

# GPS-150 AUTOMATIC VEHICLE LOCATION UNIT

## FEATURES

- INTEGRATED GPS RECEIVER & RADIO MODEM
- CONVENTIONAL AND TRUNKING RADIO COMPATIBLE
- QUADTEC™ DIGITAL SIGNALING
- TRACK ON POLL, TIMED OR EXCEPTION
- VEHICLE ALARM AND SENSOR REPORTING
- AUTOMATIC GEO-ZONE™ REPORTING
- MOTION-TRAK™ INTELLIGENT REPORTING
- EMERGENCY TRACKING
- 3 INTELLIGENT SERIAL PORTS
- 8 AUXILIARY INPUTS AND 3 OUTPUTS
- SERIAL FLASH MEMORY FOR LOGGING APPLICATIONS
- EXTERNAL MEMORY CARD

## BENEFITS

- CONTROL VEHICLE MECHANICS, E.G. ENGINE SHUT OFF, LIGHTS
- OPERATE COVERT OPERATIONS
- MONITOR VEHICLE CARGO
- DISPATCH VEHICLES TO PRECISE LOCATION
- REDUCE BACK-TRACKING ACROSS ROUTES
- CUT COSTS AND TIME DRAMATICALLY
- REDUCE OVERTIME, DRIVER ABUSE
- IMPROVE CUSTOMER SERVICE
- REDUCE FLEET COSTS
- IMPROVE RESPONSE TIMES
- PROTECT PERSONNEL
- INCREASE PRODUCTIVITY AND FLEET USE
- IMPROVE DRIVER RESPONSIBILITY
- REDUCE AIR-TIME AND RADIO TRAFFIC CONGESTION



Delivering high performance at an affordable price, the GPS-150 is but one of a family of intelligent mobile wireless data products from CES Wireless. It is designed as a stand alone GPS automatic vehicle location unit, for demanding applications where low maintenance, high performance and reliability are essential. The unit has an integral high speed data modem for connection to conventional, repeaters and trunking radio transceivers.

The device is housed in a rugged enclosure, protected from harsh environmental conditions and comes with a factory sealed radio interface cable.

In addition to the analog radio interface, the unit has 3 on board serial ports, 8 auxiliary inputs and 3 auxiliary outputs for connection to sensors and control. The device also comes with serial flash memory for logging applications, and an external memory card.

With its advanced tracking algorithms, the device reports on polled, timed or exception, and returns position, velocity, health, event log and time. A proprietary compression technology allows the accumulation of data for transmission at regular intervals, providing the dispatch manager with detailed tracking data.

The GPS-150 operates in conjunction with any of the CES Wireless software packages. These affordable and advanced software systems provide for multiple channel, multiple protocol and multiple dispatcher use. Please refer to the software brochures for detailed information.

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## OVERVIEW

The GPS-150 Automatic Vehicle Location (AVL) Unit is designed as a stand-alone automatic vehicle location device that interfaces with popular commercial two-way and trunking radio devices. It is designed for demanding applications where low maintenance, high performance and reliability are essential.

The unit is housed in a rugged steel enclosure, protected from harsh environmental conditions and comes with a factory sealed radio interface cable.

## GPS

GPS (Global Positioning System) is an existing technology originally set up by the U.S. government to accurately monitor the maneuvers of military vehicles with nearly pinpoint precision. GPS was a qualified success with military operations, and now it is revolutionizing navigational tracking for commercial and civilian use. The principals of GPS are quite simplistic in nature, yet this simple solution to maintaining knowledge of the exact location of a vehicle or troop of vehicles is currently being trusted by such high-pressure industries as Police Forces, Hospitals and Fire Departments. Other industries such as Taxi Cab Companies, Messenger Services, Cement and Concrete suppliers, Construction Firms and Utility.

Companies have also discovered the benefits of GPS, and they are finding advantageous and profitable results as an outcome.

