EPL-110

Embedded PC Logger

Unit	Description	Order Code
EPL-110	Embedded PC Logger - Standard Unit	O 030 095 017 000

ISSUE CHANGE SHEET		
ISSUE	**DESCRIPTION OF CHANGE**	**DATE**
00	Initial release	12 Jul 2010

NOTE:
This product includes hardware and software modules / components which contain cryptographic features and is subject to US and local laws governing import, export, transfer, and use. Customers must comply with all such laws and regulations and obtain all required US and local authorisations, permits, and/or licenses prior to using this product.

TABLE OF CONTENTS

1	**DESCRIPTION**		**5**
	1.1	Summary of Main Features	5
2	**ENVIRONMENTAL SPECIFICATION**		**7**
	2.1	General	7
	2.2	Operating Temperature	7
	2.3	Storage Temperature	7
	2.4	Unit Sealing / Ingress Protection	7
	2.5	Type Approval Vibration (Provisional)	7
	2.6	Electromagnetic Compatibility	7
3	**MECHANICAL SPECIFICATION**		**8**
	3.1	Dimensions	8
	3.2	Material	8
	3.3	Weight	8
	3.4	Mounting Recommendations	8
	3.5	Protective Cover for USB Ports	8
4	**ELECTRICAL SPECIFICATION**		**9**
	4.1	Supply Voltage Limits	9
	4.2	Supply Protection	9
	4.3	Supply Current Requirement	9
	4.4	Input Characteristics	10
	4.5	Output Characteristics	10
	4.6	Communications	11
	4.7	Graphics / Video Characteristics	13
	4.8	Integrated Sensor Characteristics	13
	4.9	Additional Unit Diagnostics	14
	4.10	Unit Embedded Processor and Memory	15
	4.11	Watchdog Feature	15
	4.12	Unit Programming & Application Software	15
5	**UNIT LED INDICATORS**		**16**
	5.1	POWER LED	16
	5.2	STATUS LEDs	16
	5.3	GPS LED	17
	5.4	Unit Ethernet Port LEDs	17
	5.5	WiFi LEDs	17
6	**ANTENNA INSTALLATION**		**19**
	6.1	Installers	19
	6.2	Antenna Gain	19
	6.3	Antenna Location	19
	6.4	Antenna Co-Location Requirements	19

7	**CONNECTOR DEFINITIONS**		**20**
	7.1	Connectors	20
	7.2	Connector Locations	20
	7.3	Power Supply Connector	21
	7.4	Analogue Input Connector	21
	7.5	External USB Connectors	21
	7.6	Ethernet Connector	22
	7.7	RS232 Connector	22
	7.8	CAN Interface Connector	22
	7.9	VGA Monitor Interface Connector	23
	7.10	Composite Video Input Connectors	24
	7.11	WMIC / WiFi Antenna Connectors	24
	7.12	GPS Antenna Connector	24
8	**QUALITY SCHEME**		**25**
	8.1	Quality System	25
	8.2	Production Environmental Tests	25
9	**SERVICE SCHEME**		**25**
	9.1	Service Interval	25
10	**MANUFACTURER DETAILS**		**25**
11	**ATTACHMENT 1 - MECHANICAL DETAIL**		**26**
	EPL-110 Standard Unit (Order Code: O 030 095 017 000)		26

1 DESCRIPTION

The EPL-110 is an embedded PC unit providing 2 WiFi modules, GPS, Ethernet, CAN, RS232, and USB connectivity. The unit also includes a general purpose analogue input channel as well as four analogue video inputs.

Bespoke application software for the unit can be provided in order to allow use of McLaren Electronic System's data analysis / telemetry technologies.

1.1 Summary of Main Features

The main features of the unit are highlighted below.

