KEYTROLLER

CREATING A CULTURE OF SAFETY

How to Use Technology to Improve Safety and Compliance in Lift Truck Operations

...and counteract the chaos theory of the universe

The Regulatory Environment

OSHA – Operator Training

- **1910.178(l)(1)(ii) Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer shall ensure that each operator has successfully completed the training required by this paragraph (l), except as permitted by paragraph (l)(5).**

- **1910.178(l)(3)(i)(J) Any vehicle inspection and maintenance that the operator will be required to perform;**

The Regulatory Environment

OSHA – Additional or Recurrent Operator Training

- **1910.178(l)(4)(ii)(D) The operator is assigned to drive a different type of truck;**

- 1910.178(l)(4)(iii) An evaluation of each powered industrial truck operator's performance shall be conducted at least once every three years.

The Regulatory Environment

OSHA – Unattended Vehicles

- 1910.178(m)(5)(i) When a powered industrial truck is left unattended, load engaging means shall be fully lowered, controls shall be neutralized, ***power shall be shut off,*** and brakes set. Wheels shall be blocked if the truck is parked on an incline.

- 1910.178(m)(5)(ii) A powered industrial truck is unattended when the operator is 25 ft. or more away from the vehicle which remains in his view, or whenever the operator leaves the vehicle and it is not in his view.

The Regulatory Environment

OSHA - Travel Speed

- **1910.178(n)(8) Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner.**

  How does the operator know how fast he is going?

  Do you have a corporate speed limit?

  Would you like to establish one if you could enforce it?

- **1910.178(o)(2) Only loads within the rated capacity of the truck shall be handled**.

  How does the operator know the load weight relative to the net down rated truck capacity?

The Regulatory Environment

OSHA – Equipment Examination

- **1910.178(q)(7)** Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.

The Regulatory Environment

- 1910.178(q)(9) When the temperature of any part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle shall be removed from service and not returned to service until the cause for such overheating has been eliminated.

The Regulatory Environment

- **1910.178(p)(1)** If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition.

- **What about seat belts?**

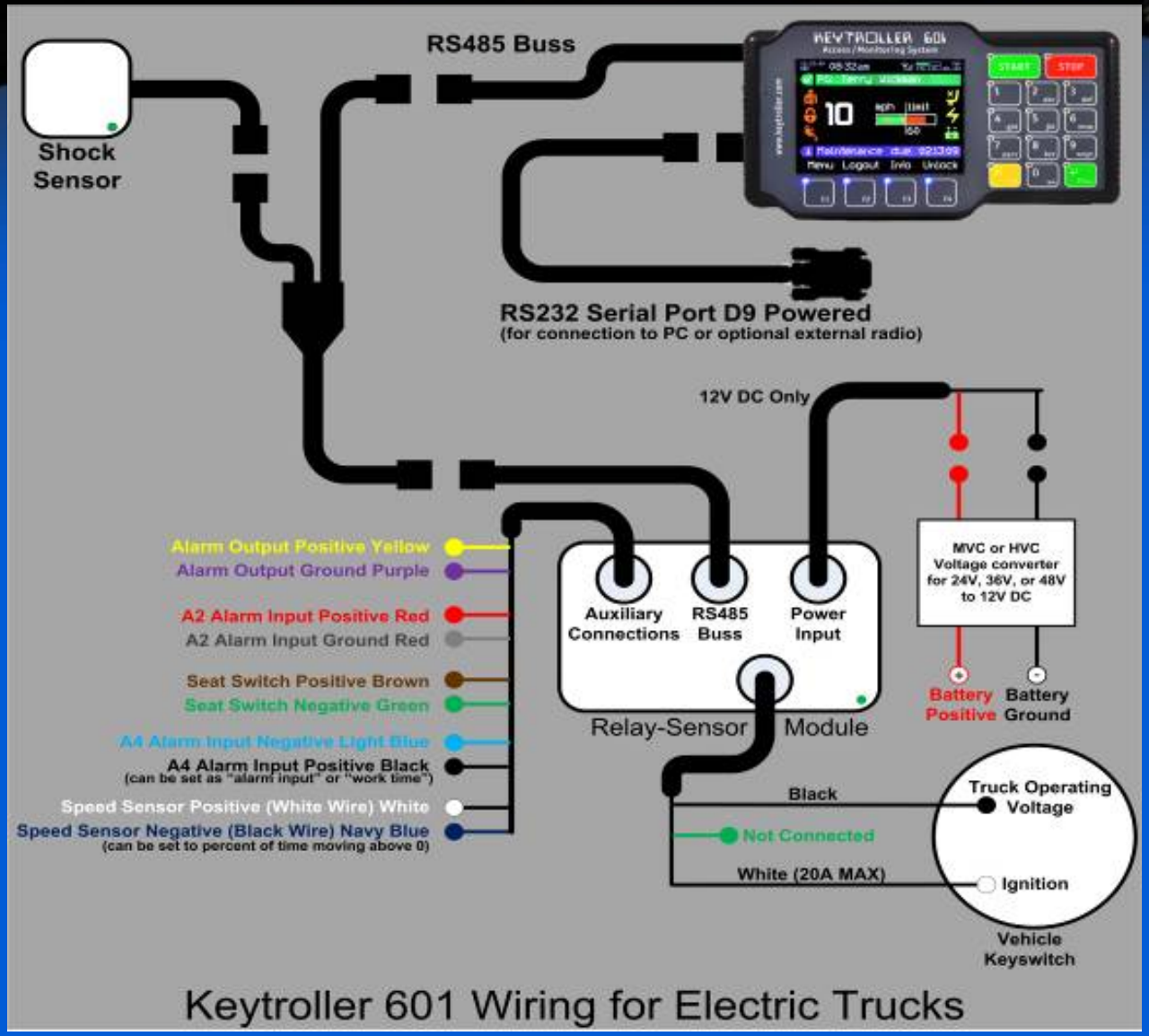
  National consensus standard ASME B56.1-1993 requires that use of an operator restraint system when equipped on a powered industrial truck. Therefore, OSHA would enforce the use of such a device under Section 5(a)(1) of the OSH Act.

