



EQMet

iCOBI3 User Manual



Document 306236
Revision NC
September, 2016



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Declaration of Conformity

We

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hereby declare that the equipment specified conforms to the essential requirements of the following applicable European Directives and Standards and carries the CE mark accordingly:

Product Name:	Kinematics ETNA 2
Product Description:	Accelerograph
Model Number(s):	ETNA 2, iCOBI3
Equipment Class:	Electrical Equipment Measurement Control and Laboratory Use-Industrial
Directives:	Council Directive 2014/30/EU and 2014/35/EU
Standards:	Safety: EN 61010-1:2010 Class II EMC: EN 61326-1:2013 EN55011 Class A Group 1 EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-5 EN61000-4-6 EN61000-4-8 EN61000-4-11

Supplementary Information:

Pasadena, CA USA
July 12th 2016



Ian M. Standley
Vice President, Division Manager



Safety

These symbols may appear on EQMet equipment or in this manual



When you see this symbol, pay careful attention. Refer to the similarly marked, relevant part of this manual before servicing the instrument.



This symbol means a low-noise earth ground. The noted item should be grounded to ensure low-noise operation and to serve as a ground return for EMI/RFI and transients. Such a ground does not work as a safety ground for protection against electrical shock!



This symbol means an alternating current (AC) power line.



This symbol means a direct current (DC) power line derived from an AC power line.



This symbol indicates an electrostatic sensitive device (ESD), meaning that when handling the marked equipment you should observe all standard precautions for handling such devices.



This symbol indicates that a particular step/process or procedure is required to ensure the installation maintains conformity to European Community requirements.



This symbol indicates that this referenced equipment or material should be re-cycled and not thrown in the normal trash stream.



This symbol indicates that the step/process or equipment has an environmental consequence and steps such as recycling are required.

These safety-related terms appear in this manual

NOTE: Statements identify information that you should consider before moving to the next instruction or choice.

CAUTION: Statements identify conditions or practices that could result in damage to the equipment, the software, or other property.

WARNING: Statements identify conditions or practices that could result in personal injury or loss of life.

Follow the precautions below to ensure your personal safety and prevent damage to the iCOBI3 system and its components. The system is provided with Battery systems that take the local AC power and produce ~13.5 VDC to power the Accelerographs and float charge a Valve Regulated Lead Acid (VRLA) battery to provide ~48 hours of battery back-up if the local AC power is lost. The Ethernet System contains an identical power supply that provides back-up power for ~48 hours of Ethernet communications between the units.

Battery and Ethernet Power Systems

The systems AC power cord not be plugged into AC outlets that will apply more than 260 VRMS between the supply conductors or between either supply conductor and ground. A protective ground connection (provided through the grounding conductor in the power supply and its power cord) is essential for safe operation. The systems are designed for indoor use only and they must not be subject to immersion in water, high humidity, or temperatures above 50°C.

WARNING: The systems must only be serviced by a qualified technician as AC voltages that can be lethal are present within the unit.

VRLA Batteries

Follow the precautions in this manual when handling and replacing the system batteries. Metallic instruments of any kind could short the battery terminals, resulting in fire or explosion. Do not drop the battery or attempt to disassemble it. When charging the battery before use, use a properly rated charger and do not overcharge the battery. The only correct replacement battery is a sealed lead-acid battery with relief vents and ratings comparable to the original battery. Never try to use a non-rechargeable battery with the battery charging system.

Grounding the Accelerograph

When using an AC power supply remember that the unit is grounded through the power supply's power cord. To avoid electric shock, plug the power supply's cord into a properly wired receptacle where the protective earth ground has been verified. Do this verification before making any power connections to the unit.

Use the Proper Power Cord

Use the power cord and connector supplied with the power supply, or an equivalent IEC-standard power cord. Be sure that it is in good condition.

Antenna, Phone & LAN Cabling

Never install antenna, telephone, or LAN wiring during electrical storms. Always ensure adequate separation between antenna cabling, telecom cabling, or LAN cabling and high voltage wiring. Always perform a safety check on telecom and LAN wiring to measure the voltage before working on the wiring. Remember telephone wiring carries fifty (50) to sixty (60) volts of DC and the ring signal at ninety (90) VAC can deliver a very uncomfortable shock. Power over Ethernet Cabling can carry DC voltages of up to 56VDC. To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. Ethernet LAN ports contain SELV circuits, and some WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

Do Not Operate in Explosive Atmospheres

The unit and the optional power supply systems provide no explosive protection from static discharges or arcing components. Do not operate the equipment in an atmosphere of explosive gases.

The EQMet iCOBI3 is not To Be Used For Life Support or Life-Critical Systems

These products are not designed for operating life critical support systems and should not be used in applications where failure to perform can reasonably be expected to create a risk of harm to property or persons (including the risk of bodily injury and death).



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Chapter 1

Introduction

Seismic monitoring systems provide data and information on the behavior of buildings during strong earthquakes leading to improved understanding of building responses and better future design codes. For these reasons, many municipalities (e.g., City of Los Angeles, CA USA) require seismic instrumentation is installed in larger buildings or offer benefits such as reduced post-event inspection requirements if these systems are installed (e.g., BORP San Francisco, CA USA).

In the Los Angeles Metropolitan area, seismic monitoring is required under the 2008 Los Angeles Building Code (§1613.8.2) which specifies a minimum of three accelerographs to be deployed at the base, middle, and top of a structure over ten stories or six stories with aggregate floor area of 60,000 square feet or more. (Accelerographs are instruments containing a sensor that measures the accelerations caused by the motion of the building and converts this to an electrical signal that is then converted in the instrument to a digital record of the acceleration.) The three instruments are usually placed in a vertical stack and interconnected for common triggering and timing. Common triggering ensures that if one unit responds to earthquake motion the other units will also “Trigger” to record this motion, while common timing ensure the records are all recorded with the same timing reference.

The iCOBI3 System (P/N 114205-PL) for building seismic monitoring, is EQMet’s solution to meet both these code requirements and for use by building owners who wish to monitor the response of their buildings in strong earthquakes. (internet ready, code Compliant Building Instrumentation iCOBI.) The system consists of an interconnected set of three digital triaxial iCOBI3 accelerographs (P/N 114204-PL), each provided with a separate Battery and Power System (P/N 114340-03-PL). These accelerographs are connected by user supplied ethernet cabling to the Ethernet Switch system (P/N 114340-04-PL) which is normally located at the location of the middle accelerograph.

This manual describes the installation and operation of the system and includes detailed instructions on all the system components including the iCOBI3 Accelerograph, the Battery System, and the Ethernet System.

Chapter 2

Pre-Installation

The information and instructions below are designed to ensure a trouble free installation at the site. This is designed to ensure that the required infrastructure has been installed, the installation environment is suitable for the equipment, and you are familiar with the equipment and have the necessary tools and supplies to complete the installation.

2.1 Support Infrastructure

Prior to installation the following infrastructure needs to be in place. Refer to [iCOBI3 System Installation Wiring Diagram](#) that shows the installation wiring diagram for the iCOBI3 system.

Three locations are required to mount the Accelerographs and the Battery and Ethernet Systems. These should be at the Top, Middle, and Base of the building.

The mounting location should be lit and ventilated and with an environment within the specification listed below. The location should be in a locked area not accessible to the public.

At each location a sufficient area of floor is required to mount the iCOBI3 Accelerograph, Battery System, and additionally in the middle location the Ethernet System. We generally recommend a 6-10" clearance around the instruments for ease of access all though this can be less if space is not available. A 30" x 20" area is recommended for the Top and Base installations and a 42" x 20" area for the Middle location.

At the Top and Base location a single AC power receptacle is required for the system that should be connected to power at all times. At the middle location two AC power receptacles connected to power at all times are required.

The units need to be interconnected with Ethernet cabling installed in the structure. This wiring should be CAT 5e, 6, or 6a and we recommend Shielded Twisted Pairs (STP). The insulation should be rated to be compatible with local building regulations. The length of the interconnect runs must be less than 100m (330 feet) to comply with the Ethernet

standard. One cable should run from the Top location to the Middle and one from the Base to the Middle. The cables should terminate into grounded RJ45 wall jacks.

If it is desired to connect the system to the Building LAN an additional Ethernet Jack connecting to the building Ethernet LAN should be provided at the middle location.

If the optional GNSS antenna is to be installed this will need to be mounted on the roof of the building and the cable run to the Top location.

GNSS (Global Navigation Satellite Systems) – is the generic term for all such systems, four of which are available as of 2016: GPS (USA), GLONASS (Russian Federation), BeiDou (People’s Republic of China), and Galileo (European Union); the GNSS system in the iCOBI3 supports any two of the four systems.

2.2 Installation Environment

The components of the iCOBI3 are designed to be mounted in a building in an indoor protected environment. The system is designed to operate in the following conditions:

- Temperature: 0 to +50.0 °C
- Humidity: 20-95% RH non-condensing

The equipment should not be exposed to direct sunlight or exposed to water or water spray.

2.3 The Instrumentation

We recommend unpacking the equipment and performing initial testing and setup at your location before installing the units in the field. This way any problems can be addressed before the field visit which then should run smoothly.

2.3.1 Unpacking and Inspecting the Equipment

Before accepting the shipment the shipping carton should be examined for any obvious damage and this should be recorded by the freight carrier.

The iCOBI3 ships in custom designed packaging. This packaging can be used to return the system or to ship it to other destinations. It should be carefully opened at the top so it can be re-used.



When the packaging is no longer required please recycle the cardboard cartons and foam insert appropriately.

The following components should be present in your system, along with any other optional components ordered. You should verify that all the parts are correct and undamaged in shipment.

2.3.2 Components

Item	P/N	Description	QTY
1	114204-PL	ASSY., ICOBI3 ACCELEROGRAPH	3
2	114340-03-PL	ASSY., BATTERY SYSTEM, ICOBI3, 12AH	3
3	114340-04-PL	ASSY., ETHERNET SYSTEM, ICOBI3, 12AH	1
4	853608	ASSY., CABLE, ETHERNET, M12, MOLDED,	3
5	853791	CABLE, CAT 5E, PATCH, BLACK, 10'	3

In the following sections each component is described.

2.3.3 iCOBI3 Accelerograph

The Accelerograph contains the sensors and digitizer that convert the motion of the building during an earthquake into a digital signal that is stored in the instruments.

2.3.3.1 iCOBI3 Front Panel

The iCOBI3 front panel consists of connectors allowing you to connect power, GNSS, and Ethernet connections as well as other functions. In this section we describe the connectors and the cables and accessories associated with them. Refer to the Figure for the location of the connectors and the LEDs.

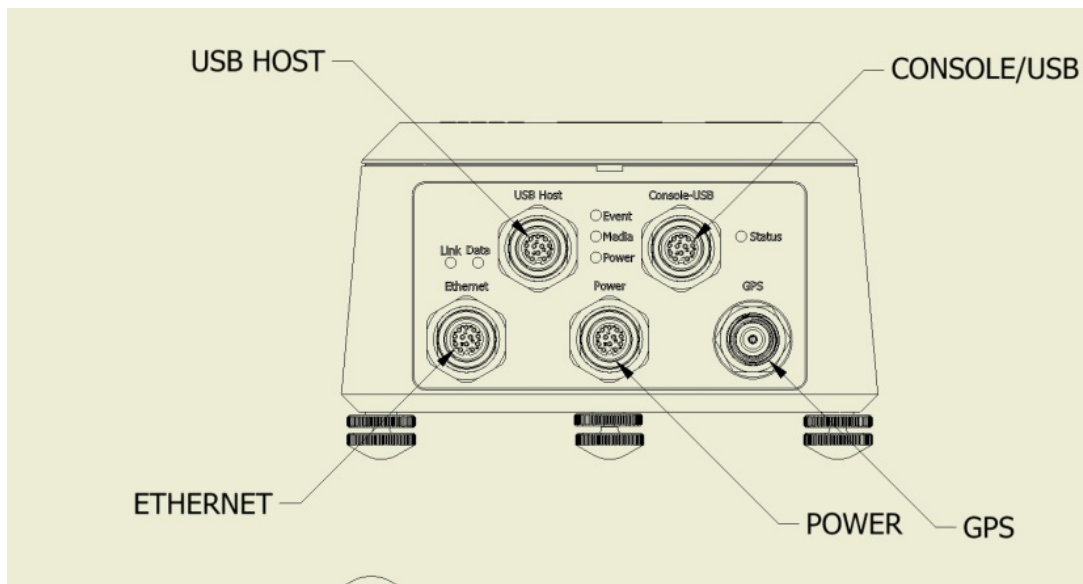


Figure 2.1: iCOBI3 Accelerograph Front Panel

Connectors are provided for:

- Power/Relays
- Ethernet port
- Console/USB Device or Host
- USB host
- GNSS Antenna

LEDs are provided for:

- Power
- Status
- Event
- Media
- Ethernet Link
- Ethernet Data

2.3.3.2 LEDs

The LEDs on the front panel provide the following information: Power:

- OFF - No power
- Flashing Green - Waiting to power up, Running off of external power
- Fast Green - Charging the supercapacitors
- Infrequent Green - System is powered up (Normal State in Operation)

Status:

- Flashing Red - No time source (Normal State for an iCOBI3 timing master unit without GNSS antenna)
- Infrequent Red - Time source detected, not locked
- Infrequent Green - Good time quality (Normal State for an iCOBI3 timing master with optional GNSS antenna, and iCOBI3 timing slaves regardless of timing method used)
- Flashing Green - The system is starting up

- Flashing Red/Green - Rockhound is shutting down or restarting

Event:

- OFF - No events
- Steady Green - Real time data stream
- Flashing Green - Storing an event
- Infrequent Green - Events stored

Media:

- OFF - Idle, OK to insert or remove
- Steady Green - Mounting
- Flashing Green - Transferring data
- Steady Red - Error detected

Ethernet Link (Green/Amber):

- Amber - Ethernet 10Mb link detected
- Green - Ethernet 100Mb link detected (Normal operational State)
- OFF - No Ethernet link detected

Ethernet Data (Amber):

- ON - Ethernet data transmission in progress
- OFF - Idle

2.3.3.3 Power

The unit is powered through this connector. In the iCOBI3 system the power is provided by the Battery System which provides a nominal 13.5VDC to the unit and provides ~48 hours of battery autonomy when AC power is lost. The cable that connects to the power plug is pre-wired into the battery box.

