

TRK-240 MOBILE DISPLAY/GPS TERMINAL

FEATURES

- LARGE 4 x 40 CHARACTER, BACKLIT LCD DISPLAY
- OPTIONAL INTERNAL GPS MODULE
- CDPD/GPRS CELLULAR/SATELLITE PLUG AND PLAY COMPATIBLE
- OPTIONAL PRINTER, CREDIT CARD SWIPE AND KEYBOARD
- PROVEN PROTOCOLS WITH SECURE DATA ENCRYPTION
- 14 TOUGH SILICONE RUBBER BACKLIT REAL KEYS
- 600, 1200, 2400, 3900, 4800 BAUD
- SERIAL PORTS FOR RADIO OR EXTERNAL DEVICES
- AUTOMATIC GEO-ZONE™ USING GPS
- AUTO STATUS REGISTRATION
- QUADTEC™ MESSAGE MANAGEMENT
- COMPATIBLE WITH CONVENTIONAL, ANALOG AND DIGITAL TRUNKING
- EXTERNAL MEMORY CARD
- COMPLETE SERIES OF COMPLIMENTARY BASE SOFTWARE

BENEFITS

- DISPATCH CALLS TO INDIVIDUAL MOBILE UNITS
- OBTAIN STATUS INFORMATION DIRECTLY FROM FLEET
- TRACK VEHICLE LOCATION WITH OPTIONAL INTERNAL GPS
- PRINT TICKETS IN VEHICLES UNDER DISPATCHER COMMAND
- LET DRIVERS LOG THEMSELVES INTO ZONES/PLANTS
- OBTAIN AUTOMATIC CREDIT CARD AUTHORIZATION
- ACTIVATE EXTERNAL OUTPUTS FROM DISPATCH



The TRK-240 is an advanced mobile data display and status terminal featuring intelligent messaging capabilities that works with your existing mobile radio system. Featuring a backlit 4 x 40 display together with 14 "real" backlit user programmable silicone rubber keys, the TRK-240 is loaded with a host of advanced features. The unit is enclosed in a rugged "industrial" enclosure and sealed from dust and the harsh environment into which these devices are often installed.

A host of additional peripheral devices interface directly for "plug and play" operation including an optional internal GPS (Automatic Vehicle Location) module, credit card reader, mobile printer and QWERTY keyboard.

The TRK-240 features an integral modem for direct radio interface. All transmissions are automatic using the exclusive CES QUADTEC™ process, which automatically takes control of over the air message management.

The CES base software system provides a complete CAD station compatible with the TRK-240 feature set. QUICK-trak™/POWER-trak™ from CES is both a CAD and mapping display system. MULTI-trak™ is a multiple dispatcher, Windows network software system. In addition, trak-CONTROL™ the CES gateway software utility provides a set of tools for third party software integrators offer compatibility between their software systems and the CES mobile data system.

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LOADED WITH FEATURES .. including

- Steel enclosure for rugged reliability
- “Snap of the Finger” digital signaling
- Integral modem with 3 level data “encryption”
- 600, 1200, 2400, 3900, 4800 programmable baud rate
- Solid, proven “over the air” protocols
- Compact size: 1.8 x 8.0 x 5.3 inches
- Serial Ports: - TTL/RS-232
- 4 x 40, backlit super twist nematic LCD display
- 14 tough silicone rubber backlit keys
- GPS option using internally mounted GPS-120 board

- 3 auxiliary inputs, 3 auxiliary outputs
- Emergency input control and separate operating protocol
- Ignition sense, horn honk output and relay
- Horn relay output to attract driver attention
- Automatic channel change for dual channel data/voice
- Weather sealed transducer for audio alerts

- Time out timer, stun, revive & poll commands
- Automatic Number Identification and selective vehicle calling
- “Stuck Mic” auto transmission
- autoCALL™ - “request to talk” by double clicking mic PTT

- Individual or fleet messages
- 2- way status messaging
- 99 message storage capacity
- Programmable display prompts for entry of status related numeric data
- Message and status scroll

- Tone blanking to prevent driver distraction
- Full acknowledgments automatically processed
- Visual LED indicators and alert output to assist driver
- Conventional, analog trunking & selected digital trunking
- “Smart” trunking access protocol
- Key masking to force driver to activate keys in logical order
- Real Time Stamping of mobile status transmissions
- Message memory when vehicle is out of radio coverage
- LED provides driver with visual recognition of key pressed
- Flash memory, extensive on board RAM
- Test tone generation for system setup
- Sequential programming of terminals
- Numeric entry using keypad or ext. keyboard, e.g. dollar amount

- Radio interface cable with sealed connectors
- Custom faceplates and features based on customer requirements
- Compatible with :
 - > CRD-500 Magnetic Card Reader
 - > PNT-97 Mobile Printer
 - > KBD-97 External QWERTY Keyboard
- TRK-240S Windows 98 programming software
- Compatible with CES CAD and Mapping software systems

Applications, here are a few . . .

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



Wireless Compatibility . . .

