

## **14 Drawer, Rugged Deployed, Managed E-Tools Mobile Manager Cabinet (EMM)**

Part # 510-1106-F20-00

Part # 510-1106-F31-00

Part # 510-1106-F40-00

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# Tracewell Systems

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## Theory of Application

The Tracewell EMMC is the answer to the Defense and Commercial Industries' initiative to implement and field electronic media platforms tools reducing the reliance on traditional paper bound manuals.

Tracewell Systems' objective was to provide a storage, transport, and charging system with a single-point LAN connection for a wide variety of E-Tool platforms that is lightweight and rugged, enabling worldwide use and operation in harsh environments.

### Physical Requirements:

The system will be ruggedized to withstand harsh transport and handling without system functionality degradation. The system shall not exceed 250 lbs when empty. The system shall not exceed 36" in height when in the shipping configuration. The systems must contain, protect, and secure 14 each laptop-size E-Tools in a variety of sizes, PDAs, batteries and chargers from damage during shipment and from theft.

### Environmental Requirements:

The system will operate in harsh temperatures and dusty environments from 0C to +50C. The system will maintain a filtered, cooling airflow for each tray. The system must be weather tight when in shipping configuration with front and rear covers attached. The system will be externally resistant to water and most corrosive chemicals when sealed and not degrade its functionality or appearance from exposure. The system will have a pressure relief valve.

### Handling Requirements:

The system must be capable of being wheeled while in its operating configuration for handling during daily use. Wheels will be removable and storable for transport. While loaded with the E-Tools in the shipping configuration, the system must have lifting handles for a 4-person lift. The system must be stackable and interlockable to two units high without tipping during shipment and operation.



## Theory of Operation and Design

Tracewell Systems' solution ensures the availability, security and protection of the E-Tools.

Availability is defined as E-Tools that have the most current technical data and sufficient electrical charge for operators and technicians to use anywhere in the world. The system provides clean AC power to all charging trays through noise filter and transient suppression devices. While charging, the E-Tools and the system itself require cooling air to prevent over-temperature conditions. The system provides metered airflow through each tray by using speed controlled fans pressurizing a central plenum and distributing air throughout the chassis and trays. The system's temperature sensitive components are housed inside the plenum, providing a compact design. The input air is filtered through washable media for particulates. Current E-Tools data is provided by a single-point LAN connection to an Ethernet managed network switch. From the Ethernet switch, data is distributed to each tray and then to each E-Tool mounted and wired in the tray.

E-Tools are secured through a single-point locking mechanism, allowing operators to lock every tray with a locking device for transport and security measures to prevent theft.

To protect E-Tools, the system itself is designed to withstand harsh handling and environmental conditions. The lightweight, all aluminum chassis is laser stitch welded for a close tolerance component fit and structural strength. The doors are a honeycomb synthetic material within an aluminum frame mating to gasket material to form a weather-tight seal. Both the chassis and the doors are coated with an impervious, abrasion and corrosive resistant polyurethane. The combination of door, chassis, and coating make a weather-tight seal in the shipping configuration. Internally, each E-Tool and accessory is secured to its individual storage tray with a multi-point, Velcro-strapping system that securely holds a variety of E-Tools sizes and shapes.

The system is designed for easy operation and mobilization with minimal training, including a single-point LAN connection, single-point power connection, tool free set-up and packing, quick release latches and casters, self storage for all components, quick reference spares listing, and easily replaceable COTS components. Total setup or packing time is designed to be less than 15 minutes.

## Operational Warning Notification

**FAILURE TO ADHERE TO THE FOLLOWING WARNINGS CAN RESULT IN OPERATIONAL AND/OR CATASTROPHIC DAMAGE TO THE CABINET AND DEATH OR SERIOUS INJURY TO THE OPERATOR.**

**Danger: High Voltage**

**Warning: DO NOT Stack More Than 2 High**

**Warning: Use Locking Pins When Stacked**

**Warning: DO NOT Extend More Than 1 Tray At A Time Per Column**

**Caution: 4-Person Lift**

**Caution: Insure AC Input Power Conforms To System Specifications**

**Caution: Remove Front And Rear Doors Prior To Operation**

**Caution: Do Not Fork Lift**

**Caution: Keep Fan Doors Closed During Operation**

**Caution: Place On Level Floor**

**Caution: Lock Wheels Prior To Use**

**Caution: Fully Extend Wall Stand-offs To Stops Prior To Use And Insert Locking Pins**

**Note: Do Not Use Silicone-Based Products On Surface Coating**



**EMMC shown in shipping configuration**

## Transportation Storage & Set Up

### Tools Required:

NO TOOLS REQUIRED— DO NOT UTILIZE ANY OBJECT TO OPEN DOORS OR INSERT CASTERS.