CES Wireless has harnessed this technology and maximized its use for the fleet management industry. With its advanced tracking algorithms, the AVL Unit reports on polled, timed or exception, and returns position, velocity, health, event log, speed, odometer reading and time.

### *The GPS-150 main product features are:*

- \* Report on poll or timed
- \* Returns position, velocity, health, event log and time
- \* Advanced tracking algorithms
- \* Differential compatible
- \* Serial flash memory for logging applications
- \* Less than 2 seconds reacquisition
- \* Internal diagnostics capability
- \* Stun and Revive; activated by dispatcher
- \* "Poll" for traffic discipline and unattended interrogation
- \* Automatic Number Identification/selective vehicle calling
- \* Full acknowledgments automatically processed
- \* Real Time Stamping of mobile transmission
- \* Long term queue when vehicle is out of radio coverage
- \* Low coast entry to AVL
- \* Dynamic GPS
- \* Intelligent GPS Automatic Vehicle Location Reporting
- \* Support popular wireless systems including conventional, trunking, CDPD, GSM and Satellite
- \* Rugged Industrial enclosure

The GPS-150 AVL Unit will operate over any voice grade channel or dedicated data network and is compatible with virtually any voice radio transmission device. In addition to an analog radio interface, the unit has 3 on board serial ports, 8 auxiliary inputs and 3 auxiliary outputs. The device also comes with serial flash memory for logging applications, and an optional memory card.



## MAIN CHARACTERISTICS



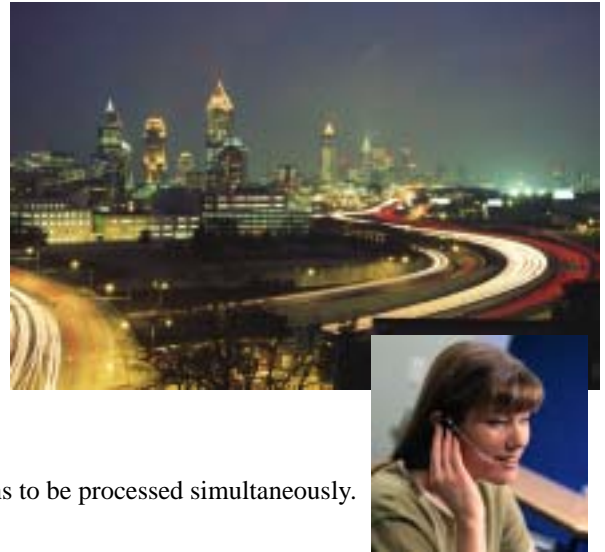
- ✓ The Automatic Vehicle Location (AVL) Unit is designed as a stand-alone GPS receiver with integrated high-speed data modem for connection to any voice grade wireless radio channel.
- ✓ The GPS-150 is compatible with any conventional two-way radio, remote base stations, repeaters and popular trunking systems.
- ✓ The unit is designed for demanding applications where low maintenance, high performance and reliability are essential.
- ✓ The device is housed in a rugged steel enclosure, protected from harsh environmental conditions and come with a factory sealed radio interface cable.