Conventional Radio Systems
Multi Channel Radio Systems
Remote Base Stations
Community Repeaters/Base Stations
220MHZ Networks
IP-MobileNet Networks

Analog trunking — EFJohnson LTR®

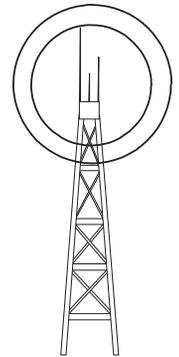
Motorola Smartnet

Motorola Privacy Plus

CDPD/GPRS/Satellite Standard Interface

Others

Any serial or data ready radio



Base Software Compatibility . . .

QUICK-trak™/POWER-trak™ -
Integrated Mapping and CAD software

trak-CONTROL™ -
Gateway software for integration of
non-CES software systems

MULTI-trak™ -
Multiple dispatcher, Windows network



Advantages . . .

Improve fleet productivity
Enhance customer service
Reduce fleet overheads
Provide greater management control
Increase driver discipline
Analyze real traffic statistics



The Message Display Terminal (MDT) is designed as a vehicle mountable Mobile Display Terminal which is interfaced with a wireless transceiver for communication with a dispatch center. It provides a display for base originated messages, a series of keys for driver to input information, together with an internal optional GPS automatic vehicle location module.

The unit is a cost-effective, rugged, 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.



The main product features are:

- LCD 4 x 40 Message Display
- Intelligent GPS Automatic Vehicle Location Reporting
- Activity Status
- Status with Numeric Entry
- Sub Menu Prompts
- Work Order Processing
- Sensors & Controls
- Emergency Reporting
- Credit Card Processing
- External Printer
- Supports popular wireless systems including conventional, trunking, CDPD, GPRS and Satellite
- Rugged Industrial enclosure

The device has an integral data modem for conventional and trunking radio, optional internal GPRS or CDPD cellular transceiver, optional internal GPS receiver, programmable to operate with the PDT-100 satellite transceiver, together with a capability to be programmed to interface with a wide range of other transceivers.

Featuring a backlit 4 x 40 high temperature display together with 14 “real” backlit user programmable silicone rubber keys, the TRK-240 is loaded with a host of advanced features including work order processing and menu driven displays. The unit is enclosed in a rugged “industrial” enclosure and sealed from dust and protected from harsh environmental conditions.



Please refer to CES Wireless issued application notes for radio specific compatibility to features outlined in this document. Implementation of some features may be subject to individual radio design. With an in house engineering team, CES Wireless can provide custom features, please call, fax or email to discuss your specific application.

MAIN CHARACTERISTICS

- ✓ The TRK-240 is designed as an integrated Mobile Data Terminal (MDT) providing a high-speed wireless data modem for connection to any voice grade wireless radio channel, serial driven radio or internal/external cellular data packet transceiver, e.g. CDPD, GPRS and satellite.
- ✓ The MDT is compatible with conventional two-way radio, remote base stations, repeaters and popular trunking systems.
- ✓ The MDT supports an internal CDPD or GPRS cellular packet data transceiver.
- ✓ The MDT supports the EMS PDT-100 satellite transceiver and operates over the TMI satellite network.
- ✓ The MDT supports GPS Automatic vehicle Location with an optional internal module (GPS-120).
- ✓ The unit is designed for demanding applications where low maintenance, high performance and reliability are essential.
- ✓ The MDT is housed in a rugged steel enclosure, protected from harsh environmental conditions and comes with a factory sealed radio interface cable.
- ✓ The MDT has a 40 characters x 4-line LCD backlit, Super Twist Nematic display rated for 50,000 hours.

The minimum LCD temperature specification is as follows:

Storage	-20 to + 70 deg. C (-4 to +158 deg. F)
Operating	0 to + 50 deg. C (+32 to +122 deg. F)

- ✓ The MDT is provided with 14 programmable, user definable, backlit gold contact keys. Faceplates for many applications are available, together with a customized label.
- ✓ Work order/job ticketing processing is supported, providing the operator (using host software) with the capability of handling multiple calls/jobs and reporting the status of these jobs to the dispatch center using the MDT Unit.
- ✓ The MDT provides for intelligent job/vehicle status activation, including sub menus associated with each status key and numeric entry using the Units integrated keypad.
- ✓ The MDT supports an external printer, magnetic card swipe and external QWERTY keyboard with compatible base end software.
- ✓ The MDT supports pre defined canned messages.
- ✓ Audio tuning controls provide for adjustment without opening the MDT, either using the TRK-240S programming software or using the external keypad.
- ✓ In addition to the analog radio interface as described further in this document, the TRK-240 MDT has 3 on board serial ports, 3 auxiliary inputs and 3 auxiliary outputs.
- ✓ The MDT is provided with serial flash memory for logging applications.
- ✓ The MDT is capable of reporting on polled, timed or exception, and return position, velocity, health, event logs and time.
- ✓ As a secondary reporting layer, the AVL MDT is provided with a proprietary data compression technology for the logging of vehicle activity over extended periods of time and then rapid transfer over a wireless infrastructure at pre programmed time intervals. This technology provides the dispatcher with 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.