### Securing Unit For Mobilization:

- ENSURE ALL E-TOOLS ARE POWERED DOWN
- ENSURE ALL TRAYS ARE FREE OF FOREIGN OBJECTS
- UTILIZE VELCRO STRAPS TO ENSURE ALL E-TOOLS ARE SECURE
- UTILIZE VELCRO STRAPS TO ENSURE ALL SPARE BATTERIES AND MATERIALS ARE SECURE
- SLIDE LOCKING MECHANISM INTO LOCKED POSITION
- REMOVE ALL EXTERNAL CABLING FROM REAR OF UNIT AND PLACE IN STORAGE BAG
- REMOVE PIN AND RETRACT WALL STAND-OFFS AND REINSERT PIN
- REMOVE ANY FOREIGN DEBRIS FROM AIR FILTER OR OTHER AREA OF UNIT
- ENSURE ALL INTERNAL DOORS ARE SECURED
- REMOVE CASTER PLATE BLANKS FROM STORAGE INSIDE UNIT
- REMOVE CASTERS AND SECURE ONTO HOLDING BRACKETS WITHIN UNIT
- INSTALL CASTER PLATE BLANKS INTO EXTERNAL PLATES
- PLACE EXTERNAL DOORS ON UNIT ENSURING THAT GASKET HAS FIRM SEAL
- SECURE DOOR LOCKING MECHANISM TO LOCKED POSITION
- UNPLUG ALL LAPTOPS FROM THE TRAY AC POWER OUTLETS

### Un-securing Unit From Mobilization:

- DEPRESS PRESSURE RELEASE VALVE ON SIDE OF UNIT
- REMOVE EXTERIOR DOORS
- REMOVE CASTER PLATE BLANKS FROM EXTERNAL PLATES
- REMOVE CASTERS FROM STORAGE AND INSERT INTO EXTERNAL LOCATION
- INSTALL CASTER PLATE BLANKS INSIDE UNIT
- REMOVE ALL WIRING FROM STORAGE AREA
- EXTEND AND SECURE WALL STANDOFFS
- ENSURE AC POWER INPUT TO SYSTEM MEETS MANUAL SPECIFICATIONS PRIOR TO PLUGGING IN
- RELEASE LOCKING MECHANISM
- BEFORE OPENING EACH TRAY, VISUALLY INSPECT FOR ANY EQUIPMENT THAT HAS SHIFTED OR BECOME UN-SECURED DURING TRANSIT
- REMOVE VELCRO STRAPS FROM E-TOOLS
- PRIOR TO THE INITIAL EMMC POWER UP, ENSURE ALL LAPTOPS ARE UNPLUGGED FROM THE TRAY AC POWER OUTLETS, START EMMC, ALLOW TO RUN THROUGH START SEQUENCE, THEN PLUG IN THE LAPTOPS



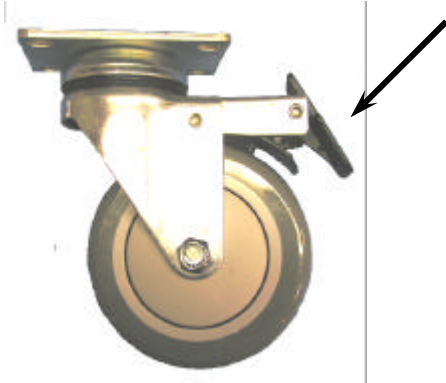
## Casters

### Caster Lock

Down = Locked

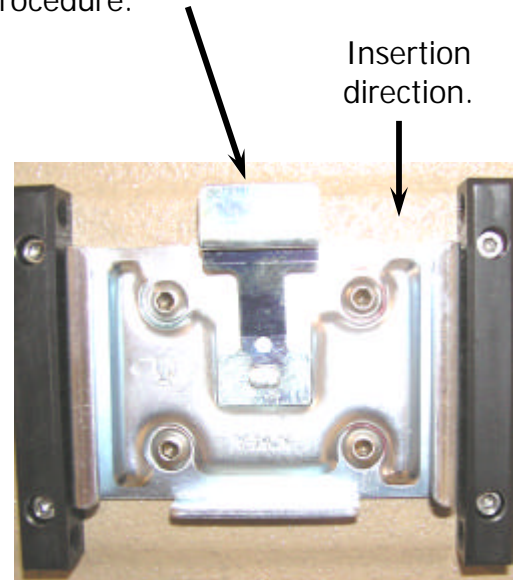
Up = Unlocked

**Note** = Locks both the wheel and the swivel.



### Quick Change Plate

Depress tab and slide caster mounting plate into grooves. To remove reverse the procedure.



### Caster Storage

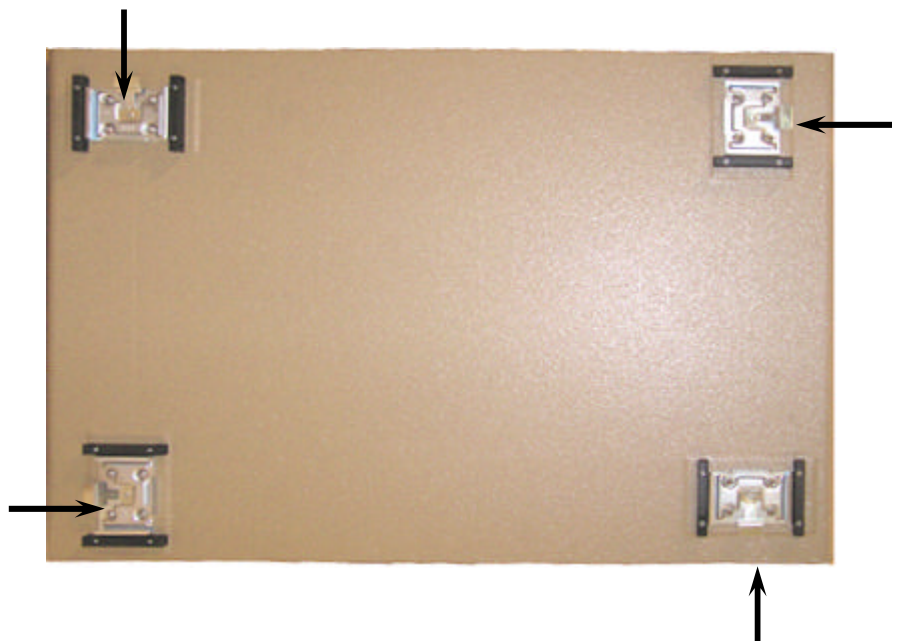
Located in right rear wall of chassis.