2.3.3.4 Console/USB Device (Optional)

This connector provides access to the RS-232 console port connection, and a USB connection that can be used either as an alternate console connection or to connect an additional USB device such as a thumb drive or cellular modem.

The console port connection is used to provide access to an operating system console that is required in initial setup of the system (before network interfaces are defined) and in certain diagnostic and maintenance operations. The console port is not needed in normal operation.

The console is `/dev/console`. The default baud rate is 115200. The cable to connect to the Console is P/N 853762 The USB device interface allows use of the unit as a USB device from a USB host (the host is typically something like a PC). This makes the USB device interface of the iCOBI3 appear as a virtual COM port on the PC. Compatible drivers will be required on the host end to utilize this interface.

From this port you can open a terminal session (using something like PuTTY) and log into the iCOBI3 without requiring a network connection or an actual serial port on your computer.

Note that this USB connection is dual use. After booting, it can act as a device (connecting to a PC as above), or as a host for use with a USB device such as a thumb drive. Note that once the interface switches into host mode (e.g. by plugging in a thumb drive) then it will not operate in device mode again until the system is rebooted.

The cable to connect as a USB Device on this port is P/N 853762

For a cable to connect to a USB device (thumb drive) on this port, use P/N 853774 with a P/N 853741 protective cap.

2.3.3.5 USB Host (Optional)

This connector provides a USB connection that can be used to connect a USB device such as a thumb drive or cellular modem.

Note that this USB connection is single use. It acts as a USB host port only.

The cable to connect to a USB device (thumb drive) on this port is P/N 853610, or P/N 853740 if used with a P/N 853741 protective cap.

2.3.3.6 Ethernet

This connector provides a low power 10/100Mb Ethernet connection. The cable to connect to this port is P/N 853608 and is supplied as part of the system.

2.3.3.7 GNSS

This connector provides the connection to an active 3.3V GNSS antenna to allow reception of timing and position signals. These antennas contain low noise amplifiers which are powered

by a DC current through the antenna cable. An optional external bullet style antenna with a 25 meter plenum rated cable can be ordered if accurate absolute time is required for the system. For additional information on antennas and cabling consult the [Optional GNSS](#) section.

GNSS (Global Navigation Satellite Systems) – is the generic term for all such systems, four of which are available as of 2016: GPS (USA), GLONASS (Russian Federation), BeiDou (People’s Republic of China), and Galileo (European Union); the GNSS system in the iCOBI3 supports any two of the four systems.

2.3.3.8 Seal Screw

CAUTION: Do not attempt to unscrew the seal test screw as this will destroy the seal and allow water to enter the unit.

2.3.3.9 Battery System

The Battery System connects to the AC Mains using the supplied AC cord and converts the AC voltage to ~13.5VDC that is used to power the Accelerograph and float charge a 12V, 12 Ah VRLA battery that is contained in the system to provide back-up power for approximately 48 hours after AC power is lost. All the components are contained in the plastic enclosure which is provided with vents for the battery.

WARNING: The Battery System must only be installed and serviced by a qualified technician as AC voltages that can be lethal are present within the unit. The unit is designed for indoor operation in a ventilated area only and must not be exposed to water spray or subject to water immersion.

2.3.3.10 Ethernet System

The Ethernet System connects to the AC Mains using the supplied AC cord and converts the AC voltage to ~13.5VDC that is used to power the internal Ethernet Switch and float charge a 12V, 12 Ah VRLA battery that is contained in the system to provide back-up power for approximately 48 hours after AC power is lost. All the components are contained in the plastic enclosure which is provided with vents for the battery.

WARNING: The Ethernet System must only be installed and serviced by a qualified technician as AC voltages that can be lethal are present within the unit. The unit is designed for indoor operation in a ventilated area only and must not be exposed to water spray or subject to water immersion.

2.3.4 Bench Testing and Configuration

The iCOBI3 system can be easily tested and configured in the lab before installation in the field. The system wiring diagram shows how the system is connected in the building but it is easy to configure the system with all three Accelerographs in the same location.

First we connect all three Accelerographs up to the battery systems and connect power. Proceed as follows:

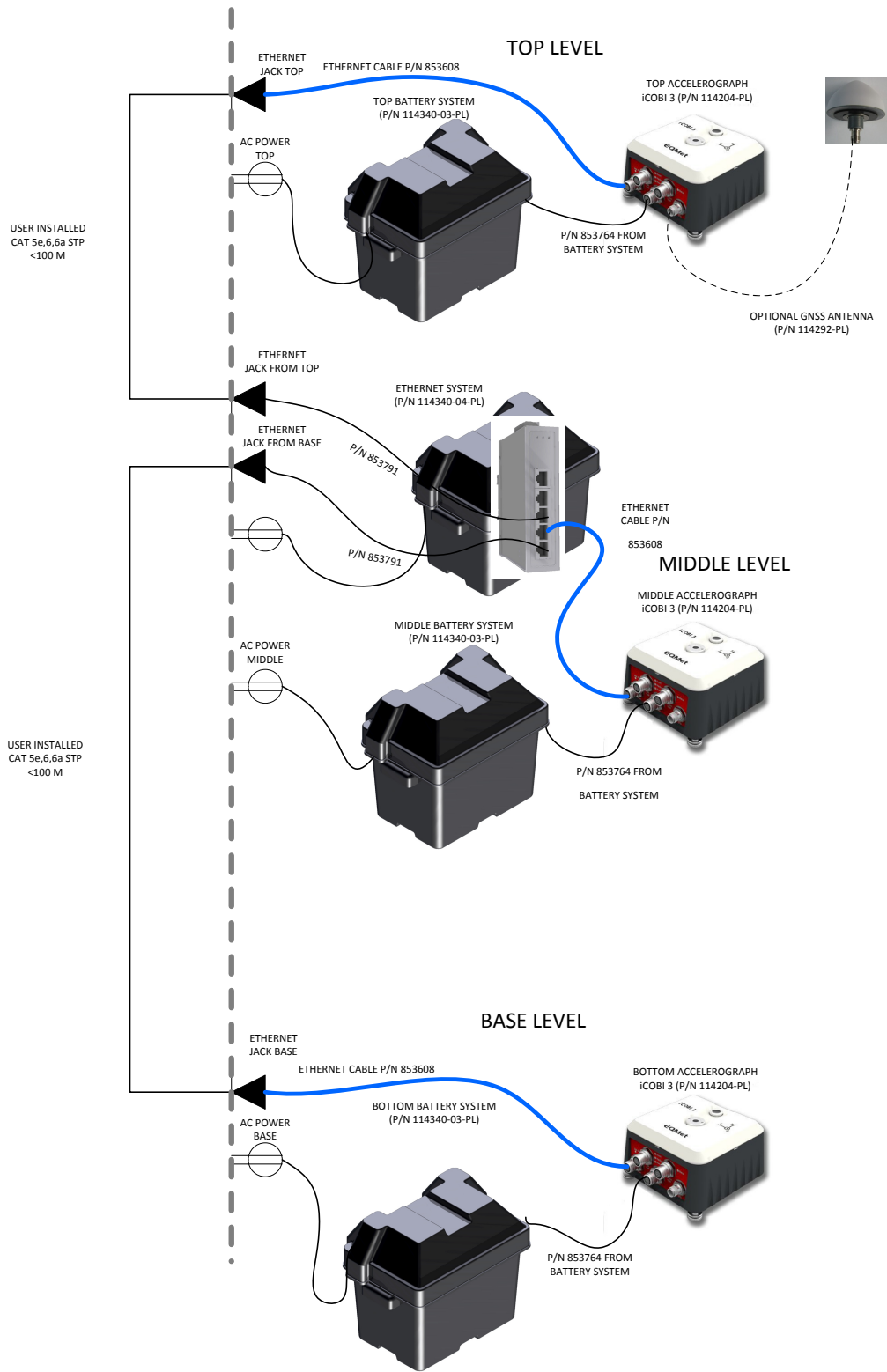
1. Open the Battery System and install the battery if necessary (see [Hardware Installation](#) for specific details)
2. Take out the power cable for the Accelerograph this has an M12 connector on the end and screw it into the middle connector on the Accelerograph.
3. The lights on the Accelerograph should light as the battery provides power.
4. Now take the AC Plug cable out of the box and plug it into the AC receptacle. Check that the green light illuminated on the AC/DC converter.

The Accelerographs and Battery System should look like the figure below. (Figure 2.3: Bench setup for Top and Bottom Accelerograph)

Now power and connect the Ethernet System as follows:

1. Open the Ethernet System and install the battery if necessary (see [Hardware Installation](#) for specific details)
2. The lights on the Ethernet switch should light as the battery provides power. Providing the battery is charged the green PWR2 LED should be illuminated along with the red FAIL LED on the Ethernet Switch.
3. Now take the AC Plug cable out of the box and plug it into the AC receptacle. Check that the green light illuminated on the AC/DC converter. Both the PWR1 and PWR2 green LEDs on the switch should be illuminated and the FAIL LED should be off.

You now need to configure the individual Accelerographs with the correct IP address as described below before completing the full system test.



iCOBI 3 SYSTEM INSTALLATION WIRING DIAGRAM

Figure 2.2: iCOBI3 System Installation Wiring Diagram



Figure 2.3: Bench setup for Top and Bottom Accelerograph

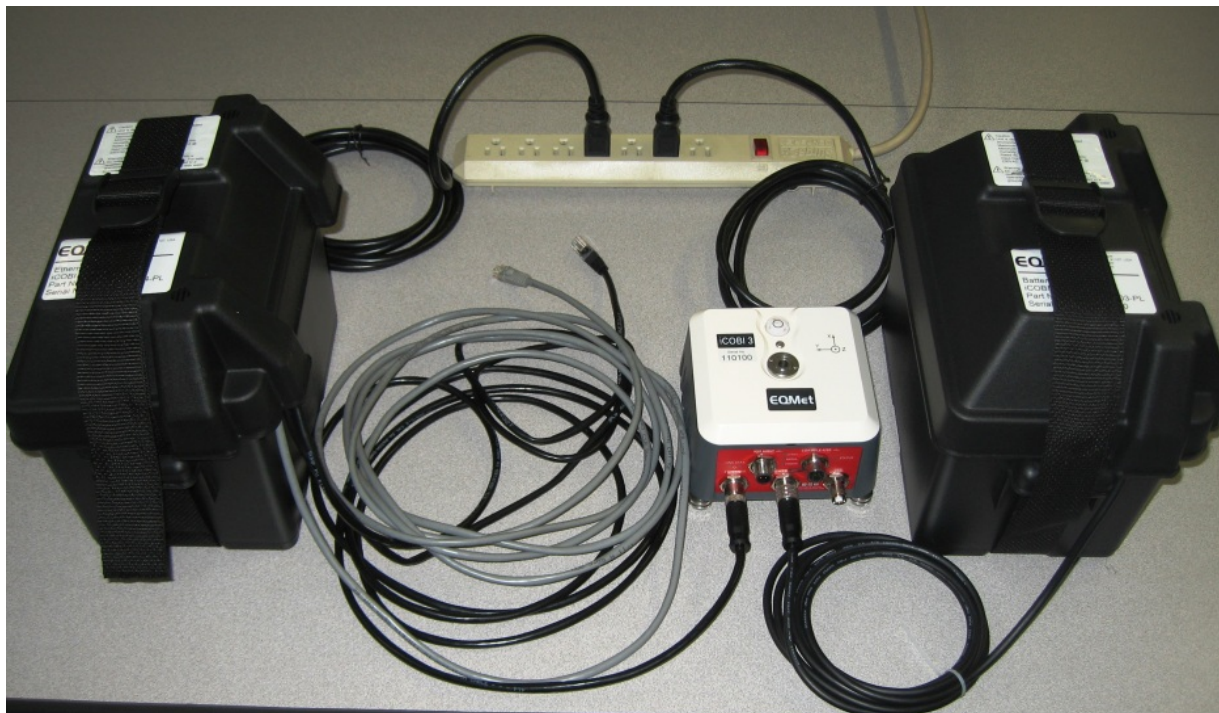


Figure 2.4: Bench setup for Middle Accelerograph and Ethernet System

2.3.4.1 Pre-set System Configuration

The units are shipped with a factory default setup that configures the system to satisfy the requirements specified by the City of Los Angeles in the Information Bulletin/Public-Building Code P/BC 2008-048.