1.1.1 Inputs

1 0V – 5V Analogue Input
4 Analogue Video Input

1.1.2 Outputs

4 USB Power Supply Outputs (5V)

1.1.3 Communications

1 CAN 2.0B upto 1Mbps
1 RS232 Port
4 USB Ports
1 Ethernet (10/100) Port
1 4.9GHz WiFi / 802.11
1 5.8GHz WiFi / 802.11
1 GPS

1.1.4 Graphics / Video

1 VGA Monitor Interface

1.1.5 Integrated Sensors

1 Tri-Axis Accelerometer (+/-4g range).
1 Unit Temperature Sensor

1.1.6 General

The EPL-110 includes the following modules internally:

- A single board computer (SBC) featuring an Intel Atom™ processor running at up to 1.3 GHz for communication and processing of data as well as providing Ethernet communications and GPS functionality.
  - Intel Atom™ Z5xx Series 1.3GHz Processor
  - 2GB Flash Drive
  - 2GB SD Card Storage (non-removable / fixed)
  - 1GB RAM
  - Windows XPe Operating System
- A video server module which converts analogue (composite) video to a MPEG-4 / Motion JPEG digital video stream for transfer/streaming over Ethernet.

- 4.9GHz WiFi / 802.11 module from Cisco. This operates in the 'public safety' radio frequency range. An operator license is required in order to use this frequency in the USA.
- 5.8GHz WiFi / 802.11 module from Cisco. Based on IEEE 802.11h.
- A Freescale MPC5514 microprocessor communicates with the single board computer. This provides a number of system monitoring and diagnostics functions as well as handling a number of communication features such as CAN and RS232.
    - Memory:
        - 512 kbytes of flash memory (on board MPC5514)
        - 64 kbytes of general purpose RAM (on board MPC5514)
        - 64 kbytes serial EEPROM

2 ENVIRONMENTAL SPECIFICATION

2.1 General

The unit enclosure is designed to provide a dust seal (IP50) only. The unit should only be used indoors or in environments where it will **not** be exposed to potential fluid splashes. If a 'stronger' unit sealing arrangement is required please contact McLaren Electronic Systems to discuss available options.

2.2 Operating Temperature

Minimum Operating Temperature: 5°C
Maximum Operating Temperature: 50°C

A temperature sensor is provided on the board.

If required, forced air cooling should be applied to the unit such that it remains within these temperatures.

The temperature limitation is due to the video server module specification. If a wider operating temperature range is required (and the video server is not required) please contact McLaren Electronic Systems to discuss possible options and achievable operating temperatures.

2.3 Storage Temperature

-25°C to +85°C

NOTE: Provisions must be made to prevent condensation build-up (around and within the unit) when storing at low temperatures.

2.4 Unit Sealing / Ingress Protection

Unit enclosure designed to achieve IP50 (IEC 60529).

2.5 Type Approval Vibration (Provisional)

The product has been type approved using the following random spectrum for a duration of 24 hours in the expected mounting axis (the Z-axis being the direction of vibration):

Frequency (Hz)	Power Spectral Density (m/s^2)^2 / Hz	Power Spectral Density (g^2 / Hz)
10	20.00	0.2080
55	6.50	0.0676
180	0.25	0.0026
300	0.25	0.0026
360	0.14	0.0015
1000	0.14	0.0015
2000	0.14	0.0015
RMS Acceleration	30.8 m/s^2	3.14 g_{RMS}

2.6 Electromagnetic Compatibility

Certification to meet the requirements of FCC Part 15 pending.

TBD

3 MECHANICAL SPECIFICATION

3.1 Dimensions

Refer to Attachment 1

3.2 Material

Aluminium Enclosure.

Outer surfaces painted in silver. Inside faces finished with Alochrome 1200.

3.3 Weight

Approximately 4kg.

3.4 Mounting Recommendations

Refer to Attachment 1 for details.

For high vibration environments also consider use of anti-vibration measures.

3.5 Protective Cover for USB Ports

A protective aluminium cover is available in order to help guard against accidental removal of USB devices such as memory sticks while the unit is in operation. This cover must be secured to the main unit using the fixing screw. It is recommended that the fixing screw is tightened to a torque of 75Ncm.