**Note**— Always lock casters when storing.



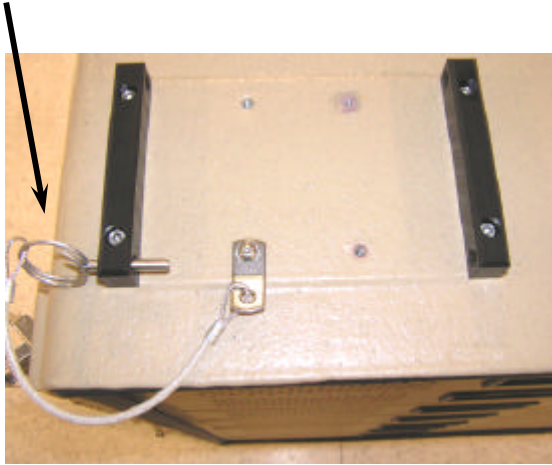
### Quick Change Plates (On bottom of chassis)

Insert in direction of arrows.



## Stacking Units (small variations among different cabinets)

Before stacking chassis, remove the locking pins from two corners.



Once chassis are stacked re-insert the locking pins.



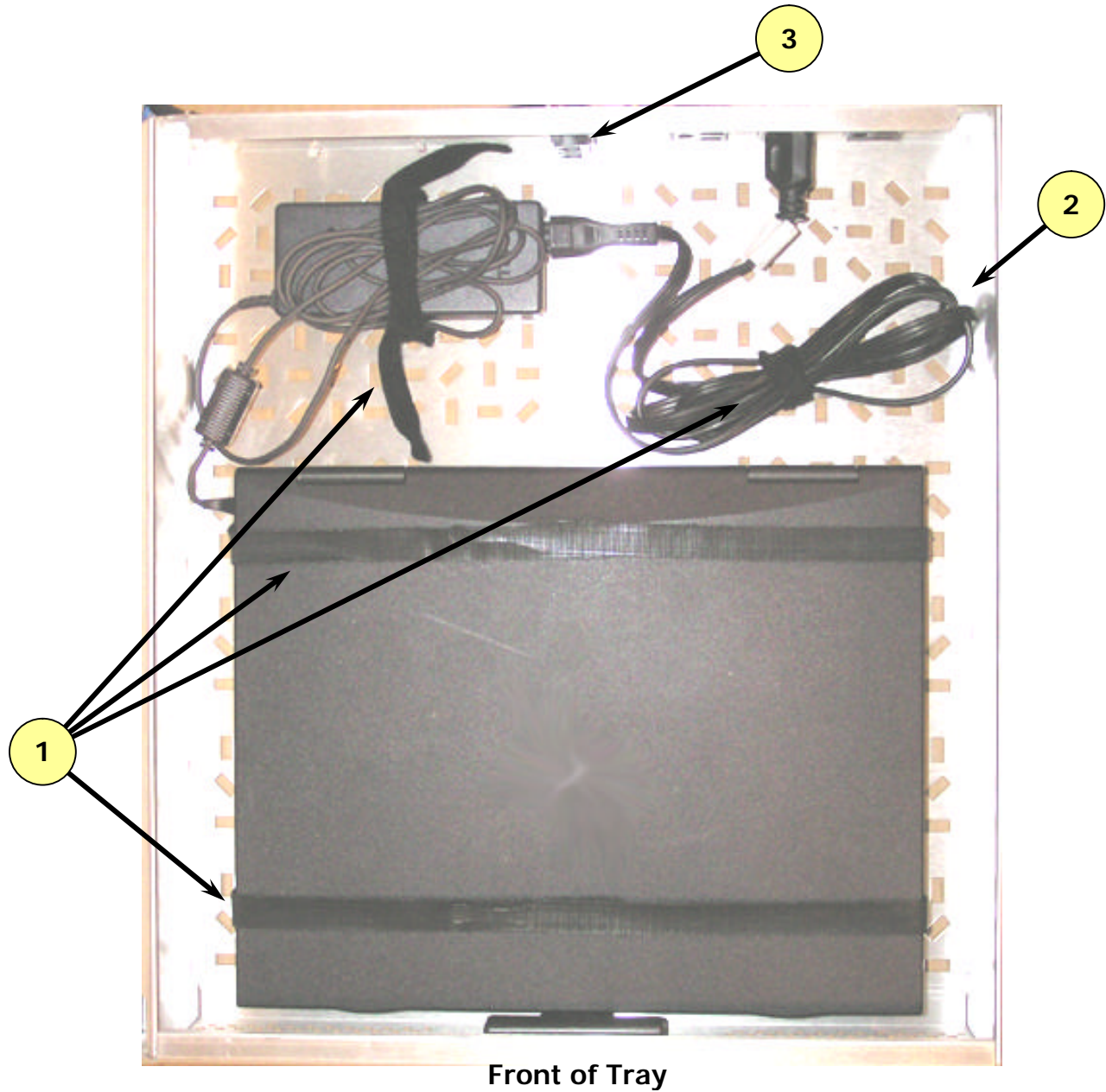
**Chassis can be stacked 2 high.**

Note: Make sure you install locking pins after stacking. Make sure you lock all the casters.