- ✓ In addition to the analog radio interface the unit has 3 intelligent serial ports, 8 auxiliary inputs and 3 auxiliary outputs.
- ✓ The AVL Unit is capable of reporting on polled, timed or exception, and returns position, velocity, health, event logs and time.
- ✓ As a secondary reporting layer, the GPS-150 is provided with a proprietary data compression technology for the accumulation and logging of vehicle activity/data over extended periods of time and then rapid transfer over a wireless infrastructure at pre programmed time intervals. This technology provides the dispatcher with a detailed step-by-step information on the vehicle being tracked together with vital statistics for accurate management analysis. The application of this technology is to collect extensive amounts of data for historical management reports. This data could be used to analyze routes, driver efficiency, or provide proof for claims against the company. (i.e. windshield broken by your trucks loose gravel). This overcomes the challenge of most wireless systems and the limited amount of data that can be sent back 'real time' because of issues relating to spectrum, capacity or airtime.
- ✓ The GPS-150 operates in conjunction with CES Wireless and third party developed software packages.
- ✓ The AVL Unit is capable of interfacing to sensors and controls to provide real time status conditions or any form of analog or digital information. Engine management systems can be supported, please check with your CES Wireless representative.
- ✓ The GPS-150 has an intelligent memory to maintain port states even on power down.
- ✓ The GPS antenna is shipped as a separate item with many different variants.
- ✓ A covert antenna can be provided for mounting in a headlight or other obscure location.
- ✓ Technology allows for mobile data text messaging, display terminals and GPS terminals to operate cohesively within the same system.
- ✓ The AVL Unit is provided with two-year parts and labor manufacturers warranty. This warranties the product to be free from defects in material and workmanship for two years from date of shipment. If such malfunction occurs, it will be repaired or replaced without charge for materials or labor when returned to the factory.
- ✓ The AVL Unit supports Stun and Revive, allowing the dispatcher to send a command to a vehicle to disable the terminal and optionally the vehicle. A second command can be sent to enable the terminal.
- ✓ The GPS-150 supports the capability of sending or programming the unit (over the air using host software and Windows based CES Wireless programming software) with up to 30 geographical coordinates allowing for certain "location" based statuses to be automated (i.e. at location A, leaving location B, on job, leave job).
- ✓ The AVL Unit supports a discrete input that can be used to trigger a faster GPS sampling (from every 5 sec. up). For example, when a police vehicle activates the siren, the updates are transmitted every 5 seconds, and when the siren, if off, the updates are transmitted every 15 minutes.



## MAIN CHARACTERISTICS

- ✓ The AVL Unit supports an intelligent movement algorithm that limits location updates to the dispatcher if the vehicle has not moved between samples.
- ✓ The GPS-150 supports speed exception reporting.
- ✓ The AVL Unit supports an Audio Alerts.
- ✓ The radio interface cables are specially designed customized cables to provide a high degree of shielding to prevent audio leak or engine noise distortion.
- ✓ The GPS-150 provided with serial flash memory for logging applications.
- ✓ The AVL Unit supports a base modem that provides for up to 50 transactions to be processed simultaneously.
- ✓ The AVL Unit supports vehicle alarm and sensor reporting.
- ✓ The AVL Unit supports a “request to talk” status by double clicking the microphone PTT.
- ✓ Internal Diagnostics capability.



### Programming

The GPS-150 is programmed using an IBM-compatible computer, Microsoft Windows. Together with the CES Wireless programming software it provides a wide range of programmable parameters, including the capability to set unit factory defaults, get, send, compare, and save programmed configuration files, and uploading new firmware as new features become available.

### Diagnostics

The AVL Unit provides a complete test and diagnostics routine such as Test Mode, GPS Test Mode, Firmware and Reset Unit mode.

### Interface Connection

When interfacing with a conventional/trunking radio/satellite, radio ready cables (terminated with the appropriate radio connector) are available. Please contact CES Wireless for the current list. Some older radios do not provide a radio accessory connector. In that instance, GPS connection points will have to be brought inside the radio. To accommodate for different radio models, the programming software provides for the programming of polarity for most of the inputs and outputs.

## WIRELESS NETWORKS

### CONVENTIONAL/TRUNKING RADIO

The GPS-150 AVL UNIT is designed to interface with two-way radio devices (see below for other network types) and has an internal wireless modem to transmit and receive data at 600- 4800 baud. It supports conventional radio (remote base station, repeater, simplex, semi duplex, wire line or leased line etc) or trunking (LTR®, Smartnet®, Smart Zone®, Privacy Plus®, SmartTrunk®) radio.

The product has internal intelligence to decide when a channel is ready for transmission, handshaking, message retry, message queues and an acknowledgment process in order to accommodate some of the peculiarities of this transmission medium, guaranteeing transmission success. This results in maximum message throughput.



CES Wireless has also interfaced serially with two-way radios having their own modem on board.