4 ELECTRICAL SPECIFICATION

4.1 Supply Voltage Limits

Unit Supply Voltage (measured at the connector pins): 28V to 40V DC

Recommended Unit Supply Voltage: 36V

Note that below a unit supply voltage of 28V the unit will go in to a shut-down/standby mode.

4.2 Supply Protection

EPL-110 has a supply transient voltage suppressor (TVS) with a standoff voltage of 45V.

Supply inputs >45V (excluding transients) could lead to failure of the suppressor and cause permanent damage to the unit.

The unit is protected against accidental reverse polarity supply connections.

An integral resettable PTC fuse is included in the positive supply line. The trip current for the fuse is 6A (@23ºC). This fuse is positioned **after** the TVS and reverse protection device. **Further external fuses / current limiting protection must be applied as demanded by the relevant regulatory requirements of the intended application (and local government agencies).**

A threaded fixing position on the chassis is provided near to the power supply connector (see section 7). This allows connection of the unit chassis / enclosure to a common ground for applications / systems that require this facility. **Note that the enclosure is connected internally to the unit's own ground.**

4.3 Supply Current Requirement

1.3A max @ 36V
1.1A typical @ 36V

47W max. power

4.4 Input Characteristics

INPUTS		
INPUT	**SPECIFICATION**	
Analogue Input	Sensor type:	General-purpose amplified or potentiometer
	Interface pull-up resistor:	1MΩ to 5V
		Single-ended input
	Resolution:	12 bits (see note 1)
	Sampling rate:	1kHz
	Range:	0V to 5V
	Interface tested to:	±0.6% FSD
	Bandwidth (-3dB):	482Hz
Analogue Video Inputs	Input Type:	Composite NTSC/PAL Video Signal
	Compression:	MPEG-4 Part 2 (ISO/IEC 14496-2) or Motion JPEG
	Image Resolution:	160 x 120 to 704 x 576
	MPEG-4 Frame Rate:	Upto 20/17 (NTSC/PAL) fps
	Motion JPEG Frame Rate:	Upto 30/25 (NTSC/PAL) fps
	Input Impedance:	75Ω
	Number of Channels:	4

Note 1: The noise floor of the MPC5514's ADCs is expected to be 9.8mV (+/- 4 counts). Therefore, the results are accurate to 10 bits.

4.5 Output Characteristics

OUTPUTS		
OUTPUT	**SPECIFICATION**	
USB Power Supply Output	USB supply outputs controlled by MPC5514 microprocessor.	
	Output Voltage:	4.9V to 5.2V
	Max Current:	500mA
	Protection:	Current limited Short-circuit protection Thermal shutdown
	Diagnostics:	Error flags for each output channel
	Number of Channels:	4

4.6 Communications

CAN:

Number of Channels Available	1 CAN 2.0B standard supporting messages with 11-bit identifiers.*
Baud Rate	Up to 1 Mbps
Interface	2-wire CAN 2.0B differential transceivers

* Extended message frames are not supported by the standard software. If this is a requirement then please contact McLaren Electronic Systems Ltd.

No termination resistors are fitted within the unit.

NOTE: CAN communications is handled by the MPC5514 processor (see section 4.10) and data is communicated to the single board computer / Windows XPe via an internal communications link. CAN channel setup and usage will require software/application support from McLaren Electronic Systems Ltd.

RS232:

Number of Channels Available	1
Baud Rate	1200bps / 2400bps / 4800bps / 7200bps / 9600bps / 14400bps / 19200bps / 38400bps / 57600bps
Data Bits	8-bits / 9-bits
Stop Bits	1
Parity	None / Odd / Even
Flow Control	No hardware flow control

Driver	High Level Output Voltage	+ 5.4V (typical) + 5.0V (min)
	Low Level Output Voltage	- 5.4V (typical) - 5.0V (min)
Receiver	Input Voltage Range	- 25V (min) to + 25V (max)
	Positive Level Going Input Voltage	1.8V (typical) 2.4V (max)
	Negative Level Going Input Voltage	1.5V (typical) 0.8V (min)
	Hysteresis	0.3V (typical)
	Interface Pull-Down Resistor	5kΩ (nominal) to DGND

NOTE: RS232 communications is handled by the MPC5514 processor (see section 4.10) and data is communicated to the single board computer / Windows XPe via an internal communications link. RS232 setup and usage will require software/application support from McLaren Electronic Systems Ltd.