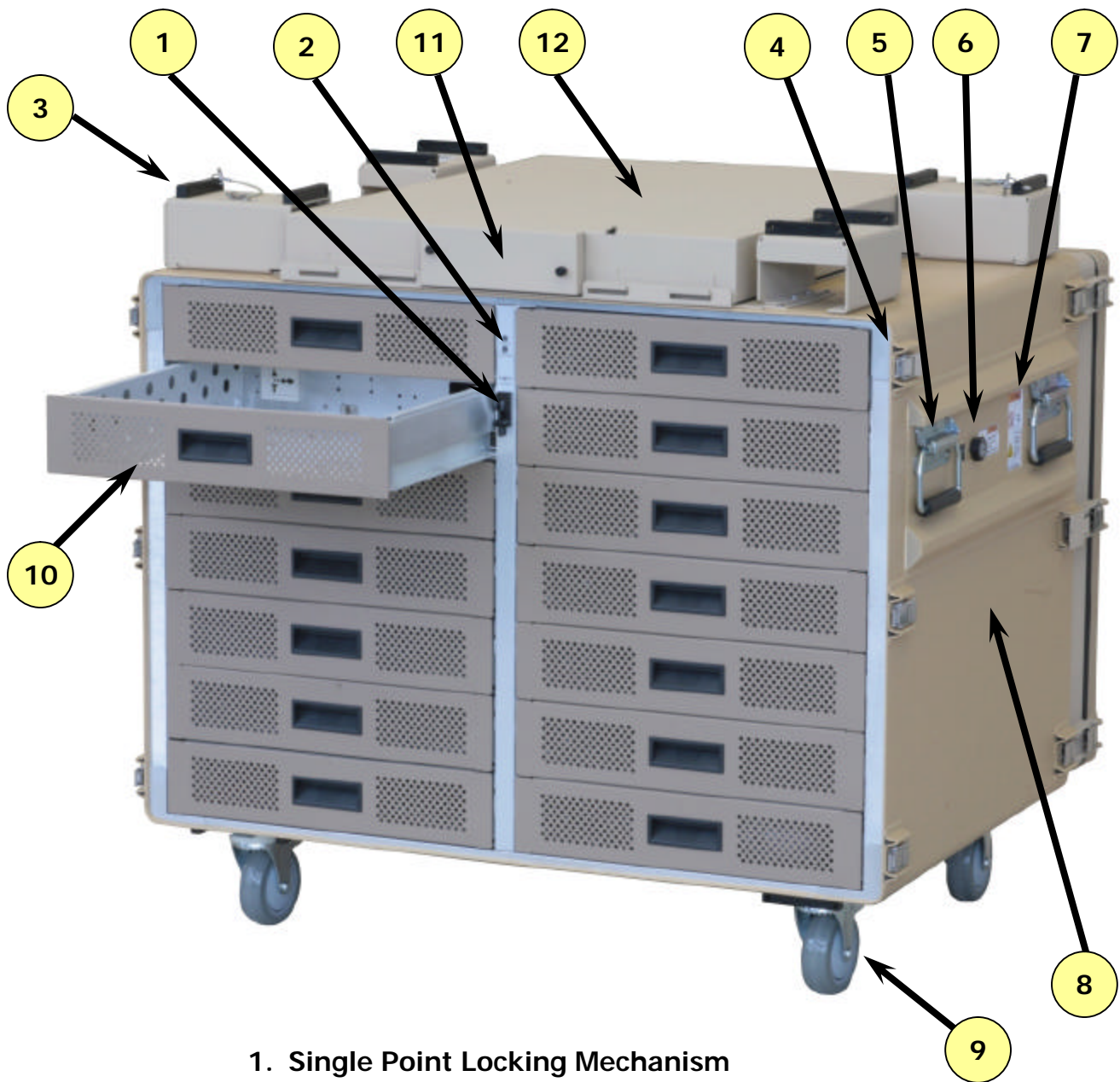


## Tray Diagram (Top Down with E-tool Strapped In Place)



- 1. Velcro Straps
- 2. AC Line Cord Receptacle (3)
- 3. Network Connector (1)

## Unit Front View With Component Description



1. Single Point Locking Mechanism
2. LED Display
3. Delrin Stacking Inter-locks With Pins
4. Door Latch
5. Lifting Handle
6. Pressure Relief Valve
7. Warning Labels
8. Chassis
9. Quick Release Caster
10. E-Tool Tray
11. Network Switch Cover
12. Switch Fan Filter Cover

## Diagram of Status Indicators And Lock Block



### Status Indicators Features:

Cooling status Light Emitting Diode (LED) on front of the chassis

Green - Fans operating, ambient temp is in operational zone

Amber Flashing - Fans operating below 50% of desired speed

Amber - inlet temp is >40C 'warm'.

Red Flashing - Fans operating below 25% of desired speed

Red - Inlet temp is >50C.