### System ID

Provides data differentiation between many companies operating CES Wireless data products on the same frequency.

### Unit ID

This is a unique mobile identity that identifies the vehicle. The Unit ID can be programmed from 00001 to 32767, and alias can be programmed at the base end. So for example, the GPS-150 unit ID might be 10123, however this would appear as John Smith on the dispatcher's screen.

### *Lead In Delay*

Another feature of the Radio Interface is the Lead In Delay. This is the period of time that the AVL Unit will cause the radio or transmitter to key prior to encoding the data, ANI or status information. This is necessary to give repeaters, line equipment or base stations sufficient time to settle prior to reception of the signal information. Example; when the system is key, the system sends a get ready message that allows the system to set or prepare for an incoming transmission. This is done to avoid any lost of transmitted data; if this is not done part of the information can be lost. The client can program the system delay from 0 to 200 ms (mille seconds) in 10ms increments.

### *Encryption*

To prevent unauthorized decoding of the data, a 3 level encryption technique is employed. Security, is one of our clients main concern, therefore no third parties have access to the information that is been sent to and from the mobile units or from and to the Central Office/Dispatcher.

### *ANI*

The Automatic Number Identification allows the Central Office to identify which vehicle is currently transmitting. This function is conducted automatically, however, each unit in the fleet must have their unique ANI. The AVL Unit has the ability to send a unique ANI data packet (with local microphone activity) that identifies the vehicle that is transmitting. The ANI (Automatic Number Identification) can be send at the beginning, end or randomly on a voice transmission.

### *ANI Holdoff*

This function avoids redundancy and excess transmission of the ANI data when short back and forth conversation between the Central Office and the mobile unit is conducted.

### *PTT Functions*

The 'Guard time' is use to prevent the AVL Unit from sending data while the user is engaged in a voice conversation. The 'Disconnect PTT In from PTT Out' allows the AVL Unit to have complete control over the transmitter in order to provide busy channel lockout.

### *Busy*

The AVL Unit will not monitor the radios busy channel indicator prior to sending data to determine if the channel is free.

### *Frame Transmit*

This involves a series of internal intelligent logic functions that respond to the amount of time the system waits, retries, stores, repeat, and respond to message transactions to guarantee that they get to the target location uncorrupted and as quickly as possible.

### *Channel Change*

When using conventional or trunking radio, and subject to radio designed, the GPS-150 can provide channel steering, to provide the user with a separate voice and data channel or trunking group.

### *Baud Rate*

The baud rate is programmable for 600, 1200, 2400, or 4800 bps. The baud rate selected will be consistent throughout the fleet and must be capable of operating reliable on the selected radio system.

### *Radio Type*

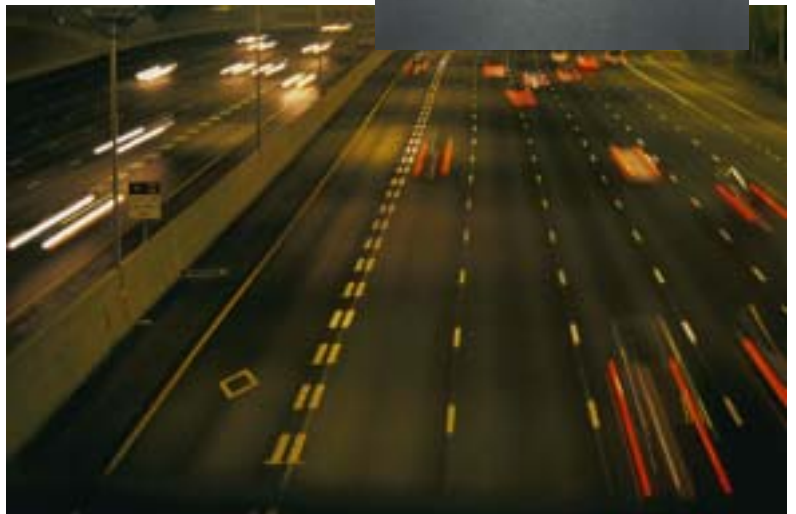
The type of radio system (conventional, LTR trunking, Smartnet trunking, Privacy Plus & Passport trunking, etc..) is programmable. The default settings relating to these protocols can be altered as follows:

#### **Lead In delay**

This is the period of time that the AVL UNIT must cause the radio transmitter to be active prior to sending data. This is necessary to give repeaters, line equipment or base stations sufficient time to settle prior to reception of the signal information.