Parameter Description	Value
Full Scale Measurement Range	$\pm 4g$
Sample Rate	200sps
Trigger Threshold	0.01g (0.25% FS)
Pre-Event Time	20s
Post-Event Time	30s
Data File Format	EVT
Votes to trigger	1
Votes to detrieger	1
Trigger Filter	Classic Strong Motion

It is not recommended that users change these default values.

In the sections below we have described what the pre-set parameters do for reference.

Full Scale Measurement Range This determines the maximum acceleration the system can measure. Setting this to $\pm 4g$ ensures that very large earthquakes can be recorded by the system.

Sample Rate A sample rate of 200 samples per second (SPS) captures the frequencies of interest in a structure.

Pre- & Post Event The pre-event time determines how many seconds of data before the trigger criteria were met will be recorded in the event file. In accordance with City of LA requirements, it is set at 20s.

The post event time determines how many seconds after the system has de-triggered will be recorded in the file. In accordance with City of LA requirements, it is set at 30s.

Channel Triggering The threshold trigger has two parameters for each channel. The first is the threshold trigger, which is the level in percent of full scale that causes the channel to trigger. In accordance with City of LA requirements, it is set at 0.01g or 0.25% of full scale range which is 4g.

The second parameter is the threshold de-trigger. This is the value in percent of full scale the signal must fall below after triggering for the channel to detriquer. In accordance with City of LA requirements, it is set at 0.01g or 0.25% of full scale range which is 4g.

The pre-trigger filter is set as the classic strong motion filter. At a sampling rate of 200 Hz, this puts the band-pass at approximately 0.1 to 12.5Hz and gives optimum triggering on an earthquake signal.

Each channel is assigned one vote that it casts towards getting the system to trigger. Only one vote is required to trigger so any of the three accelerographs can trigger the system meeting the City of LA requirements.

2.3.4.2 User Instrument Configuration

Each system needs to be configured for operation and this is dependent on the installation and configuration of the instruments. This section describes how to configure the individual Accelerographs. The Battery and Ethernet systems require no user configuration.

Network Configuration Network setup is done using the “netconfig” script.

Whether or not you use the network interface to communicate outside of the iCOBI3, it is important to set it up because the network is used to share timing and triggering information between accelerographs.

We recommend that you configure all units for unique host names and static addresses.

If you will use a router to communicate outside of the iCOBI3 environment, the router will have an inside network that will typically be something like 192.168.1.X. In this case, the router's "inside address" will be set to something like 192.168.1.1.

Whether or not you have a router, you should set each accelerograph to have unique addresses as if you would have a router. We suggest using 192.168.1.11 for the first (basement) unit, 192.168.1.22 for the second (middle) unit, and 192.168.1.33 for the third (top floor) unit as described above. (If you are linking the units into an existing network you will need to ask the MIS Administrator to assign three unique static IP addresses within the network for the Accelerographs.)

For the rest of this discussion we will assume that the iCOBI3 system is on a private network of 192.168.1.X.

You'll need a PC or equivalent running a terminal emulation program such as HyperTerminal or PuTTY on Windows or minicom on Linux. Using the terminal program, you will log into Linux and run the "netconfig" script to set up the network of each accelerograph.

As shipped from the factory the accelerographs have a static address of 192.168.222.245. So first change the IP address on your Laptop to 192.168.222.1. Then one at a time for each unit, connect to the Accelerograph that will be at the Base using the Ethernet cable and use the terminal program to log into the connected unit at 192.168.222.245.

Log in using the username "root", and the factory default password of "kmi".

Once logged in, run "netconfig" to change the IP address of the first unit to 192.168.1.11. Repeat this procedure for the top and middle units one at a time naming them Top and Middle and using suggested IP addresses of 192.168.1.22 and 192.168.1.33. We suggest labeling the units with the location and recording the Accelerograph serial numbers and configured IP addresses.

The netconfig process will look something like this:

```
iCOBI3:~# netconfig
Network Host Name for this unit > Base
Network Domain Name >
Mode for eth0
1. disabled
2. static
3. dhcp
(Note: To use wireless AP mode you must set eth0 disabled.)
Make a selection and press [Enter]
> 2
IP Address for eth0 > 192.168.1.11
NetMask for eth0 Default: 255.255.255.0
>
Default gateway
Default: 192.168.1.1
>
```

```
Mode for USB wireless adapter wlan0
1. disabled
2. static
3. dhcp
Make a selection and press [Enter]
> 1
Net Watcher is a service that attempts to recover lost network connectivity.
Do you want to enable Net Watcher? (Y/N)? > n
IP Address for primary DNS
> 8.8.8.8
IP Address for secondary DNS
>
New parameters to be saved:
HOSTNAME = [Base] DOMAINNAME = []
DNS1 = [8.8.8.8] DNS2 = []
PUBLIC_ADDR = [] NW_PING_HOST = []
eth0 Parameters:
MODE = [static]
ADDR = [192.168.1.11] NETMASK = [255.255.255.0] GATEWAY = [192.168.1.1]
wlan0 Parameters:
MODE = [disabled]
ADDR = [] NETMASK = [] GATEWAY = []
SSID = [] SECURITY = []
PASS = []
CHANNEL = []
Press [Enter] to Continue, or [Ctrl-c] to Quit.
Saving parameters...
Do you want to stop and re-start the network NOW?
(Y/N)? > y
Restarting eth0...
fec 63fec000.ethernet eth0: Freescale FEC PHY driver [NatSemi DP83640]
(mii_bus:phy_addr=63fec000.etherne:01, irq=-1)
libphy: 63fec000.etherne:01 - Link is Up - 100/Full
```

NOTE: Once the network is restarted, you will no longer be able to communicate with the accelerometer at 192.168.222.245 since the address will have changed (to 192.168.1.11 in this example). You should configure all three accelerometers, and then proceed with additional configuration.

After completing the network setup on all three accelerometers, change your PC's IP address to 192.168.1.9. Then log into each Accelerometer at its new address with PuTTY and reboot it (using the "reboot" command) to ensure that the network parameters come up correctly. Rebooting also assures proper operation of system services that may be terminated when the network(s) are stopped.

Rebooting the accelerograph will drop the network connection. Give the accelerograph a couple of minutes to restart and then re-open PuTTY to review current network parameters. Type `ifconfig` as follows:

```
Base:~# ifconfig
eth0 Link encap:Ethernet HWaddr 70:b3:d5:ce:92:8f
inet addr:192.168.1.11 Bcast:192.168.1.255 Mask:255.255.255.0
inet6 addr: fe80::72b3:d5ff:fece:928f/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:68597 errors:430 dropped:0 overruns:430 frame:0
TX packets:191 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:5463702 (5.2 MiB)
TX bytes:20075 (19.6 KiB)
lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:32 errors:0 dropped:0 overruns:0 frame:0
TX packets:32 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
X bytes:2240 (2.1 KiB) TX bytes:2240 (2.1 KiB)
```

For reference, logging into the units for initial configuration can be done in three different ways:

1. Static IP. From the factory, the iCOBI3 is configured as a dynamic (DHCP) IP and simultaneously as the static IP of 192.168.222.245. Either may be used until you run “netconfig” to specifically set up your network. Since 192.168.222.245 is a static address, do not connect more than one “fresh” iCOBI3 to your network at one time.
2. Using USB with cable PN 852762. This will present the iCOBI3 to your PC as a virtual COM port over USB. Thus way, you can simply connect to the iCOBI3 via PuTTY and log in. You may have to consult the device manager to determine the COM port assigned by Windows. Flow control and baud rates are meaningless and do not need to be set when using a virtual COM port.
3. Using the RS-232 Console with cable PN 852762. You should set up your RS-232 communication software (such as HyperTerminal) for 115200 baud, no flow control, no parity, 1 stop bit.

If you temporarily plug your PC into the network for configuration, maintenance, or data retrieval you should configure it to be part of this network and assign it an unused static address such as 192.168.1.9. Once you do that, you will be able to communicate with the accelerographs at their assigned addresses over the network using the browser interface or a utility such as WinSCP for data retrieval.

Now change the address of your Laptop to 192.168.1.9 and connect all the units using the Ethernet Switch as follows:

1. Connect the Ethernet Cable (P/N 853608) to the Base Accelerograph and then to the No 1 position RJ45 jack on the switch.
2. Connect the Ethernet Cable (P/N 853608) to the Middle Accelerograph and then to the No 2 position RJ45 jack on the switch.
3. Connect the Ethernet Cable (P/N 853608) to the Top Accelerograph and then to the No 3 position RJ45 jack on the switch.
4. Using a Patch Cable connect your Laptop to the No 4 position RJ45 jack on the switch.

All the Accelerographs and your Laptop are now connected on the Network. You can now configure each one as described below.

Network Triggering To configure the accelerographs to trigger each other across the network you must modify the parameters for the Network Trigger under Layout → Configuration → Network Trigger. Specifically, set:

- Enable Discovery. Set this to false
- Included Hosts. Set each one to have the address of the two others. For example, the unit at 192.168.1.11 should have this value set to “192.168.1.22 192.168.1.33”. The unit at 192.168.1.22 should be set to “192.168.1.11 192.168.1.33”.

Timing System Configuration In a structure, relative timing between the accelerographs is important. The iCOBI3 shares timing over the network using the PTP protocol. In this protocol, one unit (usually the top floor) must be set to be the timing “master”, and all others set to be timing “slaves”.

To configure the timing sources you must modify the Time Source parameter under Layout → Configuration → iCOBI3 Data Interface:

- For the master: Set the Time Source to “PTP Master w/ GPS” if using GPS, or “PTP Master (free running)” if not
- For the slaves: Set the Time Source to “PTP Slave”

If you will not use GPS on the master, you must set time manually on the master. The current time is set manually from Linux. As follows:

```
rock stop
date MMDDhhmmYYYY.ss
rock start
```

On the date specification, note:

- MM is month (05 for May),
- DD is day of month,
- hh is hour in 24 hour format (00-23),
- mm is minute (00-59),
- YYYY is year (2010),
- ss is seconds.

You can skip [.ss] if you wish and just enter MMDDhhmmYYYY

The system is now configured. When complete, verify proper operation as described in [Verification and Documentation](#)

Tools and Supplies The following tools and supplied may be useful during installation.

- Digital Voltmeter
- Ethernet Cable Tester
- Laptop with Ethernet Port (USB/RS232 Optional if Console Cable has been Purchased)
- (Optional) Kinometrics' Console cable (853762) to link a laptop to the
- Digital Camera or Smart Phone
- RJ45 Connector Kit
- Hammer Drill with 3/8" Bit and 1/4" Bit if Mounting Battery and Ethernet System using Plastic Anchors
- No 6 x 1" Stainless Steel Oval Head Screws and 1" Plastic anchors for mounting Battery and Ethernet System (16 required per System)
- (Optional) Spare Concrete Anchors
- Safety Glasses
- Miscellaneous Small Tools (Screwdrivers, Nut Drivers, Allen Keys (Imperial), Pliers, Wire Strippers, Utility knife)
- (Optional) Hardware for grounding straps
- Electrical Tape, Cable Ties

- Labels for marking AC Receptacles, Cords, Ethernet Jacks, and Cables to not be removed
- Spare Fuses, Fuse, KMI# 853788, FUSE, GLASS, 5A, 250VAC, 5X20MM

Chapter 3

Installation

This section describes installation at the site. You should have reviewed and performed the instrument set-up and configuration described in Chapter 2 before installing at the site. If you have not done so you will need to set-up and configure the Accelerographs before proceeding. This chapter also assumes the required Ethernet cabling, power sockets, and space are available on the site at the three locations where the instruments will be installed. Refer to [iCOBI3 System Installation Wiring Diagram](#) as you perform the installation.