MAIN CHARACTERISTICS



- ✓ The MDT operates in conjunction with CES Wireless and third party developed software packages.
- ✓ The MDT is capable of interfacing to engine management systems, sensors and controls to provide real time status conditions.
- ✓ The MDT has an intelligent memory to maintain port states even on power down.
- ✓ The GPS antenna is a separate item providing for different variants dual CDPD/ GPS and GSM/GPS are also available.
- ✓ A covert antenna can be provided for mounting in a headlight or other obscure location.
- ✓ The MDT can operate on the same system with the CES Wireless GPS-150 (a standalone Automatic Vehicle Location MDT - without status keys or display).

- ✓ The MDT 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 must be repaired or replaced without charge for materials or labor when returned to the factory.
- ✓ The MDT supports Stun and Revive allowing the dispatcher to send a command to the terminal / vehicle to disable the vehicle electronically. A second command can be sent to enable the truck.
- ✓ The MDT has a built in enunciator for driver feedback and alert.
- ✓ The MDT supports a Request to Talk status by either double clicking the microphone PTT, or by using a MDT status key.
- ✓ The MDT supports the capability of programming the MDT (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 MDT 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 is off, the updates are transmitted every 15 minutes.
- ✓ The MDT supports an intelligent movement algorithm that limits location updates to the dispatcher if the vehicle has not moved between samples.
- ✓ The MDT supports speed exception reporting.
- ✓ The MDT supports mileage reporting. The MDT calculates mileage traveled and reports based on preprogrammed status.
- ✓ The radio interface cables have separate shielded strands for audio in and audio out, together with a additional shielded strand covering the entire cable.
- ✓ The MDT supports a base modem that manages up to 50 simultaneous transactions.



Programming

The TRK-240 is programmed using the CES Wireless TRK-240PA interface adapter, which connects to a PC serial port. The TRK-240S programming software provides a wide range of programmable parameters, including the capability of saving programmed configuration files, and uploading new firmware as new features become available.

Diagnostics

The TRK-240S provides a complete test and diagnostics routine such as Test Mode, GPS Test Mode, Radio Status, Firmware and Reset Unit mode, not just for the TRK-240 but also for the GPS internal board.



MAIN CHARACTERISTICS

Audio Alert

Audio Alert capabilities allow the MDT to be setup to beep to get the drivers attention. This gets the drivers attention and forces him to hit a status button to verify he not only received the message, but also read it. Speaker muting is provided.

LCD

The TRK-240 has a 4 line x 40-character LCD display, accommodating 160 or 320 character messages.

Interface Connection

Two sealed interface cables are provided to accommodate various connection configurations. See Appendix A for a list of the connections. This provides for radio, accessory, auxiliary and programming ports.

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, TRK-240 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 TRK-240 is designed to interface with two-way radio devices (see below for other network types). For analog applications, the TRK-240 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.



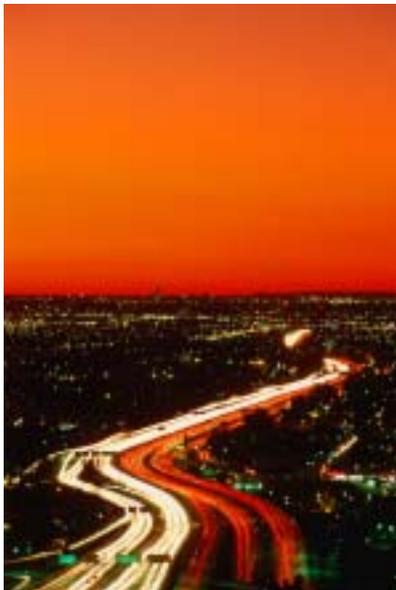
CES Wireless has also interfaced serially with two-way radios having their own modem on board.

System ID

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

Unit ID

This is a unique mobile identity that identifies the vehicle/TRK-240. The Unit ID can be programmed from 00001 to 32767, and an alias can be programmed at the base end. So for example, the TRK-240 unit ID might be 10123, however this would appear as John Smith on the dispatcher's screen.



Group ID

This provides a company with the capability to create sub-fleets and direct messages accordingly. For example, a company might have 50 ready mix trucks, 25 block trucks, 20 delivery vans and 10 supervisor's cars. Without Group ID, the rest of the fleet would also receive any global message sent to the block trucks. This allows global message to be targeted to the correct sub fleet.

A company can assign or program up to 10 different groups within the fleet minimizing message confusion while increasing efficiency and performance within the fleets.

Lead In Delay

Another feature of the Radio Interface is the Lead In Delay. This is the period of time that the TRK-240 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 keyed, the unit sends a get ready message that allows the base to set or prepare for an incoming transmission. This is done to avoid any loss 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 (milliseconds) 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 concerns, therefore no third parties have access to the information that is being 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. If fitted with a GPS receiver, the TRK-240 can be programmed to transmit the vehicle location as part of the ANI packet. The ANI (Automatic Number Identification) can be sent 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

In order to avoid unnecessary transmission over the air, the Central Office can set the "Double Click" function to on, this will unenable the operator's microphone. The operator of the mobile unit must double click the PTT in order to request to talk. The "Stuck Mike" function alerts the dispatcher that the PTT switch is active, this happens after the set time has expired (i.e. 5 minutes). However, the setting should always be longer than the TX Limit time. The "Guard time" is used to prevent the TRK-240 from sending data while the user is engaged in a voice conversation. The 'TX Limit' controls the amount of time the operator can transmit; if the operator exceeds the pre-programmed time the TRK-240 sounds its alert and unkeys the transmitter.