USB:

Number of Channels Available	4
Standard Supported	USB 2.0
Baud Rate	Up to 480 Mbps

Ethernet:

Number of Channels Available	1
Standard Supported	IEEE 802.3u 10BaseT / 100BaseTX
Baud Rate	10 Mbps / 100 Mbps
Other Features	Automatic MDI/MDI-X

GPS:
Provided as a module within the single board computer.

Module	Fastrax iTrax300 GPS module	
Number of Channels	20	
General	SiRFstar III Chipset	
	L1 frequency	
	Position / Velocity / Time Functionality	
Position Accuracy	+/-1.8m	
Velocity Accuracy	+/- 0.1ms^{-1}	
Time Accuracy	+/- 1us	
Time To First Fix	Cold Start	40s (typical)
	Warm Start	30s (typical)
	Hot	2s (typical)
Update Rate	1Hz	
Antenna Connections Impedance	50Ω	

4.9GHz (Public Safety) WiFi / 802.11:

Frequency Band	4.94Ghz to 4.99GHz
Power Settings	40 mW (16dBm) 25 mW (14dBm) 20 mW (13dBm) 10 mW (10dBm) 5 mW (7dBm) Max power settings vary according to local regulations.
Allowed Maximum Antenna Gain*	7.5dBi (mobile operation) 21dBi (fixed operation)
Antenna Connections Impedance	50Ω
Operating Channels	Ten 5MHz Channels (13.5Mbps max) Five 10MHz Channels (27Mbps max) Two 20MHz Channels (54Mbps max) (North America)
Module FCC ID	LDKXSCLCR14

*** The allowed maximum antenna gain must be adjusted in accordance with the FCC (or other) regulations and approvals conditions for this product with respect to co-location of antennas from other transmitting modules that form part of this product and/or the overall system installation.**

See Cisco 3200 series documentation (www.cisco.com) for a more detailed specification and feature list for this module.

NOTE: An operator license is required in order to use the public safety frequency band in the USA. The radio band can be used only by US Public Safety operators who meet the requirements specified under FCC CFR 47 (Code of Federal Regulations, title 47) Part 90.20. It is the responsibility of the end user to ensure that the appropriate license and authorisation from the relevant local/national authorities has been obtained.

Antennas for this unit must be installed by a trained professional only and intended as a permanent attachment to the unit. See Cisco 3200 series documentation (www.cisco.com) for further information and antenna installation instructions / guidance.

5.8GHz WiFi / 802.11h:

Frequency Band	5.250Ghz to 5.825GHz
Standards	802.11h
Power Settings	40mW (16dBm) 20mW (13dBm) 10mW (10dBm) 5mW (7dBm) 2.5mW (4dBm)

	Max power settings vary according to local regulations.
Allowed Maximum Antenna Gain*	Refer to FCC grant documentation.
Antenna Connections Impedance	50Ω
Operating Channels	20MHz Channels Only 5260MHz (52), 5280MHz (56), 5300MHz (60), 5320MHz (64), 5500MHz (100), 5520MHz (104), 5540MHz (108), 5560MHz (112), 5580MHz (116), 5600MHz (120), 5620MHz (124), 5640MHz (128), 5660MHz (132), 5680MHz (136), 5700MHz (140). (Channels 52 through 140 are ETSI outdoor channels)
Other Features	Dynamic Frequency Selection (DFS) Transmission Power Control (TPC)
Module FCC ID	LDKATBRTH16

*** The allowed maximum antenna gain must be adjusted in accordance with the FCC (or other) regulations and approvals conditions for this product with respect to co-location of antennas from other transmitting modules that form part of this product and/or the overall system installation.**

See Cisco 3200 series documentation (www.cisco.com) for a more detailed specification and feature list for this module.