3.1 Hardware Installation

These instructions are for the Middle location assuming that the Ethernet Switch will be installed at this location. For the Top and Base location follow these instructions but ignore the specific steps marked with the asterisk (*) for the Ethernet System.

1. Verify an AC plug is available to power the Accelerograph
2. Verify the Ethernet connection is available for the Accelerograph – not required for Middle location as it is the destination for the links from the Top and base. It is suggested that this connection is tested with a cable tester.
3. *Verify an AC plug is available to power the Ethernet System
4. *Verify that the optional LAN connection is present
5. If the unit is to use GPS and has been purchased with an optional GNSS antenna verify that this has been installed ([Optional GNSS](#)). The antenna will normally be installed at the Top location in the building.
6. Decide on the component Placement – decide on the exact location of the Accelerograph and the Battery System.
7. The Accelerograph needs to be rigidly connected to the floor of the building – this is normally the concrete slab and a concrete mounting anchor is supplied for this purpose. Proceed as follows:

- Be sure that each of the recorder's leveling feet are screwed into place and extending less than $\frac{1}{4}$ " of visible screw thread from the bottom of the unit.
- The locking nuts should be loosened.
- Locate the position of the center of the recorder and mark the location
- Use a drill with a $\frac{3}{8}$ " (9.5 mm) bit, and drill into the concrete to a depth slightly deeper than the length of the anchor (1" or 25.4mm). A percussion or hammer drill will make this procedure much easier. You should follow all recommended safety precautions when using power tools and we recommend you wear safety glasses during the installation procedure. (Using the anchor set tool as a depth gage can make this easier. Mark the thick end with a piece of tape at the depth of the bolt – check the hole depth with this.)

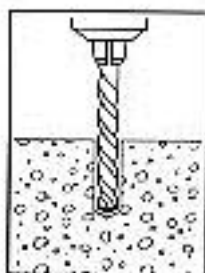


Figure 3.1: Drilling Mounting Hole

- Make sure you clean out the hole after drilling it. (Using a flexible drinking straw works very well for this, but make sure you don't blow dust in your eyes!).
- Set the anchor using the anchor set tool. Place the anchor in the hole. The top should be flush with the floor. Place the thin end of the anchor set vertically into the anchor. Strike with a hammer until the shoulder of the anchor set tool is flush with the top of the anchor.

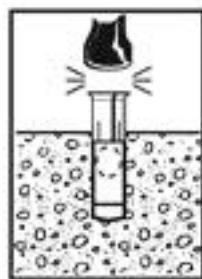


Figure 3.2: Installing Anchor 1

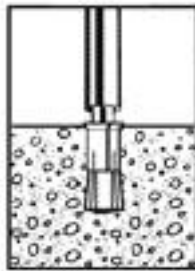


Figure 3.3: Installing Anchor 2



Figure 3.4: Installing Anchor 3

- Center the Accelerograph over the anchor, using a small diameter rod or tool to line up the hole.
- (Optional Additional Grounding) Place the grounding lug onto the bolt. If you are using the optional grounding lug it should have a copper or braid strap attached that is then connected to a low impedance earth ground.
- Now pass the bolt through the Accelerograph and into the anchor without tightening.
- Make sure the Accelerograph is oriented in the correct direction before you proceed with the next step. (This is normally with the X-Axis aligned to the major axis of the building.)
- Look at the bubble level window while you carefully adjust each of the Accelerograph's three leveling feet in or out. When you can see the air bubble centered in the bubble level window with all three leveling feet resting on the mounting pad, the recorder is level.

- Tighten the locking nuts on the leveling feet against the case.
- Carefully maintain both the Accelerograph's level and its orientation as you tighten down the anchor bolt to hold the unit firmly in place. Use a torque of 80-100 inch-lbs (9.2-10.2Nm) to tighten.

The Accelerograph is now mounted to the floor.



Figure 3.5: Accelerograph Mounted to Floor

8. Install Battery System Retainers these hold the battery system box to the ground.

You will need to provide #6 x 1" or longer screws and 1" plastic anchors if the box is to be mounted to a concrete floor. The unit is supplied with #6 x 1/2" oval head sheet metal screws which will mount the strap retainers to a wood floor.

- The four holes should be drilled at the corners of a 9.875" x 2.375" rectangle.
- The clips should be mounted to the ground using 4 screws.

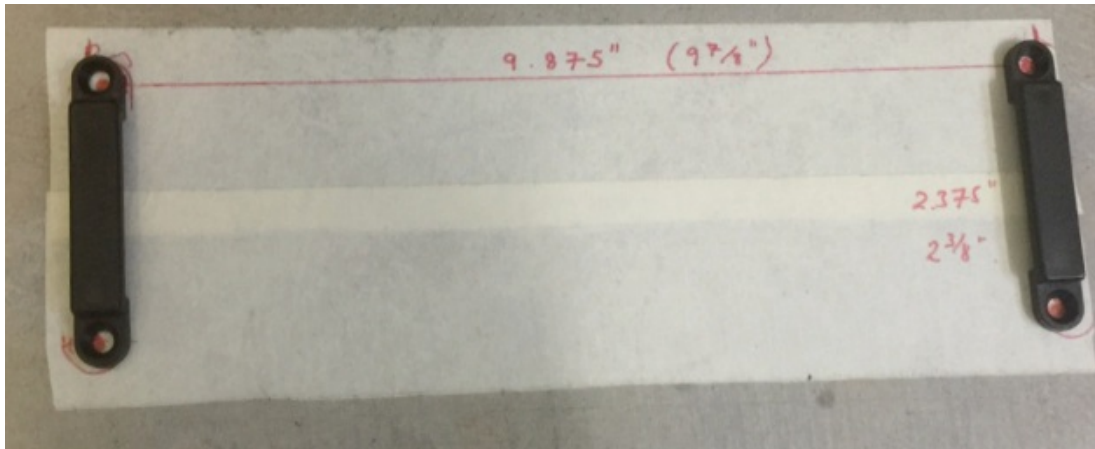


Figure 3.6: Battery Retainer Suggested Drill Pattern

9. *Install Ethernet System Retainers – follow the same instructions for the Battery System Retainers.

10. Install the Battery System

- The 12V, 12Ah Battery may be shipped in the system or separately. The battery is installed as shown in the Figure below. The terminals are at the top facing into the box. Push the battery firmly into the foam housing – with the supplied strap arranged so it can be tightened on the battery.
- Tighten the strap as shown with the buckle on the top of the battery - it is very important that this is tightened to prevent the battery from moving
- The battery terminals should be connected being very careful to get the polarity correct. First connect the black wire to the terminal with the black potting (Negative Terminal). Then connect the red wire to the terminal with the red potting (Positive Terminal).
- Now slide the strap into the left hand handle and pass it through the two retainers mounted on the floor. Now take the free end of the strap and pass it through the right side handle.
- Take out the power cable for the Accelerograph this has an M12 connector on the end and screw it into the middle connector on the Accelerograph.
- The lights on the Accelerograph should light as the battery provides power.
- Now take the AC Plug cable out of the box and plug it into the AC receptacle. Check that the green light illuminated on the AC/DC converter.
- Arrange the cables so they pass through the reliefs in the lid of the battery system and install the lid.

- Tighten the strap over the top of the box

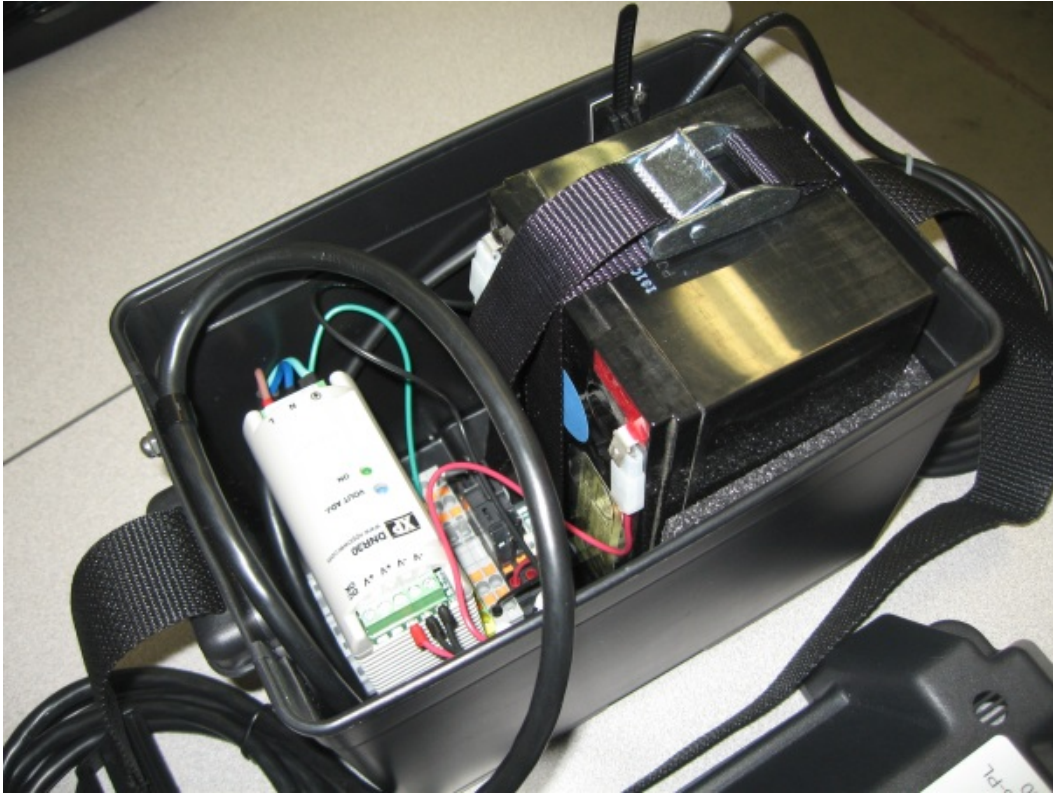


Figure 3.7: Battery Installation

11. For the Top and Base units connect the Ethernet Cable (P/N 853608) to the Accelerograph and then to the RJ45 jacks provided that will connect to the Middle unit and the Ethernet System. The installed system should look like the Figure below.