#### **Trunking - Request Check**

The Request Check slider sets the minimum time in which the AVL UNIT must consider that the radio has made a valid request.



## WIRELESS NETWORKS

### Trunking -Request Window

This is the length of time that the AVL UNIT monitors the channel available input looking for the radio to make a channel request.

### Trunking -Grant Check

This timer is to discriminate between a channel request and a channel grant. Only when the channel has been granted, must the data be sent.

### Grant Window

This is the length of time that the AVL UNIT monitors the Channel Available input looking for a Channel Grant.

### Outgoing Queue

#### Long Term Queue

The AVL Unit has a Long Term Queue to store GPS traffic.

#### Procedure Time

Sets the amount of time to begin a frame sending procedure for a frame that is in the long-term queue.

#### Repeat Count

Sets the number of times to retry sending a frame that is in the long-term queue when the procedure timer expires.

## GENERAL FEATURES

The GPS AVL is a full-featured Automatic Vehicle Location module compatible with the Global Positioning System (GPS) and comes with an integrated wireless data modem operating at between 600-4800 baud to communicate through any popular wireless infrastructure.

Using pioneering techniques, the GPS utilizes the most sophisticated form of Automatic Vehicle Location (AVL). This is called the Global Positioning System and is a constellation of 24 satellites developed by the U.S. Department of Defense, and made available without charge to commercial and civilian users. It reports GPS position, speed, elevation, input status, and direction together with time.



Navigational data is sent from the GPS satellites orbiting more than 10,000 miles above the earth, and collected by the vehicle AVL Unit. The information can be transferred using mobile radio, cellular or any form of data link to provide a dispatcher with real time vehicle tracking.

The unit is a cost-effective, feature rich device compatible with most of the popular wireless networks. It is designed to provide a driver with a number of functions to safely and effectively communicate quickly with the dispatch center, and vice versa using short messages.

### Send Position Every

This required function determines the automatic reporting time interval. This value is in 1 minute increments, 0 = off.

| Selections                              | Explanation  |
|---|--|
| Without acknowledgements                | Selecting this function does not require an acknowledgement from the base upon sending a position report.  |
| With acknowledgements                   | This option when selected requires the base to acknowledge the position report. However, if the mobile is out of range and exhausts its retries, the position report will be discarded.  |
| With acknowledgements & Long term Queue | This option when selected requires the base to acknowledge the position report. If no acknowledgement is received after exhausting the retries, the report will go into a long-term queue (be saved) to be sent again after the long-term queue "Procedure Time" is exhausted. All position reports must be stored until base acknowledgments can be received. |

### Regular Interval Reporting

The GPS can be programmed to transmit GPS location at a preprogrammed time interval from XX to XX minutes, with or without an acknowledgement.



### DACT™

A proprietary “Data Accumulation Compression Technology”, (DACT™), allows for the recording and accumulation of data over extended periods, and then “rapid fire” transfers over a wireless infrastructure at pre programmed time intervals. DACT(tm) provides detailed, step-by-step, stop-by-stop, event-by-event information on the vehicle being tracked, together with vital statistics for accurate management analysis or playback.

This provides the user with the capability to record vehicle activity every 15 seconds (programmable), from speed, velocity, position, stop, starts, auxiliary inputs etc, and using a propriety technology, the data is compressed and transmitted to the dispatch center at a programmable time period, from 1 minute up to 45 days. This is a second reporting layer, in addition to regular interval reporting.

