragraph</u> | <u>Description</u> | <u>Page</u> |
|------------------|---|-------------|
| 1.0 | GENERAL | 1 |
| 2.0 | CHARACTERISTICS | 2 |
| 2.1 | Time Code Synchronization..... | 2 |
| 2.2 | Time Offset..... | 2 |
| 2.3 | Dynamic Mode | 2 |
| 2.4 | Serial Data Output | 3 |
| 2.5 | Battery Charger..... | 4 |
| 3.0 | MECHANICAL CONFIGURATION | 5 |
| 4.0 | CONTROLS, INDICATORS AND CONNECTORS | 6 |
| 4.1 | Power On/Off | 6 |
| 4.2 | Display | 6 |
| 4.3 | External Power | 6 |
| 4.4 | GPS Antenna | 6 |
| 4.5 | IRIG B Output | 6 |
| 4.6 | RS-232 | 6 |
| 4.7 | UTC Time Mark Out..... | 7 |
| 4.8 | IRIG B Output Level | 7 |
| 5.0 | SPECIFICATIONS | 8 |
| 5.1 | Timing Accuracy | 8 |
| 5.2 | IRIG B Output | 8 |
| 5.3 | GPS Performance | 8 |
| 5.4 | GPS Antenna | 8 |
| 5.5 | Serial Interface..... | 8 |
| 5.6 | Character Display | 8 |
| 5.7 | Temperature..... | 9 |
| 5.8 | Humidity..... | 9 |
| 5.9 | Package | 9 |
| 5.10 | Battery..... | 9 |
| 5.11 | Battery Charger..... | 9 |
| 6.0 | SETUP VIA CONFIGURATION UTILITY..... | 10 |
| 6.1 | Open Port..... | 10 |
| 6.2 | Close Port | 10 |
| 6.3 | Set Time Offset..... | 10 |
| 6.4 | Serial Output..... | 10 |
| 6.4 | Dynamic Mode | 11 |

MODEL 6155D
GPS SYNCHRONIZED IRIG B TIME CODE GENERATOR

Table of Contents (continued)

| <u>Figure</u> | <u>Description</u> | <u>Page</u> |
|---------------|---|-------------|
| 1 | Model 6155D Front/Back/Top Panel | 5 |
| 2 | Model 6155D Configuration Utility | 11 |

Model 6155D
GPS SYNCHRONIZED
IRIG B TIME CODE GENERATOR

1.0 GENERAL

The Model 6155D is a battery powered, hand-held unit which provides an IRIG B time code output derived from GPS. The time code output is synchronized with UTC time unless a time offset has been specified. A twelve channel GPS receiver automatically acquires all in-view satellites upon power up and locks an internal IRIG B time code generator to the GPS time reference. If the GPS lock is lost the 6155D will automatically switch to an internal clock and continue generating the output IRIG B signal. No discernible change in the IRIG B output will occur due to this transition. Major features include:

- 1. Twelve Channel GPS Receiver.*
- 2. IRIG B time code generator.*
- 3. UTC time mark output.*
- 4. RS-232C serial port.*
- 5. Outputs Time and Latitude & Longitude via serial port.*
- 6. Time offset programmable via serial port.*
- 7. Battery powered.*
- 8. Built in “smart” battery charger.*
- 9. Built in active GPS antenna, also provisions for external. antenna.*
- 10. Liquid Crystal Display(LCD).*

The 6155D is housed in a hand held aluminum enclosure, 8 inches long, 3.8 inches wide and 2.55 inches high (excluding connectors and antenna). It is powered by six “AA” NiMH, 1500 mah rechargeable batteries.

2.0 CHARACTERISTICS

2.1 TIME CODE SYNCHRONIZATION

The 6155D internal IRIG B clock is automatically synchronized to GPS generated UTC time mark upon receipt of a valid number of GPS satellite signals. If the unit loses the GPS lock after initial synchronization, it will continue to operate on the internal clock which continues to generate the serial IRIG B signal output. No discernible change in the IRIG B output will occur when the GPS signal lock is lost after synchronization. The Time, respective signal presence, lock status and charging status are shown on a front panel LCD Display.

2.2 TIME OFFSET

The 6155D features a programmable time offset to convert the time from the GPS receiver from UTC time to local time. The time offset is entered via the RS-232 port. NOTE: The internal IRIG clock and displayed time will not respond to the programmed time offset unless the 6155D is locked to GPS. If the 6155D time offset is programmed while the unit is not locked to GPS, it will respond the next time GPS lock is acquired. After the initial GPS lock, following entry of the offset value, the corrected offset time will remain even if lock is lost. Once entered the data will be stored in non-volatile memory until overwritten. The format of the data is: S hh

Where S = Sign +/-
hh = Hours 00<hh<12

This feature may also be set by using the 6155G Configuration Utility, see Section 6.