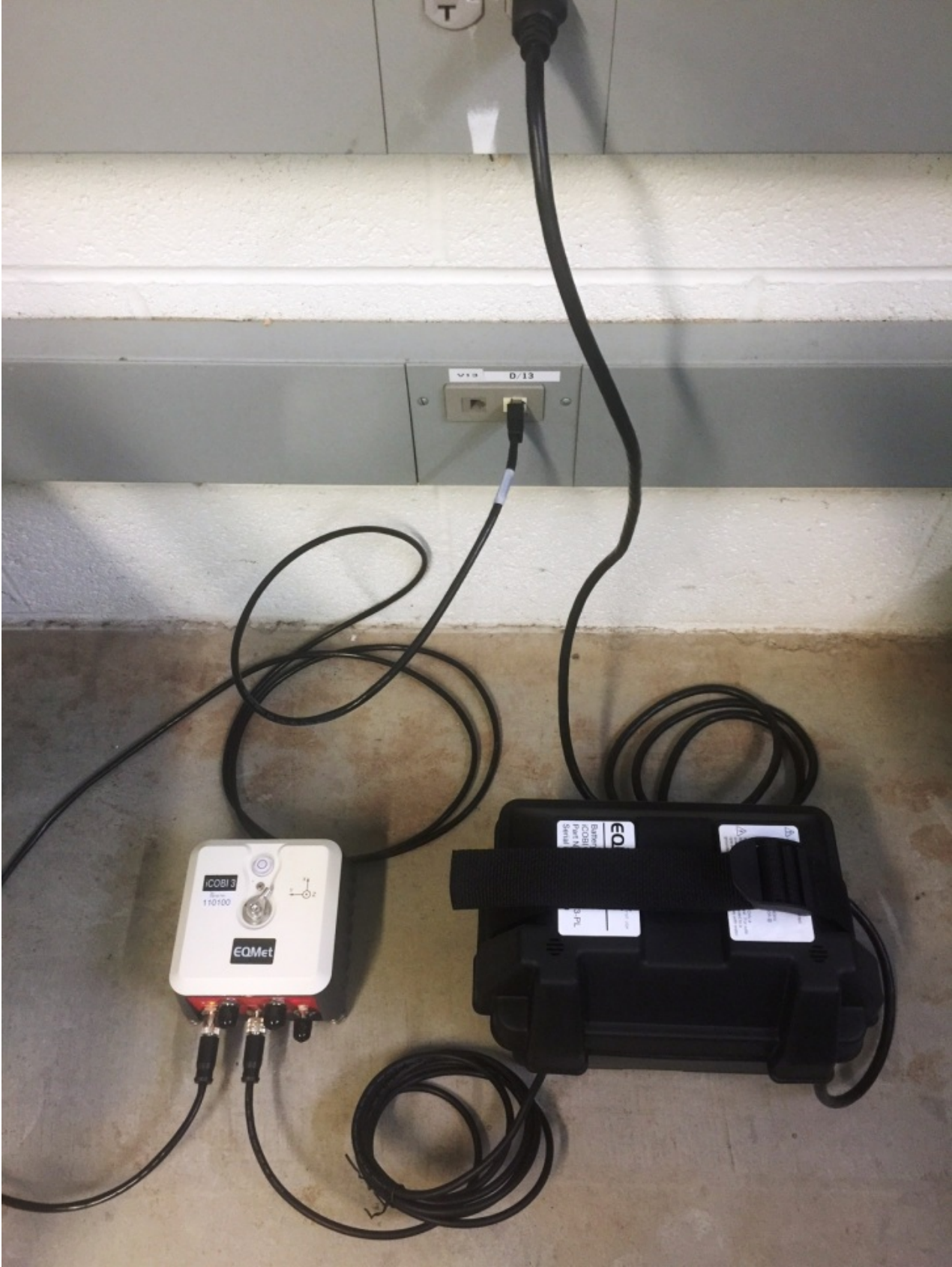


Figure 3.8: Example of an installed Top or Bottom Accelerograph

12. *Install Ethernet System

- The 12V, 12Ah Battery may be shipped in the system or separately. The battery is installed as shown in the Figure below. The terminals are at the top facing into the box. Push the battery firmly into the foam housing – with the supplied strap arranged so it can be tightened on the battery.
- Tighten the strap as shown with the buckle on the top of the battery - it is very important that this is tightened to prevent the battery from moving
- The battery terminals should be connected being very careful to get the polarity correct. First connect the black wire to the terminal with the black potting (Negative Terminal). Then connect the red wire to the terminal with the red potting (Positive Terminal).
- The lights on the Ethernet Switch should light as the battery provides power. Providing the battery is charged the green PWR2 LED should be illuminated along with the red FAIL LED on the Ethernet Switch.

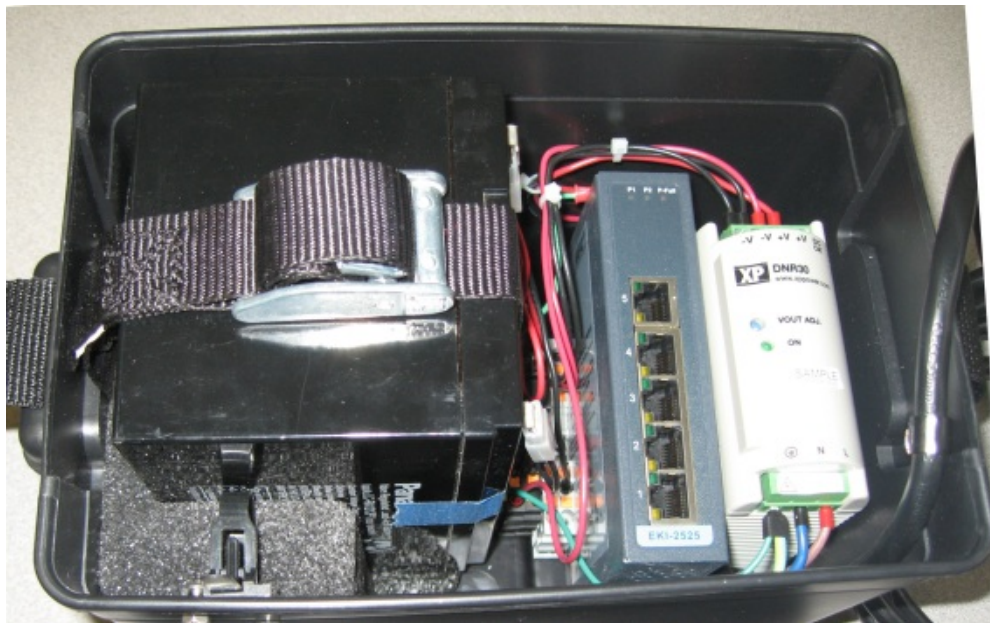


Figure 3.9: Ethernet System with Battery Connected

- Now slide the strap into the left hand handle and pass it through the two retainers mounted on the floor. Now take the free end of the strap and pass it through the right side handle.
- Now take the AC Plug cable out of the box and plug it into the AC receptacle. Check that the green LED illuminates on the AC/DC converter. Both the PWR1 and PWR2 green LEDs on the switch should be illuminated and the FAIL LED should be off.

- Connect the Ethernet Cable (P/N 853608) to the Accelerograph and then to the No 2 position RJ45 jack on the switch.
- Connect an Ethernet Patch Cable (P/N 853791) to the No 1 position RJ45 jack on the switch and to the RJ45 wall jack that connects to the Top Accelerograph.
- Connect an Ethernet Patch Cable (P/N 853791) to the No 3 position RJ45 jack on the switch and to the RJ45 wall jack that connect to the Base Accelerograph.
- If the optional connection to the building LAN is required connect an Ethernet Patch Cable (P/N 853791) to the No 4 position RJ45 jack on the switch and to the RJ45 wall jack that connects to the building LAN. (Note that this arrangement requires different IP addresses that will have to be provided by the Building MIS staff.)
- Arrange the cables so they pass through the reliefs in the lid of the Ethernet system and install the lid.
- Tighten the strap over the top of the box The Ethernet System is now installed and operational the middle system should look like the Figure below.



Figure 3.10: Typical installation of a Middle Accelerograph and Ethernet System

13. It is recommended that labels are attached to all the power and Ethernet cables indicating that they should not be disconnected and are part of the building's seismic monitoring system.

3.2 Verification and Documentation

Verify proper basic operation of the system as follows:

1. Log into the web page of each accelerographs and check the System Overview:

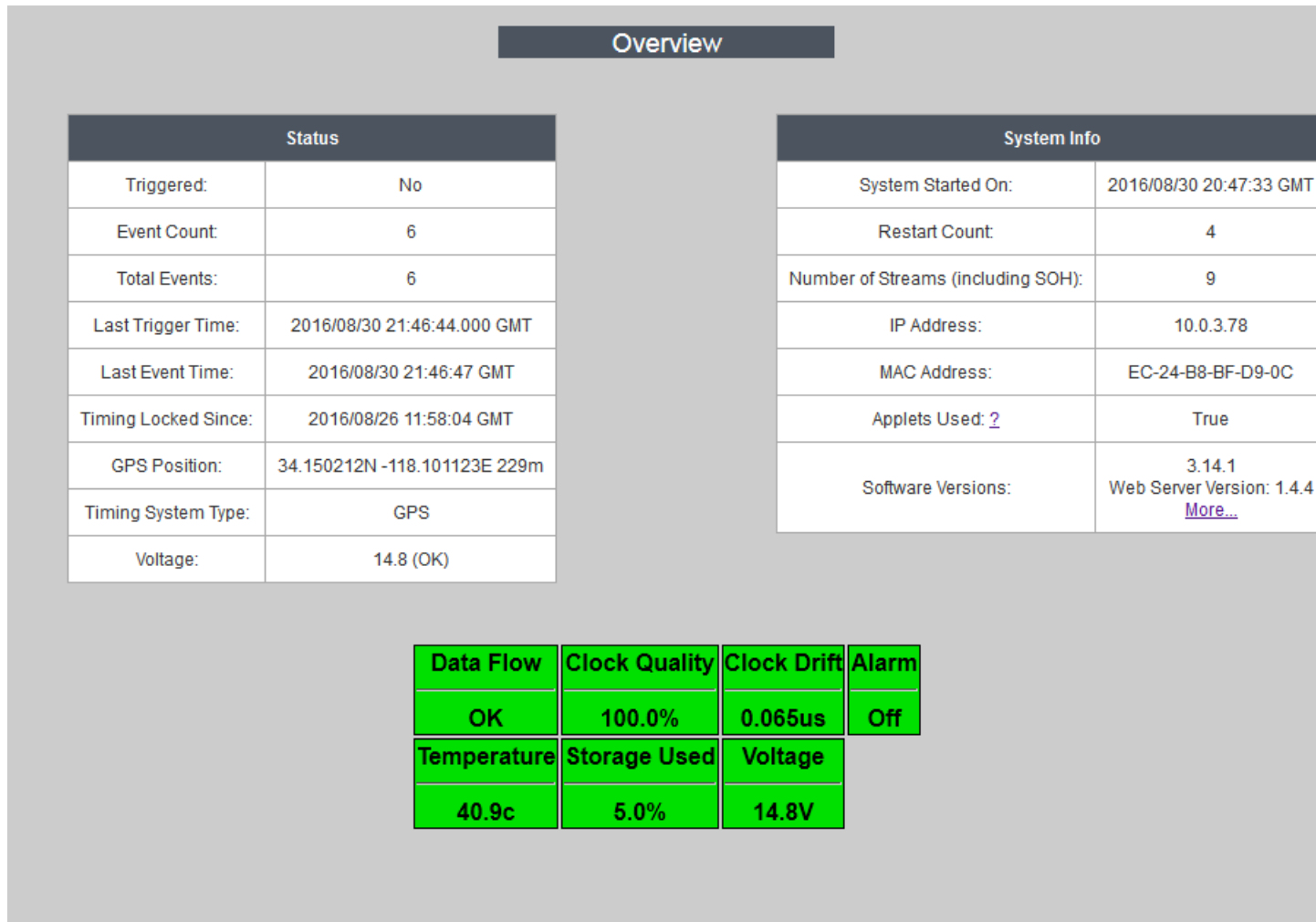


Figure 3.11: System Overview

You are specifically looking for:

- Timing System Type
- Voltage
- Data Flow
- If using GPS (GNSS) then also note GPS Position, Time Lock, Clock Quality and Clock Drift - else these can be ignored
- The Alarm state will show if the system has exceeded the set trigger levels and does not indicate a problem

NOTE: If the Timing Master is not connected to GPS you should set the time manually before proceeding. See [Timing System Configuration](#)

2. From the menu, go to Triggering → Triggering and Sensors and command a “Sensor Test”. If you have configured the Network Triggering correctly, all units should show a recorded functional test two-sided pulse at the specified time on the Files → Recorded Files page:

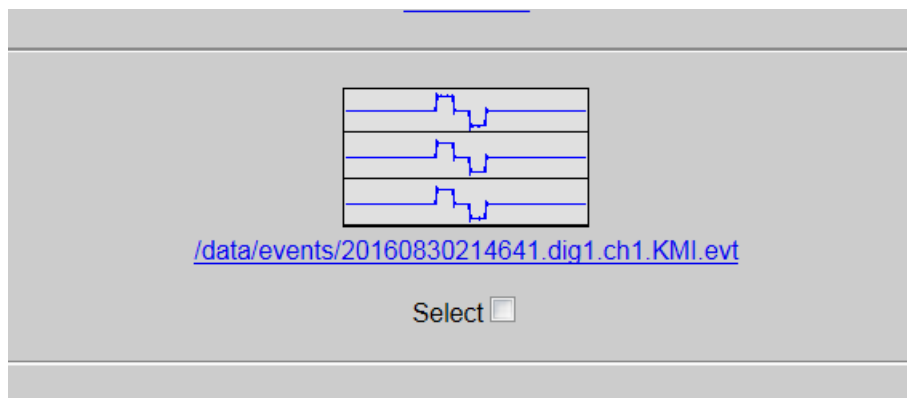


Figure 3.12: Sensor Test

We suggest that after confirming that the system is operational the installation is thoroughly documented this should include:

- A picture, GPS co-ordinates, and street address of the building.
- Contact information for the building
- A plan showing the location of the three Accelerographs and any options such as the GNSS antenna
- A picture of each Accelerograph Top, Middle and Base clearly showing it is correctly orientated to the building axes and it's serial number
- A list of the Accelerograph Serial Numbers and their configured IP Addresses and locations
- The functional test recorded on the units

Chapter 4

Maintenance

The iCOBI3 system will operate reliably with minimal maintenance but the unit does require an annual maintenance visit as described below to ensure the system is operational.

4.1 Periodic Maintenance

As part of the applicable building code specifications, the iCOBI3 system requires a yearly maintenance visit. At this visit, service engineers approved by local municipality will perform all required maintenance.

If your unit appears to need repair or service in between maintenance visits, please contact EQMet.