Busy

The TRK-240 will 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 TRK-240 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 design, the TRK-240 is capable of channel steering, to provide the user with a separate voice and data channel or trunking group.

Talk Mode

The TRK-240 is provided with two programmable talk modes; Open or Closed. Open means that the speaker and microphone is enabled at all times for operator use. Closed mode means that the speaker is muted and the microphone is disabled until the dispatcher enables them from the dispatcher center. The vehicle operator can send a RTT (Request to Talk) status either by double clicking the microphone, or activating the RTT status key on the MDT.

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 reliably on the selected radio system.

Radio Type

The type of radio system (conventional, LTR trunking, Smartnet trunking, Privacy Plus & Passport trunking, etc.,) is programmable.



CDPD/GSM

CDPD stands for Cellular Digital Packet Data, a method of sending and receiving data in small bursts, called packets, over a mobile cellular network. CDPD offers secure, encrypted data transmission in most U.S. metro areas and some international markets (Canada, Venezuela, Mexico). CDPD offers Speed and Immediacy by allowing information to be transmitted more quickly, immediately and efficiently across an IP mobile network. The TRK-240 has an optional internal CDPD transceiver available to provide connectivity over a CDPD wireless network. Limited factor is coverage.



GSM stands for Global System for Mobile Communications and is the most widely used digital cellular standard in the world. Although relatively new, GSM is widely used in Europe, Asia and Australia, US acceptance was slow, but it is growing in popularity. GSM is currently limited to short messaging services (sms) (limited to 160 characters), however GPRS (GSM Packet Data) is being installed worldwide with data speeds far exceeding that even made available by CDPD. The TRK-240 has an optional internal GSM transceiver available to provide connectivity over a GSM wireless network. Limiting factor is currently coverage, but this will quickly change as carriers roll out their upgrades.

Satellite

The TRK-240 is compatible with the EMS PDT-100, and using the TMI satellite network, provides blanket coverage from Northern Canada to Northern Venezuela.

GENERAL FEATURES

TRK-240 KEYS

The TRK-240 features twelve keys that are provided on the front panel, in addition to the F1 and F2 keys. The key functions allow the operator of the mobile unit to send messages or pre-programmed message to the Central Office/Dispatcher. The keys are fully programmable.

Custom text below each key will indicate the primary function of that key. When any key that is active is pressed, the MDT will generate a chirp on the alert output. If a status action occurs because of a numeric key press, a double beep is generated. An LED near each key provides feedback as to which key is active and the acknowledgment state. When a status key is pressed, the LED will flash at a quarter second rate until sent and then one second until acknowledged. When an acknowledgment is received it will illuminate steady. If the status is placed in the "long term transmission queue", it will flash slowly. If another status key is pressed, the LED will continue to report the acknowledgment state but it will turn off when the acknowledgment is received.

The function keys act as display message page up and page down, except when a status key is activated and the MDT is in "numeric mode", they become Abort and Send respectively.

Numeric Entry

A numeric message can be entered by the driver and associated with a status key activation. For example, Key 3 = Dollar. On activation of Key 3 display reads <Enter Dollar Amount>. Driver, using the numeric keypad, enters 3*45 to represent \$3.45, and then presses <SEND>. Other examples are mileage, leftover cargo, employee number, plant number, invoice number, credit card number etc.

Sub Menus

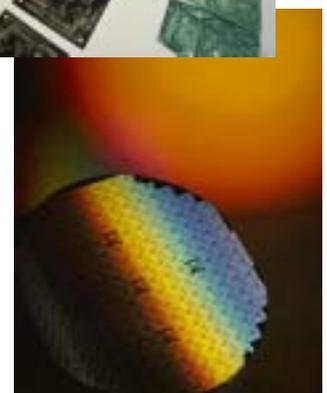
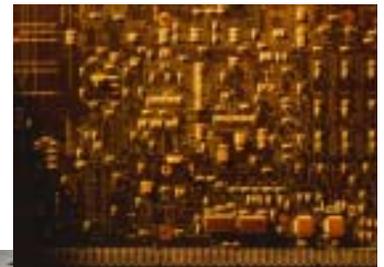
The TRK-240 can be programmed with the ability to display key driven sub-menus. These sub-menus could be used to prompt the driver for Numeric Entry as detailed above, or allow the use of the keys for further driver activation, e.g. Key 3=Out of Service, sub prompt might include, 1=Lunch, 2=Breakdown, 3=Rest Stop etc. These features allow you to query the driver for many things. (e.g. how many yards did he pour, entering his employee #, etc.) The display is used as a "menu prompt" screen to direct the driver on what to enter and how. The TRK-240 supports 16 lines of sub menus per status key, with a maximum of 160 lines available between sub menus and predefined messages (see below).

Predefined Messages Outbound

The driver can select TRK-240 predefined messages to send a fixed message to the dispatch center. This must also be configured in the base software.

Predefined Messages Inbound

The TRK-240 has the ability to display "canned" messages via a command from the dispatch computer. There are a total of 50 message screens.