All Dialed In?

EVERYONE THAT HAS ALL THIS STUFF TOTALLY UNDER CONTROL CAN LEAVE NOW AND HANG OUT BY THE POOL …

THE REST OF YOU, PAY ATTENTION.

Basic Components of An Access Monitoring System



(2 Wires EL + 3 Wires IC)
To Ignition Switch

(2) Wires To Power

(1) To Seat/Foot Switch

Aux connections as required

Keypad

Component #1

- Date
- Day of week
- Time
- WiFi signal strength
- Amount memory left
- Max temp seen
- IP address
- Operators name
- Hours on machine
- Maint due time
- Maint due date

Impact Module

- Measures Impacts in Tenths of a G
- Y (front-back) axis acclimated to cable

- X axis (side-side)
- Impact Duration measured in milliseconds
- Is calibrated for specific application

Eliminate Keys

Keyless Ignition

START & STOP - From Keypad

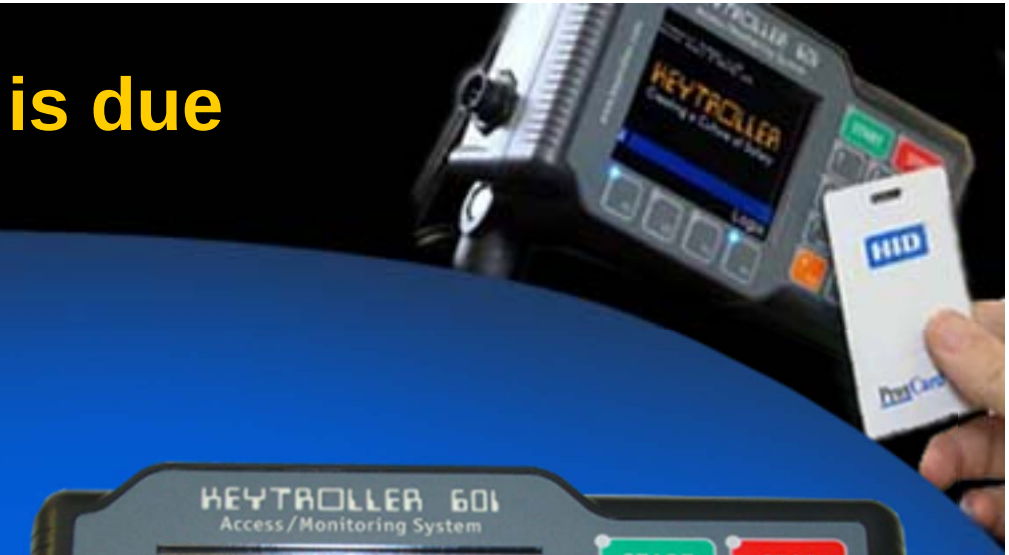
Code or RFID card enabling

Code or card only enables vehicle driver is authorized and trained on

Untrained or Unauthorized Operators are Prevented from Operating Equipment

- **Operators**
  - Trained on System Use
  - Personal ID Code Or RFID ID Card
  - Access To Assigned Vehicle Only
- **Card/Code Validation**
  - Enables Device