The suggested Maintenance schedule is as follows:

1. Verify each unit is operational and the status lights are OK
2. Open the Battery System and verify $13.5 \pm 0.1V$ on the battery terminals – disconnect the AC power and ensure battery voltage remains $>12V$ and unit continues to operate.
3. If the Battery is more than 3 years old it should be replaced see instruction below.
4. Open the Ethernet System and verify $13.5 \pm 0.1V$ on the battery terminals – disconnect the AC power and ensure battery voltage remains $>12V$ and switch continues to operate. (Red Power Fail LED should be lit along with PWR 2.)
5. If the Battery is more than 3 years old it should be replaced see instruction below.
6. Connect a laptop configured with an appropriate IP address to a spare port on the switch. Using the web interface connect to each unit.
7. If significant seismic events have occurred, and you are responsible for file retrieval, download the files and send them to the relevant government organization. (File retrieval methods are discussed in Chapter 5.)

8. If the unit does not have a GNSS antenna on the master timing unit manually update the time.
9. Trigger a functional test on one unit and verify that a functional test event is recorded on each unit as described in the installation instructions
10. Document the visit as appropriate

4.1.1 Battery and Power System Fuses

The Battery and Power System each contain two fuses refer to the wiring diagrams in the reference section. These can be replaced with 5A 5x20mm fuses by opening the Fuse holders. However, it is essential to work out why these fuses failed as they should not in normal operation and may suggest problems with either the battery or the AC/DC supply.

The fuses are Kinometrics P/N 853788 FUSE, GLASS, 5A, 250VAC, 5X20MM

4.1.2 Changing a VRLA Battery

The VRLA Batteries in the iCOBI3 System must only be replaced with a 12V, 12Ah VRLA batteries (Kinometrics P/N 840503).

CAUTION: Using the wrong battery type can result in damage to the equipment. Dispose of the old battery at a battery recycling center.

WARNING: Do not short the battery terminals with a metallic conductor as this can result in extreme heat/fire and/or the battery bursting. Do not attempt to open the battery.

1. Disconnect all power from the system
2. Disconnect the battery terminals.
3. Loosen the strap that retains the battery.
4. Carefully remove the old battery from the foam housing. (Dispose of the old battery appropriately.)
5. Check the voltage of the new battery it should be ~12V.
6. Push the new battery firmly into the foam housing – with the strap arranged so it can be tightened on the battery.
7. Tighten the strap with the buckle on the top of the battery - it is very important that this is tightened to prevent the battery from moving

8. Re-connect the battery terminals being careful to get the polarity correct. First connect the black wire to the terminal with the black potting (Negative Terminal). Then connect the red wire to the terminal with the red potting (Positive Terminal).
9. Re-connect power to the system and confirm operation.

4.1.3 Cleaning the iCOBI3 System

The iCOBI3 accelerograph should be disconnected from the power before cleaning. Wipe off the exterior surfaces with a mild detergent and a damp soft cloth. Do not use an abrasive cloth especially on the label area as this will damage the unit.

CAUTION: Possible water damage. Do not loosen the seal screw. Do not open the recorder or use water to clean the inside of the recorder. Doing so will severely damage the unit!

The Battery System and Ethernet System must be disconnected from AC power before cleaning. The exteriors can be cleaned with a mild detergent and damp cloth following the precautions outlined in the battery maintenance section.

The iCOBI3 should not normally be opened (special tools are required to open the unit) so the interior of the units should be clean. If dust or debris does get inside the unit, we recommend you use a small "computer vacuum cleaner" to remove this debris. Make sure you have turned the power off before vacuuming the unit.

Chapter 5

File Retrieval

The ICOBI3 system when any individual unit is triggered will record an event on all three of the Accelerographs. The time stamp of these files will be synchronized but unless the system is equipped with a GNSS antenna the time will only be representative of the absolute time and then only if the system's master clock unit has been set with the correct time.

Files can be transferred using SFTP or SCP. A good program for this on Windows is WinSCP.

WinSCP is a free program that allows you to make secure connections for file uploads and downloads. Since WinSCP is not Kinemetrics software and is provided only as an example, we make no attempt to thoroughly describe all capabilities. However we will describe basic operation here.

When you start WinSCP you will see a dialog that looks something like this:

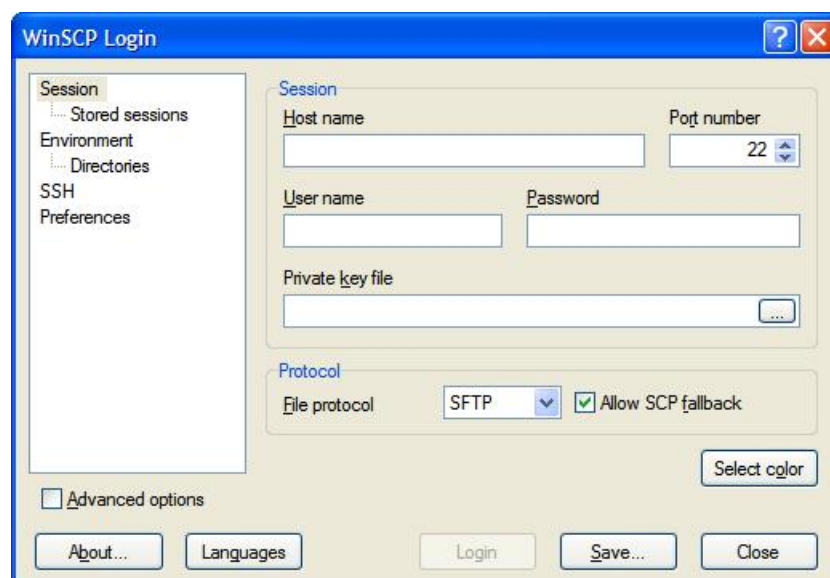


Figure 5.1: WinSCP

To connect to an iCOBI3, enter the IP address of the iCOBI3 as “Host name” as well as the User name and Password as shown here. Press “Login” and you will initially see the following confirmation:



Figure 5.2: WinSCP Key Confirmation

This message indicates that you are about to make a secure connection to the iCOBI3 and is a warning that you have to be sure you’re talking to the correct unit. Normally, once you accept the key you will not have to do this again when connecting to the same iCOBI3 from the same computer.

Once WinSCP has logged into the iCOBI3, you will see something that looks like this:

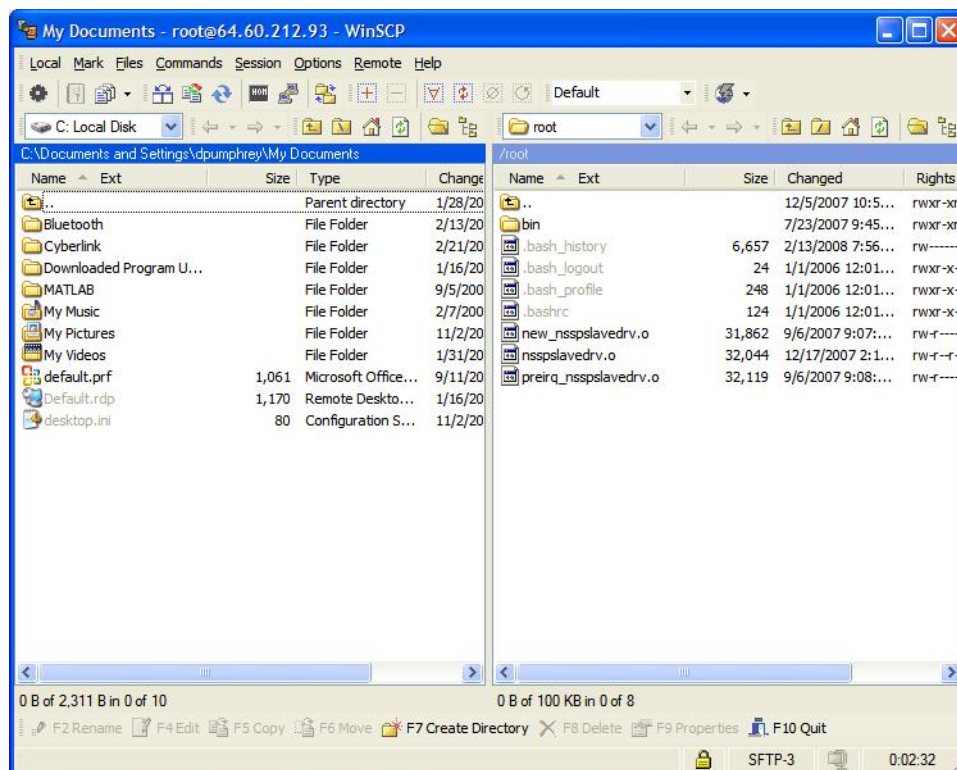


Figure 5.3: WinSCP Panes

The left pane of the program represents your computer and the right pane represents the iCOBI3. You can navigate the panes independently and can then upload or download files by simply dragging the files from one side to the other. You can also drag files directly to or from other applications such as your desktop or Windows Explorer.

If you have a set of directories that you access often, such as downloading recorded files from the iCOBI3's /data/events directory to a working folder on your computer, you can set the folders correctly and then select Session → Save Session. Later when you restart WinSCP, you can choose the session from the list and click “Login”. This will save you from having to manually enter the IP address, username, or passwords each time. In addition, the panes for your computer and the iCOBI3's directories will be set automatically.

Chapter 6

Hardware Reference

This section provides information on the connectors and cabling used in the system and schematics of the connections in the Battery and Ethernet Systems. This information is intended for users who wish to use additional features in the units but is generally not required for standard installations.

6.1 System Power

The iCOBI3 Accelerographs draw a little less than 250mA at 12V or about 3W. This power is provided from the AC mains by the AC/DC converter in the Battery System. The AC/DC converter also float charges the 12V, 12Ah VRLA battery. When AC power is lost the Accelerographs run on the battery power for ≥ 48 hours. The Ethernet System has a similar configuration and a power draw of ~ 2 W so it will run for >48 hours after loss of AC Power.

6.1.1 Power/Relay

The Power connector on the iCOBI3 is used to supply power to the unit, but also contains access to the PhotoMOS relays that are controlled by the unit. The connector is a 9-Pin, Code A, Male, M12 Connector referred to as J4. The connections are show below.

The DC power is applied to Pin 1 and the power supply return is on Pin 2. Pin 3 connects to the Protective Ground (PGP) which is connected to the case of the unit and the power supply cable shield. The power into the unit should be limited between 9-28 VDC.

The Relay connections are for two relays Relay 1 and Relay 2. These are two 1-Form-C (SPDT) PhotoMOS Relays. The Relays are isolated from the rest of the system and the user can connect to the Relay Common (RELAYXCOM), the Normally Closed connection (RELAYXNC), and the Normally Open (RELAYXNO) connection. This coupled with the software configuration allows the system to provide control outputs for a variety of purposes. The relays have a maximum ON resistance of 35Ω , and 3750V of isolation. The relays can

support high voltages but for safety we only recommend using them at 24VDC. For reference the relays are IXYS LCC110 relays.

Power and Relays are on J4.

6.1.1.1 Power Connector Description

Pin	Name	I/O	Color	Description	Protection
J4.1	XVIN0	Power	Blue	Input Power	ESD/EMI/Transient
J4.2	GND	Power	Brown	Input Power	ESD/EMI/Transient
J4.3	PGP	Power	Purple	Protective Ground	
J4.4	RELAY1COM	Isolated	Orange	Relay 1 Common	Isolated
J4.5	RELAY1NC	Isolated	Grey	Relay 1 Normally Closed	Isolated
J4.6	RELAY1NO	Isolated	White	Relay 1 Normally Open	Isolated
J4.7	RELAY2COM	Isolated	Red	Relay 2 Common	Isolated
J4.8	RELAY2NC	Isolated	Yellow	Relay 2 Normally Closed	Isolated
J4.9	RELAY2NO	Isolated	Green	Relay 2 Normally Open	Isolated
J4.Shell				Drain wire for cable shield	

Connector and Cable Information

Description	KMI Number
Connector	853755
Mating Connector	853756
Cable	853764

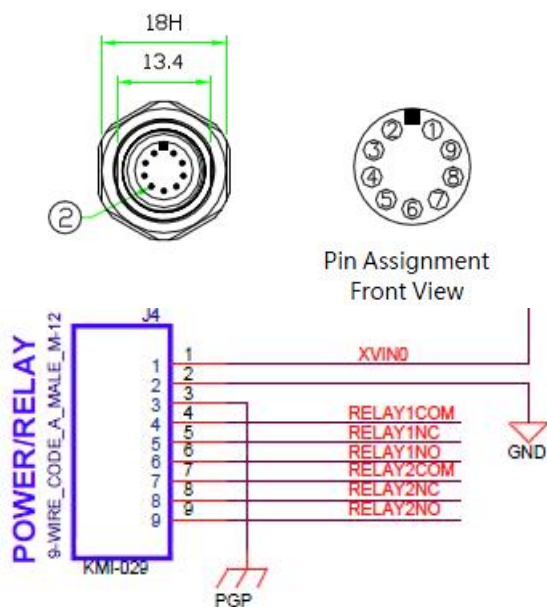


Figure 6.1: Power Connector Pins and Schematic

6.1.2 Ethernet

The Ethernet connector provides a 10/100 network interface. The X-Code M12 connector used adheres to a standard used in some European industrial Ethernet equipment, such as, switches and routers that also use this connector. The 853608 cable maps the iCOBI3 X-Code Ethernet connector to a standard RJ-45 Ethernet plug. Commercial X-Code to X-Code cables may also work if appropriate network equipment is in use.