GENERAL FEATURES

Programmability

The TRK-240 status keys can be programmed as follows:

- ✓ Function as a Request to Talk, Speaker Mute, Emergency, or Status Key
- ✓ Enabled or disabled on Power Up
- ✓ Prevent the driver activating in an illogical order
- ✓ Send GPS location coordinates with status activation information
- ✓ Open or close the speaker on activation (two-way/trunking radios)



WORK ORDER PROCESSING

This allows the TRK-240 to be programmed to accept “job tickets” from a “host” software and display them for driver review. (Work order processing firmware is an option sold separately and only available on request. Drivers can update status activities for specific work orders to keep dispatchers abreast of current activities. Most operators use the Work Order process to provide a paperless “job ticket” system. Taking a job ticket from the “host” software provider the CES Wireless system can send the job tickets to specific trucks (the holding queue for the tickets is user programmable to hold multiple tickets.) While a driver has a ticket in the display of the TRK-240, every status button he hits is sent back with the job ticket “#” attached to the front of the message. This allows the operator to track status activity on a “per ticket” basis.

INPUTS AND OUTPUTS

The TRK-240 has the capability to be interfaced with a wide range of non-CES Wireless equipment. The interfaces can be in the form of an on/off switch, with the change in switch status transmitted back to the dispatcher center (e.g. pump off). Or the interface can be through a serial RS-232 connection, which provides engine temperature, tank volume, speed, or monitor sensitive cargo. The auxiliary outputs can also be used to monitor when a door is open or closed and send the status report back to the dispatch center.

Auxiliary Inputs and Outputs

The TRK-240 contains 4 auxiliary inputs (one of them used for ignition sense) and 3 Auxiliary Outputs that send a status on Low, High or both transitions. These can be used to sense doors open, engine on, and taximeter on/off. Once activation occurs, a unique status is reported back to the dispatch center. If GPS is fitted, the GSP coordinates are also sent back, together with time and speed.

Serial Ports

The TRK-240 supports four serial ports. One is used for GPS when fitted, and one is used for programming the device. The user can assign one of the other 2 serial ports to compatible devices. The current selections include a serial radio interface, CRD-500 magnetic card reader, PNT-97 or CRD-PNT printer, and QWERTY keyboard. For non-supported devices, CES Wireless can write a TRK-240 driver to support your product.

Serial Port Assignment

The user can assign one of the 3 serial ports to a compatible device. The current selections include:

<i>Port 1</i>	<i>Port 2</i>	<i>Port 3</i>
Programmer	Unused	Unused
	Radio Interface	Radio Interface
	CRD-500 Credit Card Reader	CRD-500 Credit Card Reader
	PNT-97 or KBD-98 Printer	PNT-98 or KBD-98 Printer
	QWERTY Keyboard	QWERTY Keyboard

Display Functions

The TRK-240 can be programmed to have the ‘Backlight’ always On, always Off, when the ignition is active or only when the unit is receiving messages. The numbers of messages that the TRK-240 will store is programmable from 1-99.

Audio Alert

The TRK-240 has two ‘Alert Types’ the Buzzer or Tone. In addition the “Alert Time” allows the unit to indefinitely beep when a message is received or to stop at a programmed time interval or when the ‘PTT in’ is activated.

Outgoing Message Queue

Two types of messages can be sent, those that are placed in the 'Long Term Queue' and those that are placed in the 'Short Term Queue'. The main difference between the two is that the long-term queue will continue to send the message until an acknowledgment from the base is received. The short-term queue will abort the send after the programmed number of retries and transfer the message to the long-term queue.

Horn Output

The Horn Output provides an external alert to the driver when absent from the vehicle. This is used in conjunction with the Ignition Input; preventing the Horn alerting when the ignition is active. Various timing parameters can be set for on, off and expiry time.

Emergency – Supervisor

The TRK-240 has an independent Emergency input (a button, control foot switch or automatic switch can be attached). The emergency can be programmed OFF, send on switch closed, switch opened or both.

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 TRK-240 reports on polled, timed or exception, and returns position, velocity, health, event log, speed, accumulated mileage and time.

Regular Interval Reporting

The MDT can be programmed to transmit GPS location at a preprogrammed time interval from 1 to 65535 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™ 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. (Caution: This level of data and reporting requires sufficient spectrum to carry the data, and if fully utilized would require a packet data network such as CDPD or GPRS)

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 amount 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.



GENERAL FEATURES

MOTION-trak™

Movement Intelligence: MOTION-trak™ 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 TRK-240 can be programmed to change its reporting interval from say every 10 minutes to every 5 seconds (programmable).

geo-STATUS™

The geo-STATUS™ 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 TRK-240 message terminals are programmed with the geographical coordinates for the various fixed locations. The MDT monitors the GPS samples and looks for a match to the plant zones/job ticket zone stored. Once the TRK-240 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™ 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 zones.

Serial Radio Interface

The device currently supports many different serial driven radios, and CES Wireless can provide 'drivers' for other radios, subject to a protocol document being available. Development may be subject to an additional charge.