2.3 DYNAMIC MODE

The 6155D has a Dynamic Mode feature that allows the GPS receiver to be optimized to match the expected conditions. There are five settings:

1. Stationary
2. Man Pack/Walking
3. Automotive
4. Marine
5. Airborne

The factory default setting is 2.

2.3 DYNAMIC MODE (continued)

The mode is set via the RS-232 port using the following message format:

Set Dynamic Mode (2 character string): Dn

Where n=**1** through **5**

Query Dynamic Mode (2 character string): D?

Response for either command, (4 byte string) Dn<CR><LF>

Where n= mode value of **0** through **5**

Notes:

1. When Dynamic mode is set or queried the response can take up to two seconds.
2. If GPS is locked when Mode or Query Command is issued, it will unlock and begin relock process only after the command is processed.
3. If a query is made after the mode has been set to “**1**”, and after the GPS receiver has completed its survey, a “**0**” will be returned and displayed. This indicates that Fixed base station, maximum time and frequency accuracy has been achieved. This response can take up to 15 minutes.
4. The dynamic mode response message is issued automatically at turn-on.

This feature may also be set by using the 6155G Configuration Utility, see Section 6.

2.4 SERIAL DATA OUTPUT

The 6155D has an asynchronous RS-232C port which provides a 35 byte serial ASCII data output of UTC time, Latitude and Longitude. In the absence of GPS lock the serial data will continue with the time derived from the internal clock. The latitude and longitude, however, will be forced to zeros and the signs will be forced to positive.

2.4 SERIAL DATA OUTPUT (continued)

The format of the data is:

Tdddhhmmss,Sddmm.ffff,Sdddmm.ffff<CR><LF> where:

(in order of occurrence)

T = ASCII character "T" which indicates start of message and designates the time at which the previous time message is valid. If all latencies are considered the receipt of this character can be used to define the time to within approximately 0.55 milliseconds with a serial data rate of 19.2 Kbaud. If greater accuracy is desired RTS may be monitored. This signal drops (high to low) at the precise time of the UTC time mark produced by the GPS receiver.

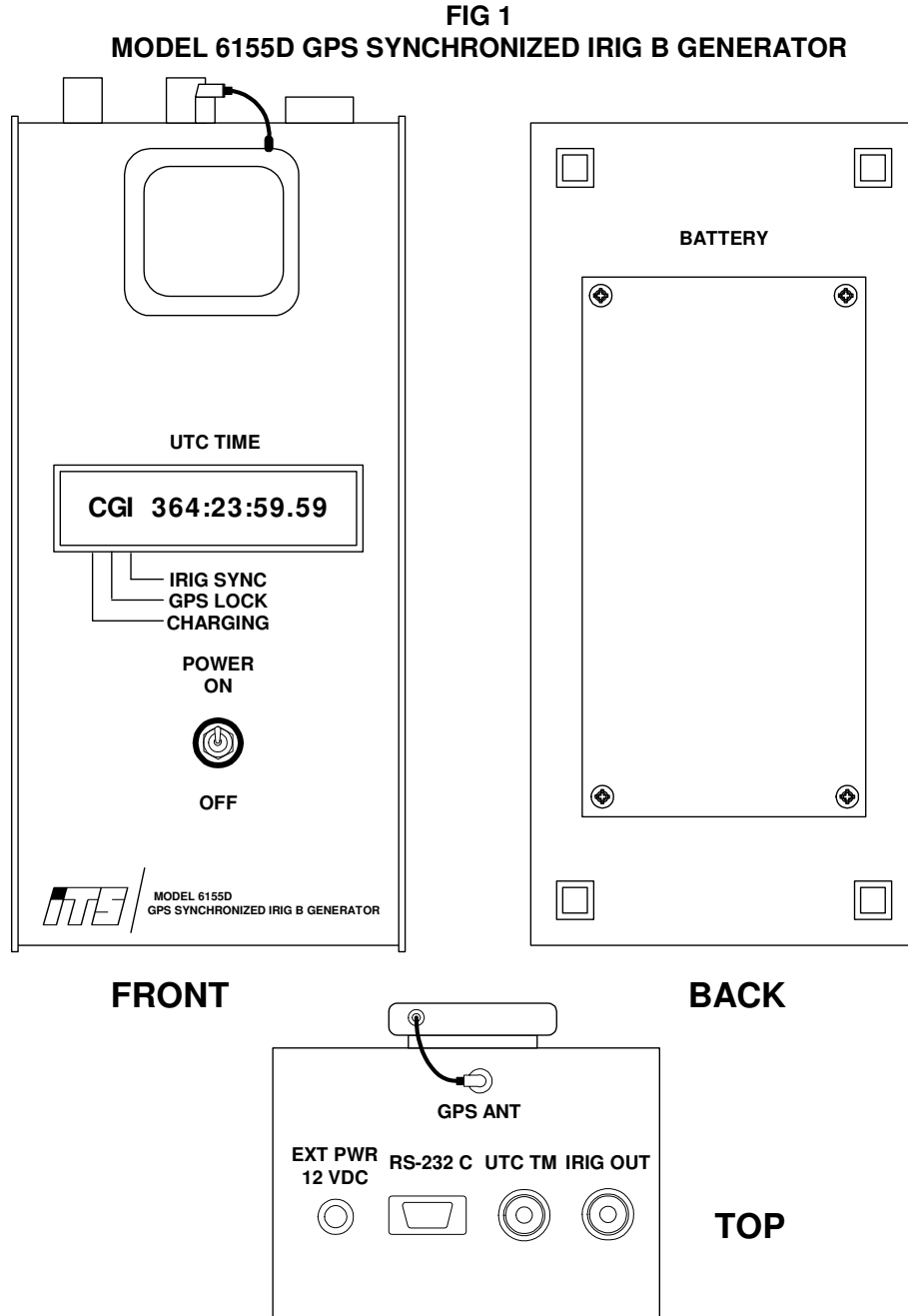
| | | |
|----------|---|---------------------------------|
| ddd | = | Days |
| hh | = | Hours |
| mm | = | Minutes |
| ss | = | Seconds |
| , | = | delimiter |
| S | = | Sign +/- (N/S) |
| dd | = | degrees of latitude |
| mm | = | minutes of latitude |
| .ffff | = | fractional minutes of latitude |
| , | = | delimiter |
| S | = | sign +/- (E/W) |
| ddd | = | degrees of longitude |
| mm | = | minutes of longitude |
| .ffff | = | fractional minutes of longitude |
| <CR><LF> | = | Carriage return/Line feed |