The compressed data is transmitted in ‘frames’ (or batches) and the frame period can be programmed also. The application of this technology to the system allows you to collect extensive amounts of data for historical management reports. This data could be used to analyze routes, driver efficiency, or provide proof for claims against the company (i.e. windshield broken by your trucks loose gravel). This overcomes the challenge of most wireless systems and the limited about of data that can be sent ‘real time’ because of issues relating to spectrum, capacity or airtime. Using this feature, customers can reduce their airtime charges dramatically.

### MOTION-trak™

**Movement Intelligence:** MOTION-trak(tm) is a movement-based algorithm that compares previous vehicle GPS samplings to new ones and then reacts to preprogrammed instructions. For example, this technology limits location updates if the vehicle has not moved between samples. This keeps the wireless infrastructure from becoming cluttered with redundant data (e.g. Instead of 12 samples of GPS data an hour for a sitting truck, there will only be one sample).

But, what will happen if the mobile unit is in stop and go heavy traffic? In order to provide reliable reporting, the unit can be programmed to log and send the data 10 seconds (programmable) after the unit has stopped or begun to move.

MOTION-trak™ also reacts to Auxiliary Input 1, to change the reporting interval. When a police car turns on the emergency siren and auxiliary 1 changes polarity. The GPS-150 can be programmed to change its reporting interval from say every 10 minutes to every 5 seconds (programmable).

### geo-STATUS™

The geo-STATUS(tm) is a proprietary ‘patent pending’ technology developed by CES Wireless to allow for certain “location based” statuses to be automated (i.e. at plant, leave plant, on job, leave job). The GPS samples and looks for a match to the plant zones/job ticket zone stored. Once the GPS-150 acknowledges its presence in a particular zone the terminal automatically reports this specific and unique status to the Dispatch Center. Entry and exit is reported. The geo-STATUS(tm) coordinates can be preprogrammed in the terminal, or can be programmed over the air by the host software therefore supporting customer locations that can change regularly throughout the day. The product can support 30 different geo-STATUS coordinates.



**WIRING CHART**

## Radio Interface Specifications

The AVL Unit has the following connectors to assure proper functionality. Radio Interface Connector is a DB-25 (Male). The radio interface cable has separate shielded strands for audio in and audio out, together with a shielded strand. CES Wireless has radio ready cables available for most popular radios.

**CONNECTOR PIN ASSIGNMENT & FUNCTION**

| Function            | Type       | Note  |
|---------------------|------------|---|
| DC Power            | 8-16v      | Switched B+ (+8 volts to +16 volts DC) with reverse polarity protection.  |
| Ground              |            | Radio Ground  |
| Modem Receive       | Audio      | Input Audio, Z = 67K or 20K, cap coupled  |
| Modem Transmit      | Audio      | Modulator with pre-emphasis, Z = 47K or 10K, cap coupled  |
| Ground              |            |   |
| No Connection       |            |   |
| Mic mute            | OC         | Open collector, with removable 27k pull up via (JP-13).   |
| Auxiliary out R     | OC         | Open collector, with removable 27k pull up via (JP-12).   |
| PTT in              | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.  |
| Auxiliary in R      | -35 to 35v | Z = 100K, -35V to +35V. Logic input with 100k pull up.<br>The standard function for this input is to detect channel activity when set to LTR or Smartnet operation.   |
| Busy/Trunk          | -35 to 35v | Z = 100K, -35V to 35V, Logic input with 100k pull up.   |
| No Connection       |            |   |
| PTT out             | OC, diode  | This output must function as a Push to talk output.   |
| Speaker mute        | OC         | Open collector, with removable 27K pull up via (JP-14).   |
| Power               | 8-16v      | Connect to same point as pin first pin described  |
| Auxiliary in 1      | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100K pull up<br>Used to sense external conditions or devices.  |
| Auxiliary out 1     | OC         | Open collector, with removable 27k pull up via JP-4.<br>This output can function as a standard auxiliary output (activated by command from Dispatch) or can be used for Channel Steering. The active state of this output must be programmable. |
| Transmit Diagnostic | RS232      | Transmitting diagnostic information from the AVL Unit program.  |
| Receive Diagnostic  | RS232      | Receiving diagnostic information from the AVL Unit program.   |
| Ground              |            |   |