Power status LED on front of the chassis

Green - +12V Fan Power OK

Red - +12V Fan Power Supply is inactive

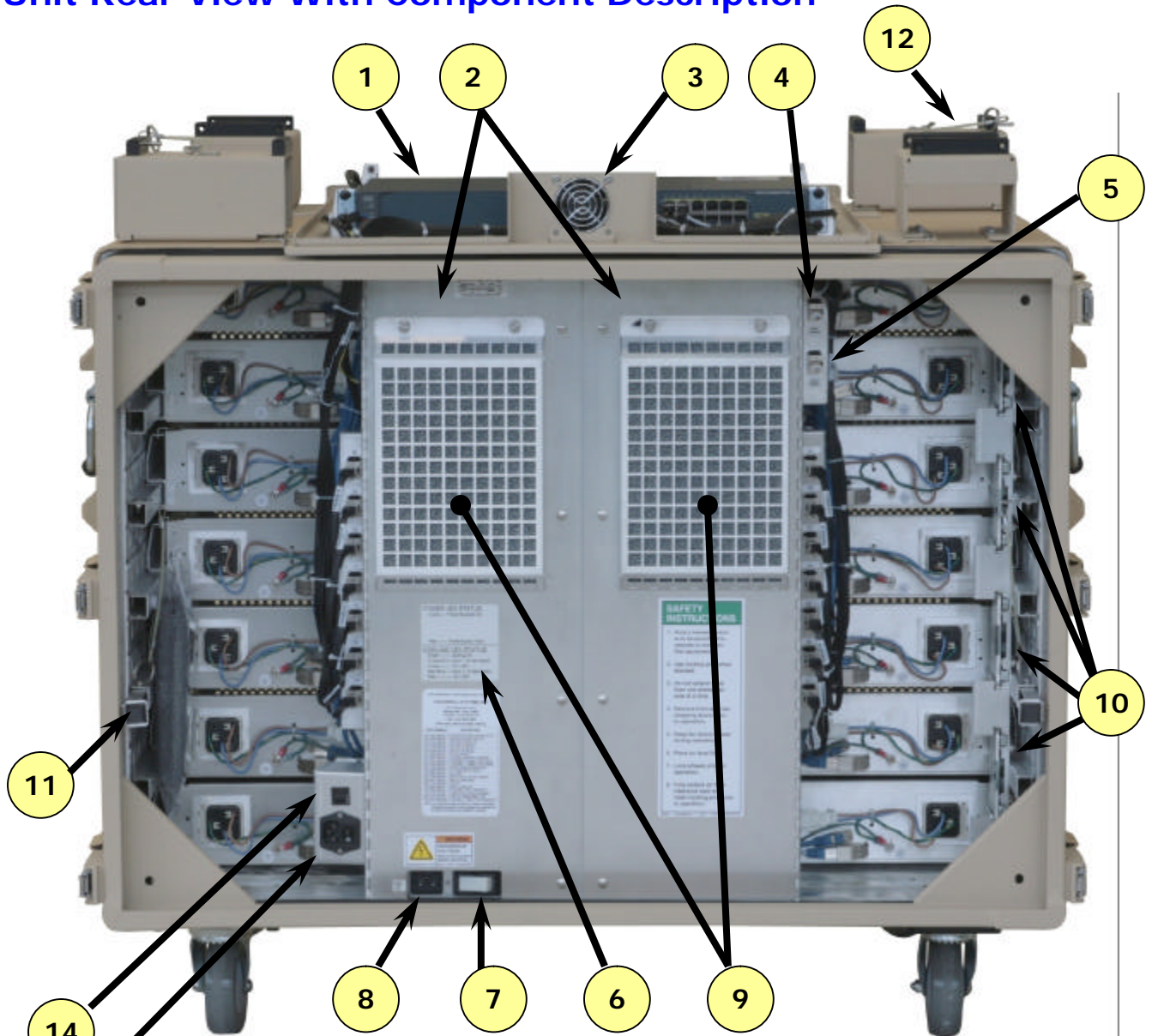
(These are the two LEDs on the front of the chassis)



### Lock Block

The Lock Block on the front of the chassis is designed for use with locks that have a 5/16" shackle diameter.

## Unit Rear View With Component Description



1. Ethernet Switch
2. Pressurized Air Plenums
3. Network Switch Bay Cooling Fan
4. Single Point LAN Connection
5. Console Connection
6. Manufacturer's Label With Serial Number
7. Power On/Off Switch/Breaker
8. AC Power Cord Receptacle for Devices
9. Fan Filter Covers
10. Castor Storage
11. Wall Standoff (2X)
12. Locking Pin w/ Lanyard (4X)
13. AC Power Cord Receptacle and On/Off Switch for Network Switch
14. Circuit Breaker for Network Switch



## Unit Operating Features

### Power Features:

- IEC Filtered AC Power Inlet
- 15A Circuit Breaker/ Power Switch
- Filtered external AC power provided to the computing devices
- Inrush Current Limiting for each drawer
- AC Voltage Transient Protection
- <1800W Peak load power available to the computing devices
- Each tray is current limited/protected with a fuse

### Cooling Features:

- Dual variable speed fans for chassis cooling
- Fan-monitor and control circuitry
- Over-temperature indicator
- Pressurized and metered airflow to each tray

### System Manager:

- Fan fail monitor
- Fan speed monitor
- Temperature monitor

### Network Access Features:

- COTS 24-port, self configuring, Managed Ethernet switch.
- Single LAN connection available in each tray
- Single-point server connection to external network



## **Status Indicators Features:**

Cooling status LED on front of the chassis

Green - Fans operating, ambient temp is in operational zone

Amber Flashing - Fans operating below 50% of desired speed

Amber - inlet temp is >40C 'warm'.