PERIPHERAL DEVICES

CRD-500 magnetic card reader

Most of the CES intelligent products have a magnetic card option available, which will accept all major credit cards. To obtain authorization for a transaction the driver simply slides the credit card through the reader. The credit card information is displayed on the TRK-240 display terminal. The driver is then prompted through a number of menus including entry of the dollar amount. When finished, the driver presses the highly visible "send" key, and the information is transmitted as an encrypted message to the dispatch center.



PNT-97 or CRD-PNT printer

The CES Mobile Printer provides the driver with a hard copy of the information transmitted from the base dispatch location. This information can be in the form of a message, credit card authorization or job ticket etc. Once received by the vehicle equipment, the printer can be activated by the base dispatcher and commanded to print a desired message. The driver can also activate this advanced product by simply pressing the PRINT key to print a selected message. The unit can print up to 80 characters across and the paper roll is 7 meters in length. TRK-240 display terminal will alert the driver if the paper is out. The driver can change the paper in seconds. In addition, the paper rolls have a red line printed as it nears the end of the roll.



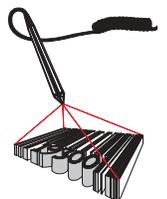
QWERTY keyboard

The external CES keyboard KBD-98 provides the driver with the capability to enter free form text messages, which are then displayed, on the TRK-240 display terminal. Once reviewed, the driver simply presses the "send" key to transmit the information to the dispatch center. The KBD-98 provides the driver with a rugged and backlit keyboard in QWERTY style, which was designed with simplicity in mind.



Bar Code Reader

Since there are many types of Bar Code Readers available on the market that apply to many different types of application, CES will provide an interface to the reader of your choice, or we will provide the reader that best meet your application. Additional charges may apply for this interface. Bar Code readers provide quick, accurate and secure data collection. With the addition of the CES Wireless equipment, remote host computer access and rapid data transfer is provided.



Non-supported devices

CES Wireless can write the TRK-240 driver to support your product. Please contact CES Wireless at 407-679-9440 for further information. Development may be subject to an additional charge.

WIRING CHART

The TRK-240 contains two wiring looms, one for Radio connection and one for Auxiliary connections.

Radio Interface Connector DB-25

CONNECTOR PIN ASSIGNMENTS

Pin	Function	Type	Notes	Direction
1	Power	8-16v	Switched B+ (+8 volts to +16 volts DC) with 1 Amp fuse. Connect to an 8 to 16 volt switched and fused source. Most radios with an accessory connector provide a switched 12-volt source for the accessory. Use this output providing it is capable of at least 1 amp of current.	
2	Ground		Radio Ground (Connect to any good ground.)	
3	Receive audio	Audio	Input Audio, Z = 67K or 20K, cap coupled It is recommended that receive audio be obtained from a flat un-muted audio source. In most cases this will be the receiver's discriminator. Radios with accessory connectors usually provide such a source. With an oscilloscope, verify that there is no loading of the discriminator with the TRK-240 connected. If loading occurs or the receive audio is too high and difficult to adjust, remove JP2 inside the TRK-240. This increases the receive audio input impedance. Sometimes an additional external resistor is required. See TRK-240 Adjustments for the Rx audio adjustment procedure.	Input
4	Transmit audio	Audio	Modulator with pre-emphasis, Z = 47K or 10K, cap coupled It is recommended that this output be connected to a point after the microphone pre-emphasis circuit. Most radios with an accessory connector provide a flat audio injection point. After making this connection verify that there is no loading of the microphone or signaling (CTCSS/DCS) levels. If loading occurs or the data level is too high and difficult to adjust, remove JP3 inside the TRK-240. This increases the transmit output impedance. Sometimes an additional external resistor is required. See TRK-240 Adjustments for the Tx audio adjustment procedure.	Output
5	Ground			
6	Speaker enable	OC	Audio Power Amplifier Enable (Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. This logical function may be required to turn on the receiver audio circuitry, as would normally be disabled or muted while the radio is in a transmit condition - applicable only if the Alert Tone is being used and a speaker/audio amplifier input is required to enable the audio circuits. The active state of this output is programmable.	Output
7	Mic mute	OC	(Hardware Version 1) Open collector, no pull up. connection. The active state of this output is programmable. (Hardware Version 2) Open collector, with removable pull up. This connection is only required if Leading or Random ANI will be used. This connection is used to mute the local microphone while data is being sent. This connection must not effect the data injection point. Some radios with accessory connectors provide such a connection. The active state of this output is programmable.	Output