|                            |       |  |
|----------------------------|-------|--|
| Spare Serial Port Transmit | RS232 | Serial out to peripheral devices >or data port of radio Output |
| Spare Serial Port Receive  | RS232 | Serial in to peripheral devices or >data port of radio Input   |
| Spare Serial Port RTR      | RS232 | Serial out to peripheral devices or >data port of radio Output |
| Spare Serial Port CTS      | RS232 | Serial in to peripheral devices or >data port of radio Input   |
| Ground                     |       |  |

*Auxiliary Interface Connector DB-15 (Female).*

## CONNECTOR PIN ASSIGNMENTS

|                 |            |   |
|-----------------|------------|---|
| Auxiliary in 1  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 2  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 3  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 4  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 5  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 6  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 7  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Auxiliary in 8  | -35 to 35v | Z = 100K, -35V to +35V, Logic input with 100k pull up.<br>Used to sense external device conditions. |
| Transmit Radio  | RS232      | Serial out to peripheral devices >or data port of radio Output                                      |
| Auxiliary out 1 | OC         | Open collector, 27k pull up via jumper JP-4<br>Used to control external devices.                    |
| Auxiliary out 2 | OC         | Open collector, 27k pull up via jumper JP-5<br>Used to control external devices.                    |
| Auxiliary out 3 | OC         | Open collector, 27k pull up via jumper JP-6<br>Used to control external devices.                    |
| Receive Radio   | RS232      | Serial in to peripheral devices or >data port of radio Input  |
| Ground          |            |   |
| Power           |            | 12 Volt Power to CES accessory  |

## FEATURES

### General . . .

- Formed steel for rugged reliability
- “QUADTEC” digital signaling
- 600, 1200, 2400, 3900, 4800 baud
- GPS Receiver with integral RF modem
- 3 level data “encryption”
- Solid, proven “over the air” protocols
- Compact size: 9.5W x 1.25H x 5.5D inches
- Radio interface cable with sealed connectors
- Compact, active, magnetic, non-magnetic, bulkhead mount or covert antenna optional.

### Features . . .

- Report on poll, timed or exception
- Returns position, velocity, health, event log and time
- Advanced tracking algorithms
- Differential compatible
- Serial flash memory for logging applications
- Less than 2 seconds reacquisition
- Internal diagnostics capability
- Transmission “time out timer”
- Stun and Revive; activated by dispatcher
- “Poll” for traffic discipline and unattended interrogation
- Automatic Number Identification/selective vehicle calling
- “Stuck Mic” auto transmission
- autoCALL™ - “request to talk” by double clicking PTT
- Tone blanking to prevent driver distraction
- Full acknowledgments automatically processed
- Real Time Stamping of mobile transmission
- Message memory when vehicle is out of radio coverage
- Flash memory, extensive on board RAM
- Test tone generation for system setup
- ‘smart’ trunking access protocol

### Programming . . .

- Sequential programming of devices
- Windows programming software

### In/Out Controls . . .

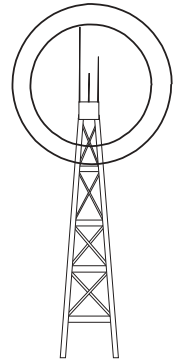
- 8 auxiliary inputs,
- 3 auxiliary outputs
- 3 Serial Ports

### Peripheral Items Supported . . .

- CES PNT-97 Mobile Printer
- Bar Code Scanner
- Engine Management interface

### Wireless Compatibility

- Conventional Radio Systems
- Multi Channel Radio Systems
- Remote Base Stations
- Community Repeaters/Base Stations
- 220MHZ Networks
- Analog trunking —
  - EFJohnson LTR™
  - Motorola Smartnet™
  - Motorola Privacy Plus™
- Others Any serial or data ready radio



### Applications

Ambulance, Readymix,  
Concrete, Mobile Service,  
Parts delivery, Fire,  
Police, Couriers, Security  
Transportation, Taxi, Buses  
Food delivery, Mining  
Domestic repair services  
Limousines, Barges, Tug boats...