Red Flashing - Fans operating below 25% of desired speed

Red - Inlet temp is >50C.

Power status LED on front of the chassis

Green - +12VDC Fan Power OK

Red - +12VDC Fan Power is inactive

## **Enhanced Status Accessible Features:**

Serial port connector access to the System Monitor card

## **System Specifications:**

Operating temperature: 0C + 50C

Dimensions without casters (H) 31" (W) 39.1" (L) 33" with casters (H) 36" (W) 39.1" (L) 33"

Spring loaded recessed handles

Weighs less than 250 lbs when in the empty (no E-Tools) standard configuration.

Rugged abrasion & corrosive resistant polyurethane (TuffStuff™) coating

Eight systems fit on one 463L pallet when stacked.

Scalable design (e.g. 6-trays) for future requirements and flexibility

Frame guides and safety pin-locks for stacking and anti-tipping.

Quick-change, removable casters/wheels for daily use that stow internally for shipping

## **Rack System:**

14 Universal trays with 1 LAN port and 1 Universal AC Port

COTS Washable airflow filters

Lightweight corrugated, laser stitch welded frame

## **Common Rugged Docking Trays (14):**

Individually removable with an 11" normal operating clearance at stops

Dimensions: (D) 16.4" (W) 15.3" (H) 3.25".

Single point locking mechanism simultaneously secures all trays

Adjustable and secure strapping system supports multiple E-Tools platforms

Individual 5A fuse per tray to isolate and protect E-Tools

Universal AC power outlet in each tray

## **OPERATION SPECIFICATIONS**

### **Electrical Operating Specifications:**

**Input Voltage Range:** 90-264VAC

**Input Frequency Range:** 47-63Hz

**Surge Protection:** A primary cause of computer device failures is electrical surges in the input power to the devices. With up to 14 devices in the chassis, prevention and limitation of surges is a major design concern.

**Short Circuit Protection:** The primary goal of the chassis is to provide fully charged and operational computer devices for field use, therefore, it is highly desirable to prevent a faulty computer device from incapacitating the remaining devices.

### **IEC Filtered Inlet**

**Circuit Breaker, ISA Thermal, Integrated Into The Chassis**

**Dual Variable Speed Cooling Fans**

### **24 Port, Managed Ethernet Switch**

10/ 100 Megabit

No configuration required

EN55022 Class A

Full Duplex

Power Status LED

Link, Speed, Activity indicators built into each port

### **Drawer Interface**

Single LAN connection

Single Universal AC power outlet

Power Outlet is current limited/protected

### **Monitored Signals**

Fan tach outputs (fan speed)

12V fan power good

Inlet air temperature

5V housekeeping supply

## **Analysis of Signals Monitored:**

Fan speed based on the inlet air temperature

Inlet air temperature (40C) triggers alarm message, status LED (Amber) change.  
Temperature falls below 35C clears.

Inlet air temperature (50C) triggers alarm message, status LED (Red) change.  
Temperature falls below 45C clears to "Amber" state.

Failure of 12V supply triggers alarm message, and status LED (red) change.

DC not OK signal from the 12V supply triggers alarm message and status LED (red) change.

Chassis Fans speed drops below 50% of desired operating speed, triggers fan alarm message, status LED (Amber) change.

Chassis Fans speed drops below 25% of desired operating speed, triggers fan alarm message, status LED (Red) change.

## Chassis Interface

### SERIAL COMMUNICATION COMMAND SET:

(Actual command set is customized based on final hardware and software design.)

The monitoring system may be accessed over the RS232 link. Voltage, temperature, and trip point statuses are read using the defined command set. Any monitored parameter having a trip point to indicate a fail status generates an autonomous status message to indicate the fault condition.

### Communication terminal settings:

Baud rate: 9600  
Data bits: 8  
Parity: none  
Stop bits: 1  
Flow control: none

## RS232 Command Syntax

Note: Commands are case sensitive. The terminal device will issue the following COMMANDS, the monitoring board will respond back with the RESPONSE, XXX will be the value of the measurement being reported back.

Temperature Measurement Commands:		
Command	Response	Description
TA		Transmit all Temperatures as listed below:
T1	T1: XXX	Transmit temperature sensor #1 value in degrees C

Voltage Measurement Commands:		
Command	Response	Description
VA		Transmit all voltages as listed below:
V2	V2:+X.XXX V	Transmit the voltage of the +5.0VDC power supply
V3	V3:+X.XXX V	Transmit the voltage of the +12VDC power supply

Status Request:		
Command	Response	Description
SA		
	ST:T1: X	Status of temperature sensor #1, X = OK or FAIL
	SV:V2: X	Status of the +5.0VDC power supply, X= OK or FAIL
	SV:V3: X	Status of the +12VDC power supply, X= OK or FAIL

## Mechanical Operating Specifications

**Chassis** Strong and durable all-aluminum construction utilizes a corrugated design and laser welding for a precise, interlocking frame that provides a lightweight system that is rugged enough to withstand harsh handling while protecting contained E-Tools without system or E-Tool functionality loss. There is a single-point locking mechanism that locks all doors simultaneously for end of day security.