APPENDIX A

8	Auxiliary out R	OC	(Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. This open collector output is normally used for channel steering. Some radios provide inputs for channel or group steering. Alternately this wire can sometimes be connected to the channel up or down circuitry in the radio. This output can also be used to strip CTCSS or DCS signaling during data transmissions. This may aid in keeping the data muted. See Channel Change for additional information about Channel Steering. The active state of this output is programmable.	Output
9	PTT in	-35 to 35v	Logic input, Z =100K, -35V to +35V This input should be connected to a point that provides local microphone activity. When this input is active the TRK-240 will not send data (excluding ANI). This input may be connected to the same point as the PTT Out wire. Alternatively, if it is required that the TRK-240 be in complete control of the Transmitter, in other words provide busy channel lockout, trailing ANI or closed mode operation, a modification to the radios PTT circuitry will be required. The local microphone's PTT signal must be isolated from the TX circuitry. Generally a PC board trace must be cut to do this. Connect the PTT In wire to the microphone side of the cut and the PTT Out wire on the other side of the cut. This puts the TRK-240 circuitry in series with the radio's PTT circuitry.	Input
10	Auxiliary in R	-35 to 35v	Logic input, Z = 100K, -35V to +35V. Used for Channel Change prior to firmware version 5.49. Used as additional Busy input after firmware version 5.48 (subject to change with custom firmware). The standard function for this input is to detect channel activity when set to LTR or Smartnet operation. This input when active can force the TRK-240 to hold off sending data transmissions. Connect this wire to a point that changes state when the squelch switch is open. This input is not required for conventional mode operation. The active state of this input is programmable.	Input
11	Conventional/ Trunked	-35 to 35v	Busy/Channel Ready Logic, Z = 100K, -35V to 35V The Radio Type selected determines the function of this input. It functions as a busy channel input when in conventional mode, and a channel available (Clear to Send) input when in a trunked mode. For conventional only operation, connect this wire to a point that changes state when the receivers squelch is open. For trunked only or trunked with conventional mode operation, connect this wire to TX volts or the Clear to Send signal if available. On some radios the Clear to Send signal only functions in trunked modes. If the system involved is a combination of trunked and conventional repeaters this wire may need to be connected to TX volts or any signal that indicates transmitter activity. The active state of this input is programmable.	Input
12	Alert	Audio	Receiver audio power amplifier, Z = 67K, cap coupled (see Note 1).	Output
13	PTT out	OC, diode	Push to talk output, Open collector, no pull up Connect this wire to a point that will key the radio to send data. Also see "PTT In". The active state of this output is programmable.	Output

APPENDIX A

14	Speaker mute	OC	(Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. This output is normally used to mute the local speaker during data transmissions. It goes active after the TRK-240 has determined that data is being received. Therefore a small amount of the data packet may be heard. This output is always active (until unit called) during Closed Mode operation. Connect this wire to a point that will mute the local speaker but not affect the receive audio pickup point. Some radios with accessory connectors provide an input for this. The active state of this output is programmable.	Output
15	Power	7-16v	Power to external device	
16	Auxiliary in 1	-35 to 35v	Z = 100K, -35V to +35V Used to sense external conditions or devices.	Input
17	Auxiliary out 1	OC	(Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. 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 is programmable.	Output
18	Net A TX Diag	RS485 RS232	(Hardware Version 1) Serial in/out to peripheral devices (Hardware Version 2) Serial in/out to peripheral devices	I/O I/O
19	Net B RX Diag	RS485 RS232	(Hardware Version 1) Serial in/out to peripheral devices (Hardware Version 2) Serial in/out to peripheral devices	I/O I/O
20	Ground			
21	Tx radio serial	TTL	Serial out to peripheral devices or data port of radio	Output
22	Rx radio serial	TTL	Serial out to peripheral devices or data port of radio	Input
23	RTS radio serial	TTL	Serial out to peripheral devices or data port of radio	Output
24	CTS radio serial	TTL	Serial out to peripheral devices or data port of radio	Input
25	Ground			

CONNECTOR PIN ASSIGNMENTS

Pin	Function	Type	Notes	Direction
1	Power	8-16v	Power to external device	
2	Ground		Ground to external device	
3	Net A TX-Programming	RS485 RS232	(Hardware Version 1) Serial in/out to peripheral devices (Hardware Version 2) Serial in/out to Programmer	I/O I/O
4	Net B RX-Programming	RS485 RS232	(Hardware Version 1) Serial in/out to peripheral devices (Hardware Version 2) Serial in/out to Programmer	I/O I/O
5	Ground			
6	Auxiliary out 1	OC	(Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. Used to control external devices. The active state of this output is programmable.	Output
7	Auxiliary out 2	OC	(Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. Used to control external devices. The active state of this output is programmable.	Output
8	Auxiliary out 3	OC	(Hardware Version 1) Open collector, no pull up. (Hardware Version 2) Open collector, with removable pull up. Used to control external devices. The active state of this output is programmable.	Output
9	Auxiliary in 1	-35 to 35v	Z = 100K, -35V to +35V Used to sense external conditions, sensors or devices.	Input
10	Auxiliary in 2	-35 to 35v	Z = 100K, -35V to +35V Used to sense external conditions, sensors or devices.	Input
11	Auxiliary in 3	-35 to 35v	Z = 100K, -35V to +35V Used to sense external conditions, sensors or devices.	Input
12	Horn honk	Relay, C	Common relay contact, 4 Amp Max	Output
13	Horn honk	Relay, NO	Normally open relay contact, 4 Amp Max	Output
14	Emergency	0-5v	Logic input (when activated sends specific emergency packet) Connect through a switch to ground with an optional 1K resistor. See Figure 1	Input
15	Ignition	-35 to 35v	Z = 100K, -35V to +35V Connect this input to the vehicle ignition to inhibit the Horn Honk function while the ignition is active.	Input
16	Tx port 1	RS232	Serial out to peripheral devices or data port of radio	Output
17	Rx port 1	RS232	Serial out to peripheral devices or data port of radio	Input
18	RTS port 1	RS232	Serial out to peripheral devices or data port of radio	Output
19	CTS port 1	RS232	Serial out to peripheral devices or data port of radio	Input
20	Ground			
21	Tx port 2	TTL	Serial out to peripheral devices or data port of radio	Output
22	Rx port 2	TTL	Serial out to peripheral devices or data port of radio	Input
23	RTS port 2	TTL	Serial out to peripheral devices or data port of radio	Output
24	CTS port 2	TTL	Serial out to peripheral devices or data port of radio	Input
25	Ground			