Connection speed is automatically determined. The iCOBI3 Ethernet interface also supports auto sensing so there should be no need for crossover adapters.

PTP is a standard feature in the iCOBI3 Ethernet interface.

LINK/SPEED and ACTIVITY LEDs on the iCOBI3 front panel indicate network traffic and connection speed.

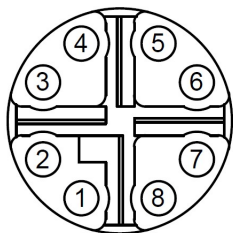
The Ethernet is on J3

6.1.2.1 Ethernet Connector Description

Pin	iCOBI3 Name	I/O	Description	RJ-45 Pin	Name	I/O	Protection
J3.1	MDX+0	Output	Transmit +	1	TD+	Input	ESD
J3.2	MDX-0	Output	Transmit -	2	TD-	Input	ESD
J3.3	MDX+1	Input	Receive +	3	RD+	Output	ESD
J3.4	MDX-1	Input	Receive -	6	RD-	Output	ESD
J3.5	MDX+3		Reserved for PoE	7			
J3.6	MDX-3		Reserved for PoE	8			
J3.7	MDX+2		Reserved for PoE	5			
J3.8	MDX-2		Reserved for PoE	4			
J3.Shell			Drain wire for cable shield				
	X-Code Ethernet						

Connector and Cable Information

Description	KMI Number
Connector	853594
Mating Connector	853602
Cable	853608



Pin Assignment
Front View

Figure 6.2: Ethernet Connector Pins

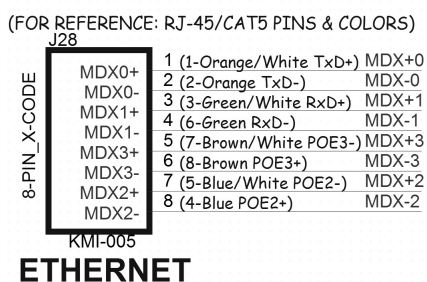


Figure 6.3: Ethernet Connector Schematic

6.1.3 Console/USB

The Console/USB Connector provides an RS232 Linux Console and a dual function USB 2.0 Port. The connector is J2 in the iCOBI3 and the schematic is shown below.

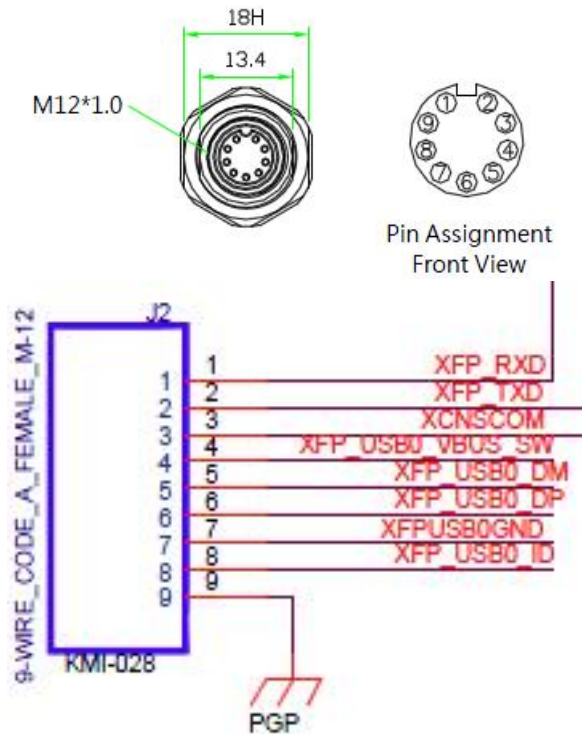


Figure 6.4: Console/USB Connector Schematic

6.1.3.1 Console

The CONSOLE connector provides a 115.2Kb 3-wire UART interface (TX data, RX data, and Ground) to access Linux console function. Most iCOBI3 features are controlled through the Rockhound interface but certain functions, mainly netconfig, need to be set up before a network connection can be achieved.

The Console and the USB Device/Host are on J2

Console Connector Description

Pin	iCOBI3 Name	I/O	Description	DB-9 Pin	PC Name	I/O	Protection
J2.1	XFP_RXD	Input	Receive Data	3	TD	Output	ESD/EMI
J2.2	XFP_TXD	Output	Transmit Data	2	RD	Input	ESD/EMI
J2.3	XCNSCOM	Power	Ground/Common	5	Ground		ESD/EMI
J2.9	PGP		Protective Ground	Shell	Chassis Ground		
	M12 DTE			9-pin DTE			

6.1.3.2 USB Device/Host

The USB port in this connector can either be a USB Device or a USB Host. In operation the port first is configured as a USB Device allowing the user to talk to the instrument using a

connection to a PC. Connecting a host device to the port switches it to the Host mode and the port continue to operate as a Host until the iCOBI3 is re-booted. Thus, this port can be used as a second Host port and connected to either a USB Memory or communication device.

USB Device/Host Connector Description

Pin	iCOBI3 Name	I/O	Description	RJ-45 Pin	PC Name	I/O	Protecti
J2.4	XFP_USB0_VBUS_SW	Power	Provides power to device	1	VBUS	Output	ESD/EM
J2.5	XFP_USB0_DM	Bidir	Data-	2	D-	Bidir	ESD/EM
J2.6	XFP_USB0_DP	Bidir	Data+	3	D+	Bidir	ESD/EM
J2.7	XFP_USB0GND	Power	Gnd/Common	4	GND	GND	ESD/EM
J2.8	XFP_USB0_ID	Input	Gnd/Common	N/C	ID	Input	ESD/EM
				USB Type A			

Connector and Cable Information

Description	KMI Number
Connector	853754
Mating Connector	853757
Cable (DB-9 USB Device)	853762
Cable (USB Host)	853774

6.1.4 USB Host

A USB 2.0 Host Port is provided for devices like USB Flash drives and wireless adapters. This port can only function as a Host port.

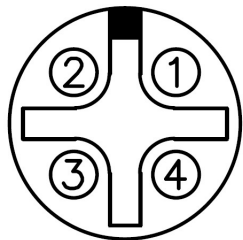
The USB Host is on J1

USB Host Connector Description

Pin	iCOBI3 Name	I/O	Description	RJ-45 Pin	Name	I/O	Protection
J1.1	XFP_USB1_VBUS_SW	Power	Provides power to device	1	VBUS	Output	ESD/EMI
J1.2	XFP_USB1_DM	Bidir	Data-	2	D-	Bidir	ESD/EMI
J1.3	XFP_USB1_DP	Bidir	Data+	3	D+	Bidir	ESD/EMI
J1.4	XFPUSB1GND	Power	Gnd/Common	4	GND	GND	ESD/EMI
	M12 USB Host			USB Type A			

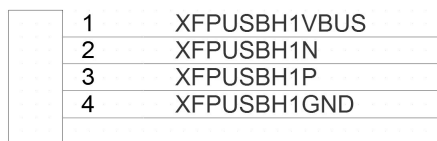
Connector and Cable Information

Description	KMI Number
Connector	853596
Mating Connector	853604
Cable	853610
or Cable	853740



Pin Assignment Front View

Figure 6.5: USB Host Connector Pins



USB HOST

Figure 6.6: USB Host Connector Schematic

6.1.5 Optional GNSS

The optional internal GNSS system is built into every iCOBI3 can provide a very accurate timing system to time stamp the data typically to sub-microsecond accuracy in relation to absolute universal time (UTC). The system requires an optional active antenna that connects to the TNC connector on the front of the unit to operate. (The standard iCOBI3 system is not supplied with a GNSS antenna as absolute time accuracy is not a normal requirement for a code compliant building set.)

6.1.5.1 Optional GNSS Bullet Antenna

The optional GNSS Bullet Antenna (P/N 114292-PL) comes with a 25m Plenum rated TNC-TNC cable and a mounting adapter for the antenna. The 25m (82 feet) cable allows the antenna to be routed to the roof of the building and generally connects to the Top iCOBI3 Accelerograph, which must then be set as the PTP Master. The accurate UTC time is then sent by PTP transmissions to the Middle and Base units that are configured as PTP Slaves.

6.1.5.2 Mounting the Optional GNSS Bullet Antenna

The bullet antenna comes with an adapter to convert from its M18X1 mounting threads to 3/4" NTP, which threads onto standard 3/4" pipe fittings. The use of a pipe union on the lower end of the 3/4" nipple that screws into the adapter will simplify getting all of the pipe connections tight. It is advisable to use Teflon pipe tape on all of the pipe connections. Attach the half of the union with the captive nut to the nipple, and attach that to the adapter. Attach the other half of the union to the top of the pipe that will carry the cable. Feed the GNSS antenna cable through the pipe up to the roof, and through all of the components: the disassembled union, the nipple, the adapter, the stainless steel flat washer, and the rubber flat washer. Screw the cable's TNC connector tightly to the GNSS antenna's connector. With the rubber washer centered over the lands on the base of the antenna, screw the adapter assembly tightly onto the antenna. Feed the cable slack back into the pipe until you can join the two halves of the union together, and tighten its nut securely.

Connect the GNSS Antenna The GNSS antenna Cable can now be connected to the Top Accelerograph using the TNC adapter on the Front panel.



Figure 6.7: GNSS bullet antenna with TNC jack and M18X1 mounting threads

Configure the Timing Source See [Timing System Configuration](#)

6.1.5.3 Installing Optional GNSS Lightning Protection

The bullet antenna does not have built-in lightning protection, due to the high cost of protective devices that can pass the low-level, high-frequency signals used in GNSS systems.

CAUTION: It is the user's sole responsibility to install and ground the lightning protection system in accordance with safety concerns and applicable electrical and building codes. KMI recommends customers hire an expert in lightning protection to design and install all lightning protection systems.

The optional lightning protection kit (P/N 114225-PL) can be used with internal GNSS timing systems. The lightning protector is a small 3" x 3" x 1½" weather-resistant box

which contains surge-protection devices to shunt surges from lightning strikes to ground while still allowing high-frequency signals and the DC power for the active antenna to pass. It has two female TNC connectors, and comes with a 3' (approximately 1 meter) male-to-male TNC coaxial cable. Purchase a weatherproofing kit for the lightning protector from EQMet (P/N 790076) if the lightning protector box will be installed outdoors or in a hostile environment.

Connect the GNSS antenna to the lightning protector as follows:

- Connect the antenna cable to the protector's SURGE connector.
- Connect one end of the short TNC male-to-male cable to the protector's EQUIPMENT connector, and connect the other end to the GNSS connector on the iCOBI3.
- Make sure to provide a good ground. If at all possible, mount the protector to a metal plate approximately 12" square (approx. 30.5 cm sq.), with a good low-resistance and low-inductance ground connection. To mount it to the grounding panel, use approximately 20 inch-pounds (2.26 Nm) of torque on the screws. In addition, the large screw in the base of the protection device should be used to attach a copper strap or braid at least 1" wide to the plate. Details on mounting are supplied by the lightning protection manufacturer.

CAUTION: The lightning protector will not work without adequate grounding.

The strap connecting the grounding panel to earth ground should be as short and heavy as possible (use a copper strap or braid at least 1" wide) to minimize the resistance and inductance of the ground system. Since a skin effect is present, use a straight strap with as large a surface area as possible, and keep the bends in the strap to an 8" (20.4 cm) or larger radius.

6.2 Cable and Wiring Diagrams

The drawings below show the two cables supplied with the iCOBI3 System and the wiring diagrams for the Battery and Ethernet Systems.