The total system weighs less than 250 lbs and its shipping configuration dimensions are (H) 30" (W) 39" (L) 29"

**Environmental** The system operates in all environments from 0C to 50C, using a filtered, pressurized, and metered airflow that maintains a constant airflow around contained E-Tools even when other trays are opened.

The shipping configuration is completely weather tight with lightweight plastic honeycomb doors sealing against the aluminum chassis.

The chassis is polyurethane-coated (TuffStuff™), making the system virtually impervious to abrasion and corrosion from materials, handling, and chemical exposure. The system has a pressure-relief valve on the right side of the chassis.

**Handling** The system has quick-latch/change wheels that stow internally for shipment. The frame incorporates spring-loaded, recessed handles for a 4-person lift while loaded with E-Tools in the shipping configuration.

The system has interlocking frame guides and security pin that align and lock the systems for stacking two-high, preventing tipping during shipment and operation.

**Maintenance** COTS components are designed into the system, including but not limited to, the air filter (user choice of filtering capability), Ethernet switch, power supply, inverter, and the generic hardware and wiring. Access to all major components is provided through quick release doors, latches, and tool removable panels to all components. The air filter is removable and washable.



## Maintenance

**NOTE: THE FOLLOWING ITEMS MUST BE INCORPORATED INTO A PREVENTIVE MAINTENANCE SCHEDULE**

- **INSPECT CASTERS FOR OBSTRUCTIONS** - PRIOR TO INSTALLATION OR MOVEMENT
  - **FILTERS** - CLEAN USING SOAP AND WATER, DRY THOROUGHLY BEFORE REINSTALLING - **WEEKLY**
  - **CABLES & WIRING** - INSPECT ALL CAT5 CABLING AND ELECTRICAL WIRING ASSEMBLIES FOR CHAFING - **QUARTERLY**
  - **INSPECT ALL LOCKING MECHANISMS** - **QUARTERLY**
  - **INSPECT UNIT FOR CORROSION** (APPLICABLE IN SPECIFIED ENVIRONMENTS ONLY) **MONTHLY**
- INSPECT FANS FOR BROKEN OR DAMAGED BLADES - SEMI ANNUALLY**

## Procedure for Ethernet Switch Access for Service and/or Replacement



1. Turn off cabinet and remove both power line cords.
2. Release latches (1 and 2) on each side of the rear of the Network Switch cover.
3. Remove cover.
4. After maintenance or replacement, reinstall cover by hooking tabs along the front edge, lowering the cover into place, and securing both latches (1 and 2).

## View of Ethernet Switch Bay with cover removed



## Troubleshooting

- 1. E-Tools within a tray show no power indication.**
  - a. Verify that both ends of the E-Tool charger are plugged in.
  - b. Cycle power to Docking Station. If the E-Tool indicates power, then the Polyswitch current protection most likely had tripped for the tray.
  - c. Check E-Tool and charger for excess current draw. Each tray is guaranteed to operate with up to a 2 A load (do not exceed 15 A total per cabinet).
- 2. Cooling failure is indicated by the status LEDs.**
  - a. Verify that the fans are plugged in.
  - b. Verify that the FET mounted on the inside of the right hand door compartment when viewed from the rear of the docking station has its connector firmly attached.
- 3. Docking station has no LED indicators lit, the fans aren't turning, and none of the trays appears to have power.**
  - a. Check the circuit breaker/switch on the back of the docking station. Cycle the switch through "OFF" to "ON".
- 4. No power to the system.**
  - a. Check to make sure the wall outlet has power.
  - b. Verify the power cord is plugged in and seated properly.
  - c. Turn the ON/OFF power switch off and then on again.
- 5. No power to a tray.**
  - a. Unplug the charger and the E-Tool from the tray and turn ON/OFF switch off for two minutes and then turn the power back on. (If power returns to the tray check to see if the charger is shorted)
  - b. Make sure the power cord on the charger is plugged into the tray AC receptacle securely.
  - c. Make sure the power cord for the charger is plugged into the charger securely.
- 5. System shut off on its own.**
  - a. Check for over temperature.
- 7. General System Failure - Cooling and Power LEDs show solid red.**
  - a. Turn off EMMC,
  - b. Unplug all laptops from tray AC power outlets,
  - c. Turn on EMMC,
  - d. Plug in laptops,
  - e. Allow laptops to charge for at least two hours prior to shutting off EMMC