Warns when training is due



Warns operator he's within 30 days of the expiration of his ID Code (or recurrent training due)

Pre-shift Equipment Inspections

- Daily Pre-Shift Inspections are now required to enable equipment operation.
- Operators checklist performance is time and date stamped, digitally logged into SQL database.
- Inspection data can be formatted to analyze historical trends.
- Find “Failed” checklist items by date, time, operator, vehicle
- Easy access to SQL database stored data
- More effective and timely maintenance scheduling
- Data supports OSHA investigations of accidents

Mandatory Pre-shift Checklist

- **Eliminates potential chaos of paperwork to fill out, misplace or lose**

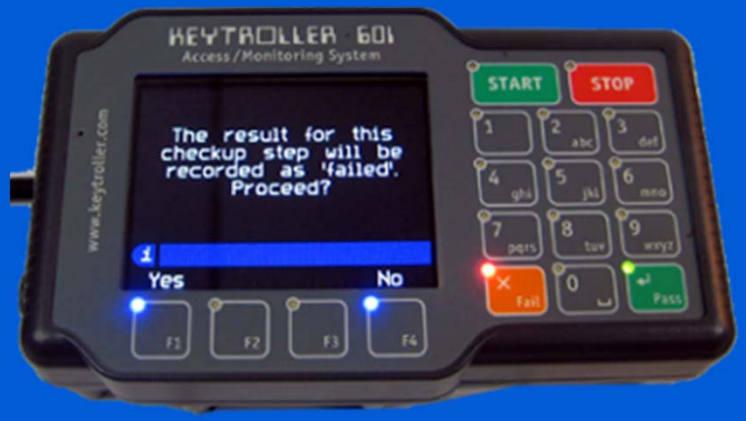
- **Complete Checklist OR Vehicle Shuts Down In Allotted Time**

- **Checklist Includes:**
  - **Time/Date/Operator/Vehicle Stamped**
  - **Timed to the second to see if list was “finger whipped”**
  - **Provides “Accountability” Of Checklist & Operator**
  - **Emails “Failed” items automatically from software**

“Flagged” or Critical Items

- **Flagged Checklist Items That Fail ---**
  - **Lock Out Warning Will Appear**
  - **If operator presses YES, device will lock out**

- **Re-enabling Device Can Only Be Done By:**
  - **Programmer**
  - **Supervisor Or Mechanic**



- **Non-flagged / Non-critical Items Failed**
  - **Also warns operator on display screen**
  - **If operator responds with YES**
  - **Recorded In Log**
  - **No Supervisor Interface**

Checklist:
In Other Languages

- Checklists can be programmed in other languages

SHOWN IN SPANISH

- Note Checklist completion period is under one minute and device is timing down warning operator to complete checklist or device will shut down

Auxiliary Inputs + Output Descriptions

- 1 Output
  - Powers external 120dB flashing siren
- 4 Inputs
  - #1 Speed Sensor (Magnetic or Gear Tooth)
  - #2 Aux (Typically seat switch, overload etc)
  - #3 Seat Switch (Typically: Seat or foot switch)
  - #4 Aux (Can be set as aux input or “work” time)

Seat Switch + STOP "Time Out" Functionality

Logging off and shutting down

- Operator presses STOP

OR

- Operator leaves seat

  - Default set at 1 minute
  - Settable from 0—X# minutes
  - Shuts down KEYTROLLER and vehicle/engine
  - Re-Entry of operator onto vehicle ends time out sequence
  - Controls/Eliminates excessive idling
  - Required on electric forklifts where STOP is not typically pressed - operator just leaves the seat or platform with foot switch

2 options for “Work time” Productivity Evaluation

1. Secondary hour meter connected to:
   - Hydraulic load presence sensor
   - Switch on accelerator to monitor “idle time”
   - Lift pump motor
   - Drive motor

2. Set up as time vehicle is moving over “0” MPH/KPH
   Requires Keytroller to be connected to speed sensor input

Set up either way, input is shown in seconds and can be compared against “seat on” or “key on” standard hour meter timer

Gives management data for productivity evaluation for both equipment usage and operator performance