Mechanical

Dimensions: 8.5 x 5.3 x 1.8inch (10.16 x 10.16 x 3.8 cm)
 Weight: 3.00lb (1.40kg)
 Cabinet: Steel Extrusion
 Interface Cable: 3 or 15 ft shielded / factory sealed connector
 Hardware: Mounting bracket/screws

Electrical

Voltage: 7-16 V DC
 Current: Standby 170mA. Backlight on 400mA
 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 O/p Imp.: Z=47K or 10K cap coupled
 Encode Tone O/p Level: 1 Volt RMS (variable)
 Signal Input Sensitivity: 100-1000mv RMS (variable)
 Signal Input Impedance: Z=67K or 20K cap coupled
 Alert Tone O/p Impedance: Z=67K or 20K cap coupled
 Alert Tone Output Level: 1.5V RMS (variable)

Signaling

Format: MSK 600/1200/2400/3900/4800 baud
 Programming: TRK-240S Windows Software

Environmental

Operating temperature: -20 to +70 deg. C (-4 to +158 deg. F)
 Storage temperature: -30 to +80 deg. C (-22 to +176 deg. F)

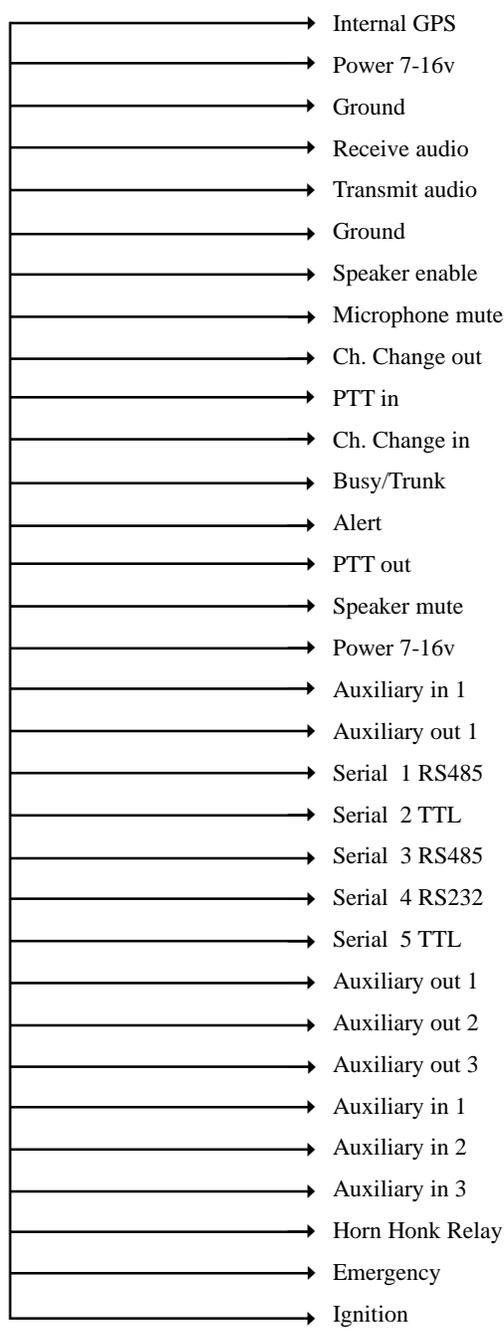
Display

LCD: 4 x 40 Character, backlit, Super Twist Nematic
 Rated 50,000 hours
 LED: - Each Status has a built in LED to indicate progress
 - 7 Segment LED verifies key press
 - Keypad LED backlit

Ordering

TRK-240	Mobile Status/Display Terminal	CRD-500	Magnetic Card Reader
TRK-240/01	Radio Interface harness	PNT-97	Mobile Printer
TRK-240/01	Auxiliary Interface harness	KBD-98	External QWERTY Keyboard
TRK-240/04	Label - Numeric	TRK-DEMO-DATA	Dealer Demonstration System with GPS
TRK-240/03	Label- Taxi	TRK-240S	Programming Software Windows 98 English
TRK-240/02	Label - Readymix	TRK-240PA	Programming Interface Adapter
TRK-240/08	Label- Aggregate	TRAN19	110V AC Adapter (for 240PA)
TRK-240/09	Label - Custom	CONV01	DB-9 to DB25 Adapter (for 240PA)
SHLD-120	Sun Shield	MANUAL104	Programming & Installation Manual
GPS-120	GPS Module		
ANT-01	GPS Antenna		

Interface Connections



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