2.5 BATTERY CHARGER

The 6155D "smart" battery charger prevents overcharging by detecting fully charged batteries and having a maximum charge time of 264 minutes. The batteries will charge when the 6155D power switch is in the **ON** position and when it is in the **OFF** position. During charging, when the power switch is in the **ON** position, a **C** will be displayed on the LCD.

3.0 MECHANICAL CONFIGURATION

The 6155D is housed in an aluminum enclosure, 8 inches long, 3.8 inches wide and 2.55 inches high, which includes rechargeable batteries and an attached antenna. All controls, indicators and LCD display are on the front and all connectors are on the top (end surface). The batteries are accessible via a removable panel on the bottom. See figure 1.



4.0 CONTROLS, INDICATORS AND CONNECTORS

- 4.1 Power On/Off Toggle Switch - Turns power on and off.
- 4.2 Display 16 Character LCD Display - Displays time, GPS lock status, and IRIG B synchronization status. A “G” is displayed when valid GPS lock is established. An “T” is displayed when internal IRIG clock is or has been synchronized with UTC time mark since last power up and that IRIG timecode is valid in event of loss of GPS lock. A “C” is displayed when external power is applied and the batteries are charging.
- 4.3 External Power 3.5 mm Miniature Phone Connector - Connects to external 12 volt, 800ma DC power. This input powers both the internal battery charge circuitry as well as the unit. Note that the connector tip is positive and the sleeve is negative.
- 4.4 GPS Antenna SMA connector - Connects to attached GPS antenna or to an external active antenna. Do not attach a passive antenna to this connector unless it includes a DC block. The unit is set to interface with active antennas utilizing 5 volt power. Damage to the GPS receiver can occur if an incompatible antenna is used.
- 4.5 IRIG B Output BNC Connector - Outputs serial IRIG B signal. 3:1 modulation ratio. Factory set to 3V peak to peak.
- 4.6 RS-232 DE-9S connector - Outputs time, latitude and longitude. Receives time offset and dynamic mode setting. Also outputs UTC time mark on the RTS output.
- | <u>Pin</u> | <u>Mnemonic</u> | <u>Function</u> |
|------------|-----------------|--|
| 2 | RxD | Receive data |
| 3 | TxD | Transmit data |
| 5 | Gnd | Signal ground |
| 7 | RTS | Request to send (outputs 1pps time mark) |
| 8 | CTS | Clear to send (n/u) |

4.0 CONTROLS, INDICATORS AND CONNECTORS (continued)

4.7 UTC Time Mark Out

BNC Connector -
Outputs UTC Time Mark, TTL

4.8 IRIG B Output Level

Internal Potentiometer -
Sets the level of IRIG B output. Range is 0 to 5V
peak to peak unloaded. Factory set to 3V peak to
peak.