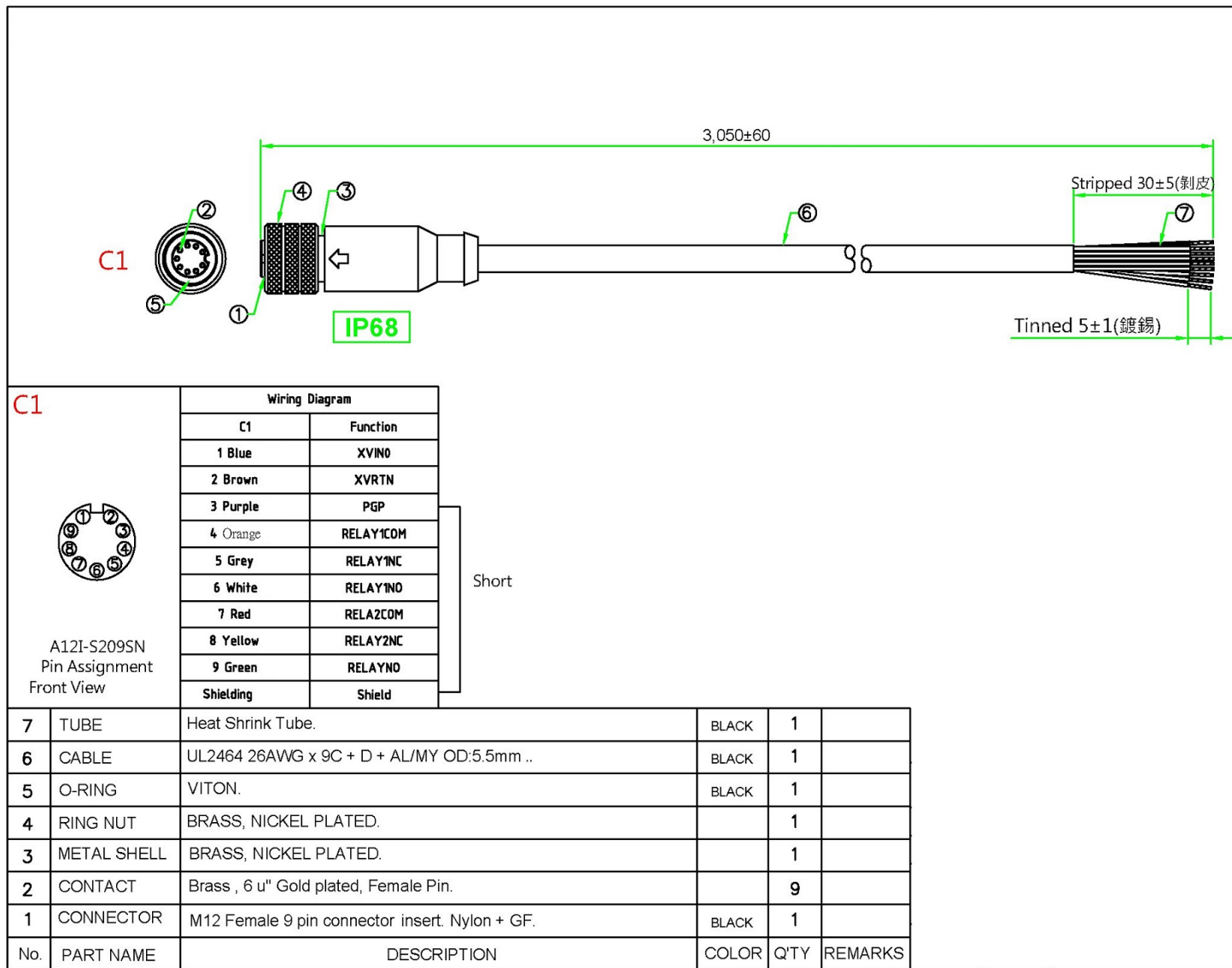
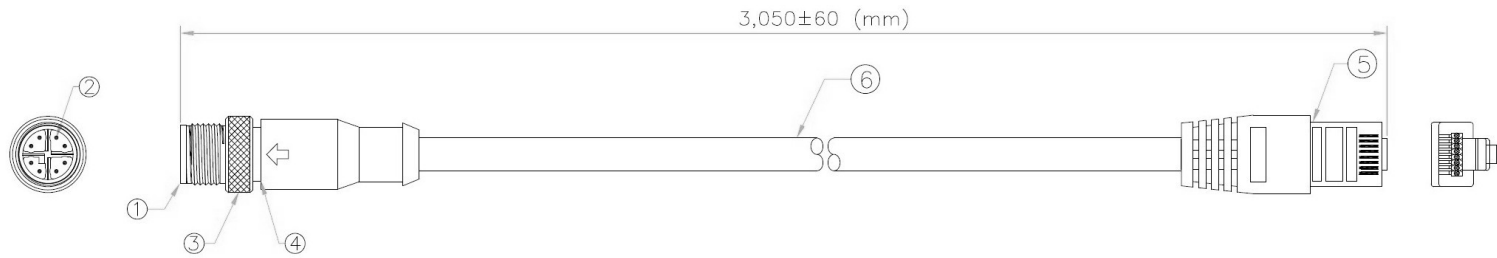


Figure 6.8: P/N 853764, Power and Relays



6	CABLE	CAT.5E FTP CABLE.	BLACK	1	
5	RJ45 PLUG	RJ45 8P8C SHIELDED PLUG.	BLACK	1	
4	SLEEVE	BRASS, NICKEL PLATED.		1	
3	RING NUT	BRASS, NICKEL PLATED,		1	
2	CONTACT	Brass , 6 u" Gold plated .Male Contact.		8	
1	CONNECTOR	M12 X-code male 8 Pin Insert.	BLACK	1	
No.	PART NAME	DESCRIPTION	COLOR	Q'TY	REMARKS

Figure 6.9: P/N 853608 Ethernet Cable

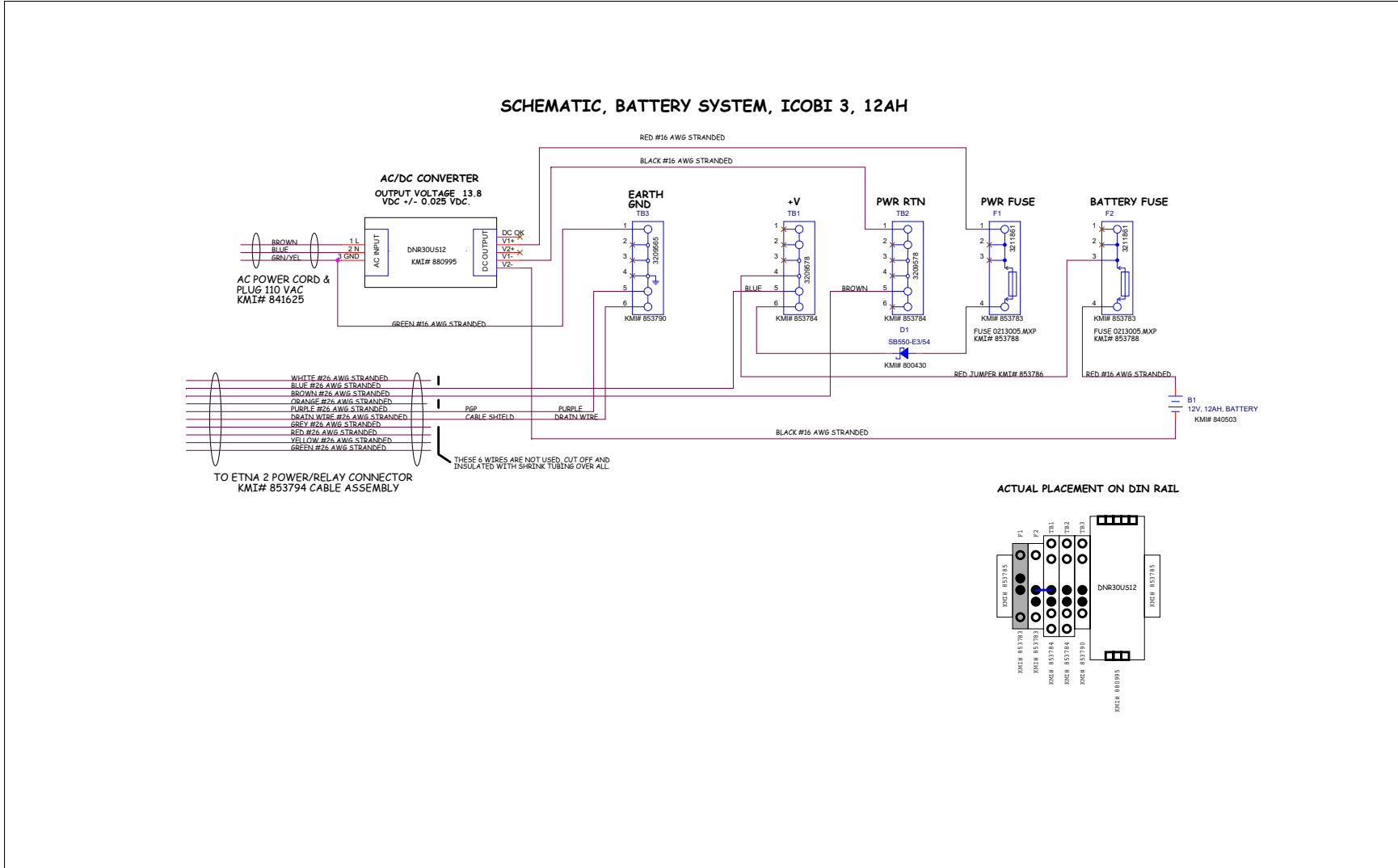
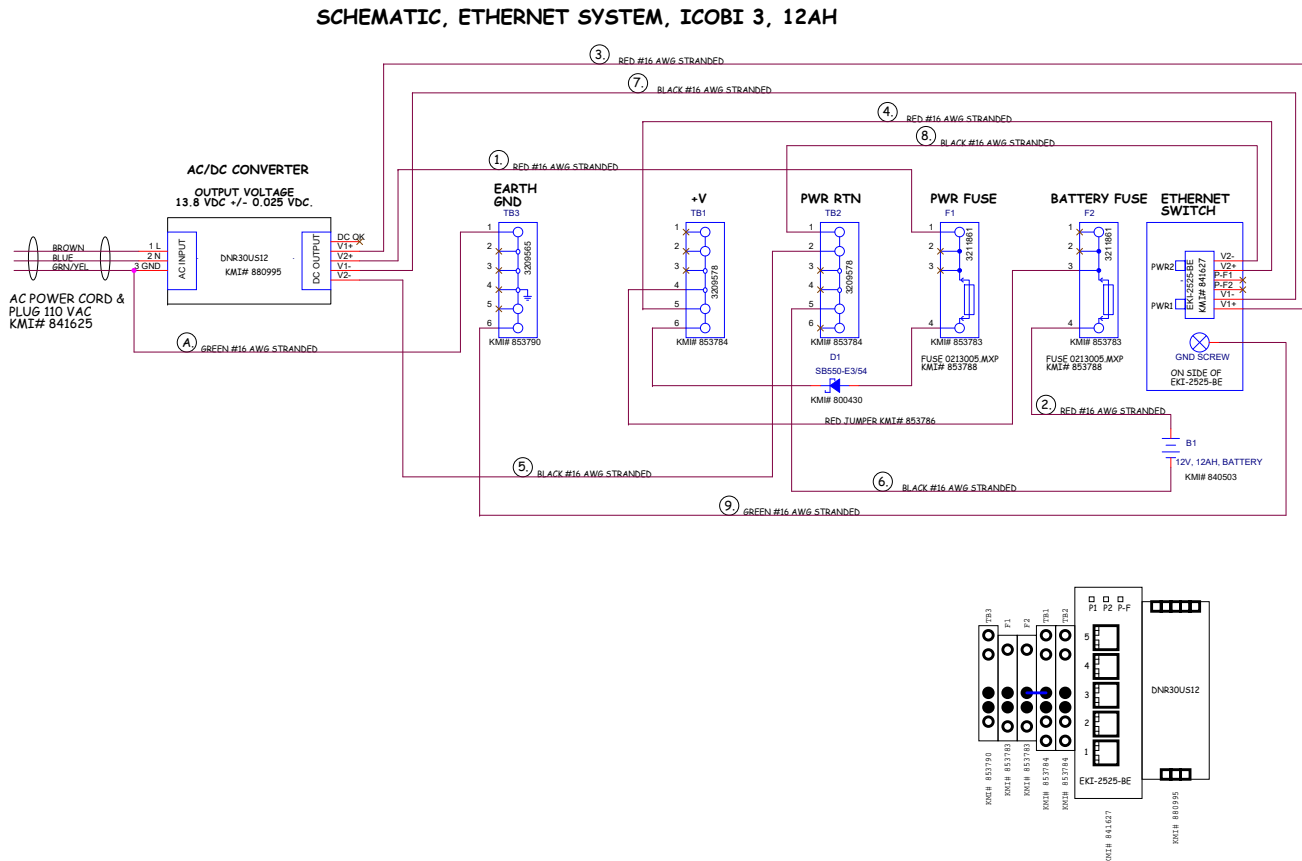


Figure 6.10: Wiring Diagram Battery System



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