Example: How much time forklift was carrying a load
How much time forklift was moving

VS: How much time operator was on the seat (key on time)

Auxiliary Inputs
Examples: Seat Belt

OSHA's Seat Belt Use enforcement policy

- Section 5(a)(1) - OSHA Act
- Failure to use seat belts on equipped forklifts ---*IS A VIOLATION!!*

Auxiliary input on LCD601 device

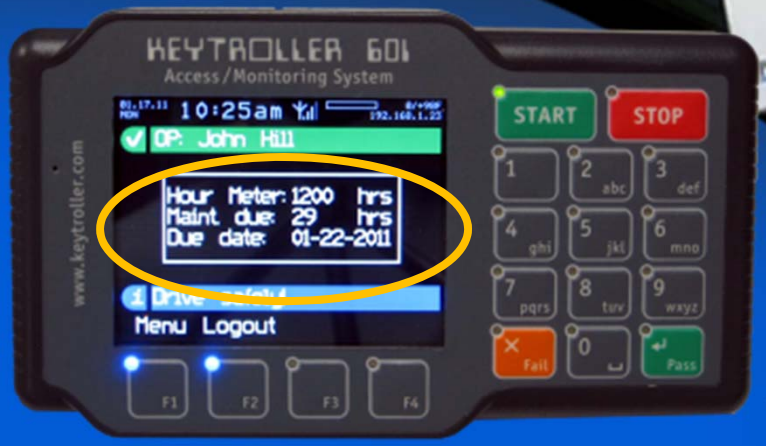
- Can be connected to seat belt with an internal switch

Access Monitor shuts down when:

1. Seat belt not engaged in preset number of seconds
2. Vehicle begins to move for X# of seconds

See When Maintenance Is Due Right From LCD Display

- **Display At Start Up**
  - Hours currently on vehicle
  - Date maintenance due
  - # of hours until maintenance due



- **Display while running**
  - Date maintenance due
  - # of hours until maintenance due

Speeding Accountability

- Speeding Forklifts + Congested Plant = BIG Safety Hazard
- Display Speed Shown In MPH Or KPH
- Speed Limit set in MENU by programmer
- Once set, set-point same for all vehicles with same wheel diameter
- Grace Period (In Sec) Programmed
- Device beeps flashes warning operator speed limit is exceeded
- Alarm Sounds When Speeding Through Grace Period Exceeded
- Event Logged When Alarm Sounds

Above shows speed limit of 6 mph with vehicle traveling at 9.8 mph and device is warning driver to slow down

Objective: Establish A Culture of Operator Accountability

- Abuse to Rack, Equipment & Product Damage
- Costly Repairs Or Replacement Of Racks
- Statistics show 5% of the operators account for 80% of the damage

Impact—Abuse Sensing

No Proof Of Abuse/Accidents

- Facility Too Large To Supervise
- Operator Failed To Report
- No One Saw It! No one knows who did it!

Cost/Benefit

- 50%+ Reduction In Damage IMMEDIATELY
- Typical ROI Within First Year Of Usage
- Automated Record Of Incidents

Flashing Siren Alarm

- Optional alarm connects to output on relay sensor module
- Unique alarm for events
- Can be wired to flash—strobe only or siren only or BOTH
- 120dB siren
- Alarm sounds when (programmable in software):

  -When there is an abusive impact

  -Can be set for only supervisor or mechanic to shut off, or also for operator shut off