5.0 SPECIFICATIONS

5.1 Timing Accuracy

When Locked to GPS: 1×10^{-9} @ 1 second
 1×10^{-10} @ 100 second
 3×10^{-12} @ 1 day
(Dynamic mode set to 'Fixed')

When not locked to GPS $<2.5 \times 10^{-6}$ without discipline
 $<0.3 \times 10^{-6}$; <30 ms per day
(after 24 hours of GPS locked disciplining)

5.2 IRIG B Output

Standard IRIG B serial time code IAW IRIG Standard 200-98 (synchronized with time code generator).

5.3 GPS Performance

Channels: 12 Parallel channels, tracks all satellites in view.

Time-to-first-fix: <15 seconds typical (warm start), <90 seconds typical (cold start).

UTC Time Mark: Synchronized with Global Reference Standard.

Reacquisition: 2 seconds typical.

Dynamics Mode: Five settings: Fixed, Walking, Land Vehicle, Marine, Airborne. Timing accuracy varies from <25 nsec (Fixed) to <100 nsec (Airborne)

Datum WGS 84

5.4 GPS Antenna

Active Patch Antenna, 5 VDC power provided via antenna cable. Gain: $26 \text{ db} \pm 2 \text{ db}$. Noise figure: 1.5 db Max. See section 4.4.

5.5 Serial Interface

EIA RS-232C, Asynchronous, 19200 baud, 8 data bits, 1 start bit, 1 stop bit, no parity, no flow control. Note that the RTS output pin is not used for handshake but instead outputs the 1Hz UTC Time mark.

5.6 Character Display

16 Character, Reflective, LCD. 5X7 Dot Matrix. Character size: 3.07 X 5.73 mm

5.0 SPECIFICATIONS (continued)

| | | |
|------|-----------------|---|
| 5.7 | Temperature | |
| | Operating | 0°C to +55°C |
| | Nonoperating | -20 to +70 |
| 5.8 | Humidity | 95% non-condensing |
| 5.9 | Package | Hand held configuration, aluminum enclosure, 8 inches long, 3.8 inches wide and 2.55 inches high. |
| | Weight: | 2 lbs., 4 ozs. |
| 5.10 | Battery | The unit requires 6 each “AA” NiMH, 1500 mah batteries. |
| 5.11 | Battery Charger | Maximum Charge Time: 264 minutes |
| | | Maximum Voltage: 20 VDC |
| | | Minimum Current: 750ma |

6.0 SETUP USING THE CONFIGURATION UTILITY

Included with the 6155D is a CDROM containing a self-installing utility program for setting up the unit via a Graphical User Interface (GUI) from a Windows™ 95, 98 or XP computer (see figure 2). The user must connect the 6155D to one of the computer's COM ports. Offset data is saved in non-volatile RAM.

6.1 OPEN PORT

This button, when active, allows the user to open the respective COM port on which the 6155D is connected. This button will be grayed out when it has been pressed, and the **Close Port** button will be active. The port must be opened before commands to the board are accepted. The user should avoid selecting an incorrect COM port as that port may be in use for some other purpose (e.g. the mouse is usually on COM 1 unless a PS/2 mouse is used).

6.2 CLOSE PORT

This button, when active, deactivates the COM port preventing further communication with the 6155D. The port is automatically closed when you exit the program.

6.3 SET TIME OFFSET

To change the time to local time, an offset must be entered in the Time Offset field (e.g. –07 for PDT, –08 for PST, or 0 for UTC) and the **Enter Value** button pressed to accept the value. The offset value must be an integer value greater than –12 and less than +12. Pressing Enter in the Time Offset field executes the same as depressing the **Enter Value** button.

6.4 SERIAL OUTPUT

When the 6155D is locked to GPS, the Time, Latitude and Longitude will be displayed in the respective boxes.

6.5 DYMAMIC MODE

The **Set** button will set the GPS receiver dynamic mode to the value entered into the **Mode** box. The **Query** button will return the current dynamic mode value and display it in the **Mode** box. The accepted values for the Dynamic Mode are:

6. Stationary
7. Man Pack/Walking
8. Automotive
9. Marine
10. Airborne

Note: If a query is made after the mode has been set to “1”, and after the GPS receiver has completed its survey, a “0” will be returned and displayed. This indicates that Fixed base station, maximum time and frequency accuracy has been achieved. This response can take up to 15 minutes.

FIGURE 2

Model 6155D Configuration Utility