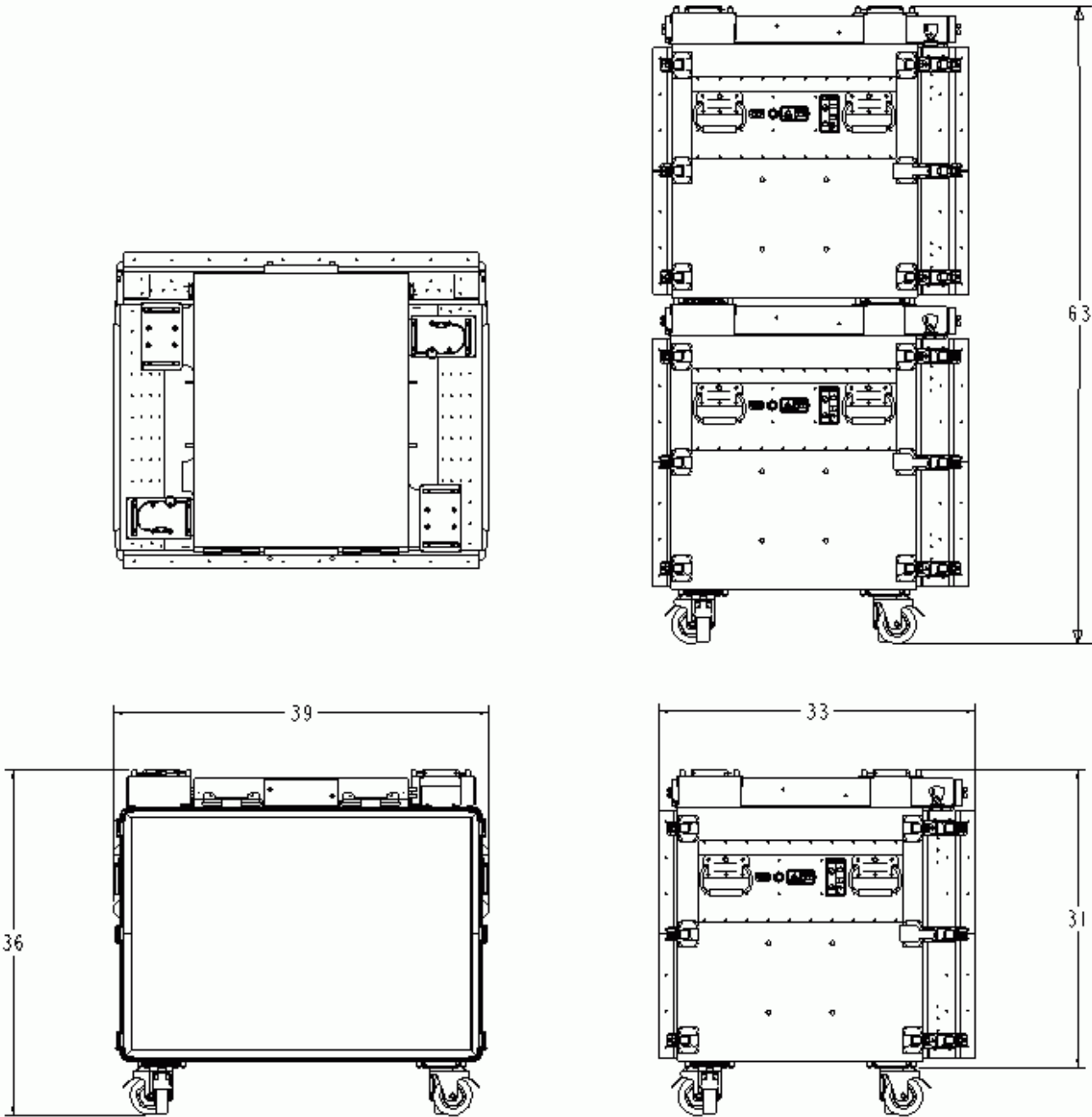
**Note: Consult factory regarding any other issues.**

## FRPs (Field Replaceable Parts)

Part Number	Description
015-1054-000-0P	DELTRIN STACKING INTERLOCKS
015-2063-000-0P	QUICK RELEASE CASTER
015-2157-000-0P	VELCRO STRAP 12"
015-2158-000-0P	VELCRO STRAP 6"
015-2159-000-0P	VELCRO STRAP 8"
015-2364-000-0P	AIR FILTER MEDIA
015-5069-000-0P	DOOR GASKET
017-4031-000-0P	LOCKING PIN WITH LANYARD
021-2450-000-0P	ETHERNET CONNECTOR
023-1401-000-0P	ON/OFF SWITCH
023-1828-000-0P	AC CORD RECEPTACLE
403-0209-000-WH	AC CORD
076-0140-000-0P	ETHERNET SWITCH (F20 Cabinet)
076-0204-000-0P	ETHERNET SWITCH (F31 Cabinet)
060-1178-K00-00	FAN KIT
110-4690-099-01	WALL STANDOFF
110-5597-129-00	COMPOSITE DOOR ASSEMBLY
110-4730-099-01	CASTER PLATE BLANK
403-0098-00-WH	ETHERNET CABLE FOR DRAWERS
	<b>Note—Any Items Not Found On This List Are Not Considered To Be FRP's And The EMMC Must Be Returned For Repair (See Warranty Section)</b>



# Chassis Dimensions (inches)



## Limited Warranty

The EMMC is warranted for a period of 1 year for electrical and 3 year mechanical from the ship date against defects in workmanship and component failure. For a list of Field Replaceable Parts (FRP's) consult this manual or see the label placed conveniently on the rear of the system.

**For replacement parts contact Tracewell Systems Repair Center.**

**Please have the serial number of the EMMC and the address of where you would like the replacement parts shipped before you call.**

Replacement parts will be shipped from our plant within two working days and failed parts should be returned to Tracewell Systems Repair Center, 567 Enterprise Drive, Westerville, OH 43081 using the carton and packing material the replacement parts are shipped in.

An RMA (Return Material Authorization) number will be given to you when you call as well as a specified shipping method.

( Extended warranties are available, please contact the factory for specifics.)

### **Service:**

For warranty and non-warranty service, contact Tracewell Systems Repair Center at:

**1-614-846-6175**

**Fax us at 1-614-846-2903, or**

contact us via the web at [www.tracewellsystems.com](http://www.tracewellsystems.com)