  -Operator drives speeding though the “grace period” setting

    - Auto shut off when speed is reduced below limit

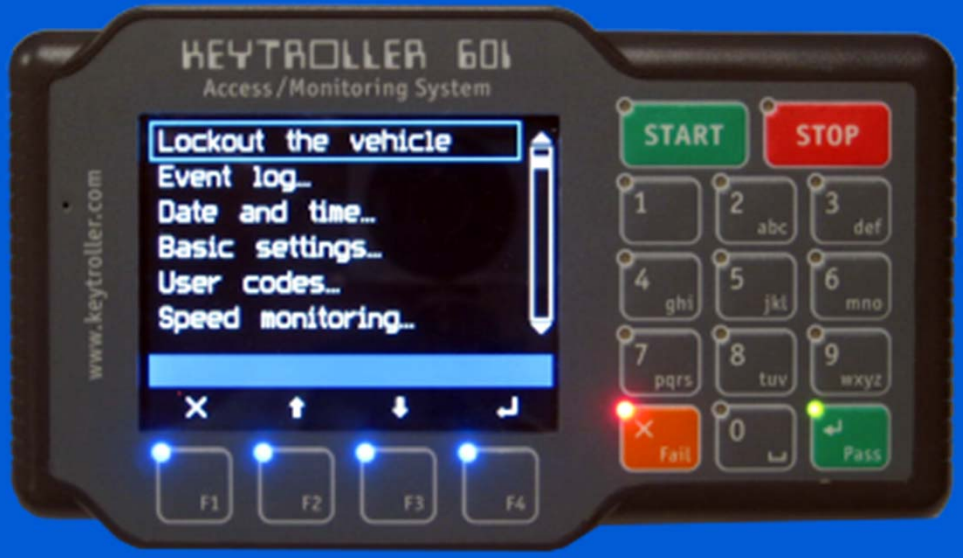
Event Log

- When An Event Occurs
  - The Log Of Event Can Be Viewed by Supervisor on LCD Display
  - Events Automatically Downloaded to Software & E-Mails of Chosen Events sent

Vehicle Lockout for Unsafe Conditon

- Mechanic, supervisor or Programmer can “lock out” vehicle to all pre-programmed operators in MENU.

- Any mech/super/prog can re-enable device to all pre-programmed operators by going to MENU again & unlocking.

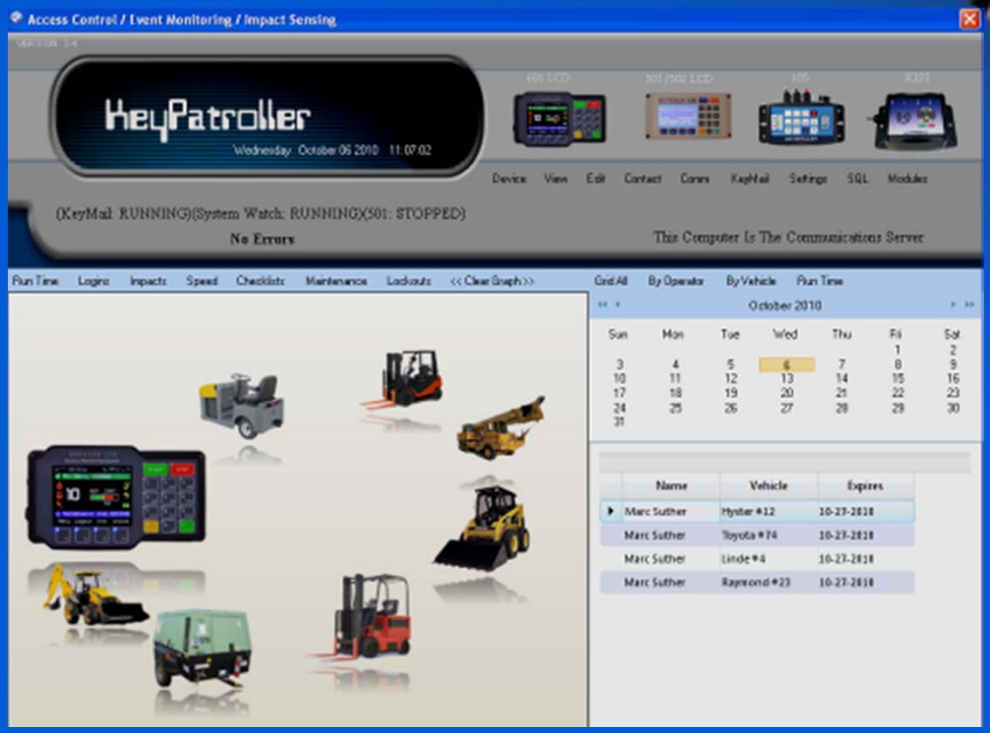


TEXT Messaging:
Alert operators

- Wireless text messaging sent from software
- Operator can respond alerting host he has received message
- Messages can be sent to individual operators or broadcast to all vehicles
- Example of broadcast message: “Fire in building #2---EVACUATE IMMEDIATELY!”