### Base Software . . .

#### QUICK-trak™ / POWER-trak™

Integrated Mapping, Dispatch and Status Monitoring

#### trak-CONTROL™

Gateway software for integration of non-CES software systems

#### CASH-trak™

Credit Card authorization software

#### MULTI-trak™

Windows NT- multi user server software



## SPECIFICATIONS

### Mechanical

- Dimensions: 9.5 x 1.25 x 5.5 (25 x 3.2 x 14cm)
- Weight: 36.00 oz (1.02Kg)
- Cabinet: Formed steel
- Interface Cable: Shielded factory cable

### Electrical

- Voltage: 7-16 V DC
- Current: <200mA
- Microphone Muting: Open collector
- PTT Output: Open collector
- Speaker Mute Output: Open collector
- Horn Alert Output: Open collector
- Auxiliary Inputs: Z=100K -35 to +35V
- Auxiliary Outputs: Open collector
- Emergency input: 0-5V connect to ground via switch
- Ignition Sense: Z=100K -35 to +35V
- Encode Tone Out Imp.: Z=47K or 10K cap coupled
- Encode Tone Out Level: 1 Volt RMS (variable)
- Signal Input Sensitivity: 100-1000mv RMS (variable)
- Signal Input Impedance: Z=67K or 20K cap coupled
- Alert Tone Out Impedance: Z=67K or 20K cap coupled
- Alert Tone Output Level: 1.5V RMS (variable)

### Signaling

- Format: MSK 600/1200/2400/3600/4800 baud

### Programming

- Software: GPS-150S Windows 98 software

### Environmental

- Operating temperature: -10 to + 60 deg. C
- Storage temperature: -55 to + 100 deg.

### GPS Receiver

- Tracking Capability 12 satellites simultaneously
- Reacquisition < 1 sec typical
- Datums 189 standard, 5 user defined
- Accuracy Horizontal < 6 meters (CEP)  
DGPS < 1 meter (CEP)

### Ordering

- GPS-150 GPS receiver/modem
- HRNS10 Radio interface harness
- HRNS03 Auxiliary interface harness
- ANT-01 GPS antenna magnetic mount
- ANT-02 GPS antenna fixed mount
- PNT-97 Mobile printer
- CD-Soft1 Programming software CD
- MANUAL99 Programming & installation manual

### Analog Radio Interface

- Power 7-16v
- Ground
- Receive audio
- Transmit audio
- Speaker enable
- Microphone mute
- Ch. change out
- PTT in
- PTT out
- Ch. change in
- Busy/trunk
- Alert
- Speaker mute
- Power 7-16v

### Controls

- Serial 1 GPS receiver
- Serial 2 Peripheral expansion
- Serial 3 Programming
- Auxiliary out 1 Sensor out, e.g. activate lights
- Auxiliary out 2 Sensor out, e.g. deactivate ignition
- Auxiliary out 3 Sensor out, e.g. activate siren
- Auxiliary in 1 Sensor in, e.g. emergency input
- Auxiliary in 2 Sensor in, e.g. ignition input
- Auxiliary in 3 Sensor in, e.g. trunk open
- Auxiliary in 4 Sensor in, e.g. drum active
- Auxiliary in 5 Sensor in, e.g. door open
- Auxiliary in 6 Sensor in, e.g. meter on
- Auxiliary in 7 Sensor in, e.g. status
- Auxiliary in 8 Sensor in, e.g. status



Louisville  
Lexington  
Central Kentucky  
Southern Indiana