System Software

- **Software**---Client server or browser based
  - Wireless communication protocol
  - Inputs user codes—cards—data
  - Extracts event log data
  - Creates graphs and reports
  - Auto emails of chosen events
  - New firmware features must be matched with new software capabilities
- Can upload new firmware and software
- Software allows for wireless upload of new firmware to all trucks in fleet



Embedded 802.11 WiFi radio

- Current encryption schemes
  - - OPEN ACCESS (no security)
  - - WEP64
  - - WEP128
  - - WPA1-PSK [TKIP]
  - - WPA2-PSK [AES]
  - - WPA1/WPA2 [AES]*
- Signal strength “bars” show on display
- IP address shown on LCD display
- ***Embedded WiFi should be tested on site to ensure encryption security compliance and operation***

External 802.11 WiFi radio

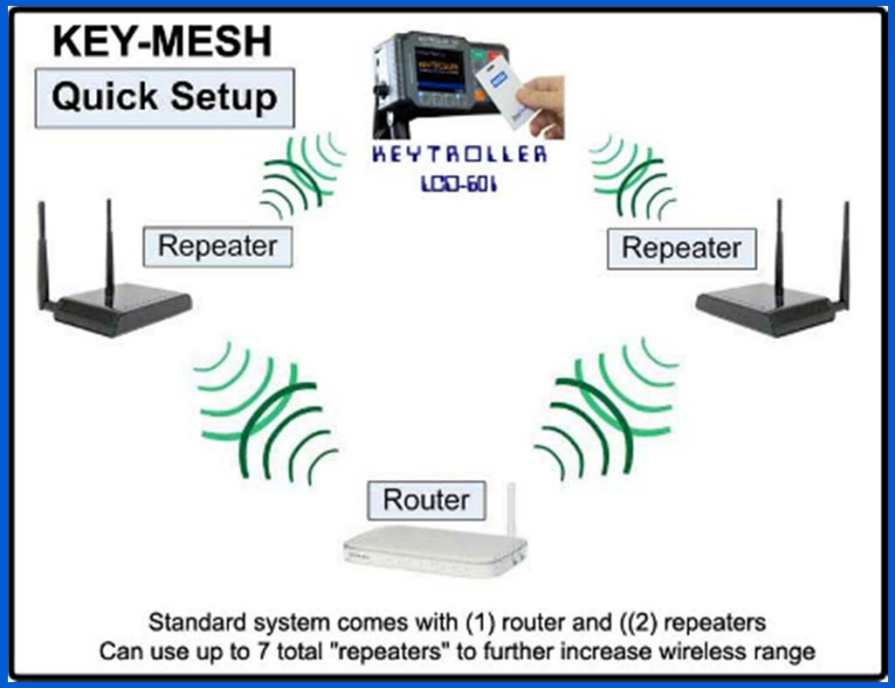
- Requires WiFi access point “infrastructure” in ceiling to communicate to network PC
- Access points are dispersed throughout the ceiling of warehouse providing constant contact with roving forklifts
- Each lift has 802.11 radio in weatherproof box mounted to overhead guard
- Each lift radio has it’s own IP address
- Devices can be configured to any encryption schemes
- Radio range and reception can be extended with optional magnetic antenna

Encryption Security:
WEP: 64-bit/128-bit data encryption
WPA, WPA2, 802.11i: Enterprise mode and Pre-Share Key (PSK) mode
Encryption: 128-bit TKIP/AES-CCMP
EAP-TLS, PEAP/GTC, PEAP/MD5, PEAP/MSCHAPV2,
EAP-TTLS/PAP, EAP-TTLS/CHAP, EAP-TTLS/MSCHAP,
EAP-TTLS/MSCHAPV2, EAP-TTLS/EAP-MSCHAPV2,
EAP-TTLS/EAP-GTC, EAP-TTLS/EAP-MD5, LEAP

KEY-MESH
Inexpensive “hot spot” zone

- For clients with NO wireless infrastructure---inexpensive----about $600
- Very easy to set up –just plug in each component into 110VAC outlet—NO WIRING! Mount vertical or horizontal
- When vehicle is in “hot spot” zone, device communicates
- It’s recommended that the “hot spot” is set up in a frequently traveled area like loading dock or battery charging/fueling area.
- If the vehicle is out of range, KEYTROLLER will save any event data (up to 8000 events) and will download when in hot spot range.
- “HOT SPOT” WiFi zone of about 400’—500’ is created

Optional “Outdoor” rated units available



System Software

Program a variety of settings

- User codes/RFID Cards Expire Dates
- Individual or Cloned Multi Vehicle Settings

Features

- Send text messages
- Usage and Event Reports with Graphs
- Automatically sends emails of user defined event log items
- Automatically “searches” for, connects with devices in wireless range.
- Automatically downloads available event log data
- Automatically uploads event log data into SQL database.

Thank You

Fellow Chaos Fighters

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KEYTROLLER, LLC
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