Antennas for this unit must be installed by a trained professional only and intended as a permanent attachment to the unit. See Cisco 3200 series documentation (www.cisco.com) for further information and antenna installation instructions / guidance.

4.7 Graphics / Video Characteristics

GRAPHICS / VIDEO	
OUTPUT	**SPECIFICATION**
VGA Output	VGA interface for use with a standard VGA monitor.

4.8 Integrated Sensor Characteristics

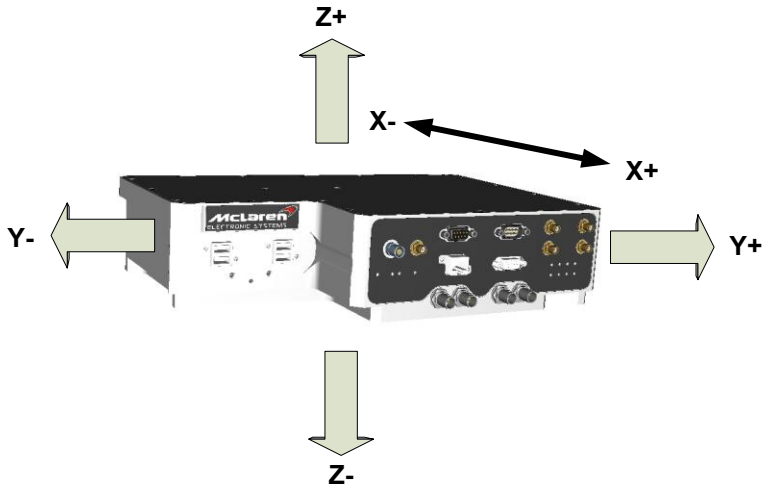
INTEGRATED SENSORS		
SENSOR	**SPECIFICATION**	
Tri-Axis Accelerometer	Sensor type:	Surface micro-machined capacitive sensing cell (g-cell)
	Range:	+/- 4g
	Sensitivity:	308mV/g (Typical) 289.5mV/g (Minimum) 326.5mV/g (Maximum)
	Resolution:	12 bits (see note 1)
	Voltage Range:	0V to 3.39V
	Bandwidth:	300Hz
	Calibration:	Basic calibration to correct for offsets.

INTEGRATED SENSORS	
SENSOR	**SPECIFICATION**
Unit Temperature Sensor	A temperature sensor is provided within the unit. This allows monitoring of the internal unit temperature. The unit temperature must be kept within the specified operating temperature range (section 2).

Note 1: The noise floor of the MPC5514's ADCs is expected to be 9.8mV (+/- 4 counts). Therefore, the results are accurate to 10 bits.

Accelerometer Orientation

The accelerometer device is positioned such that the X, Y, and Z axes are as shown below:



With the unit in the position shown above (placed on a horizontal bench), the following nominal voltages are expected for the three axes.

Axis	Nominal Voltage	
	+/-4g Range	+/-12g Range
X (0g)	1.650V	1.650V
Y (0g)	1.650V	1.650V
Z (+1g)	1.958V	1.734V

4.9 Additional Unit Diagnostics

In addition to the diagnostics specified above, the following internal diagnostics are provided:

- Unit supply voltage
- 5V internal digital supply rail voltage
- 3.3V internal digital supply rail voltage
- 1.8V internal supply voltage*
- 3.3V WiFi modules supply voltage*
- 5V single board computer supply voltage*
- 5V WiFi modules supply voltage*
- 12V video server supply voltage*
- Vpp (5V) flash programming supply rail voltage*

* These supply rails can be switched on/off by the MPC5514 microprocessor.

4.10 Unit Embedded Processor and Memory

Processor:
The unit features a Freescale MPC5514 microprocessor. This is used to provide control of a number of voltage supply rails, monitoring/diagnostic features, and communications.

Flash Memory:
The MPC5514 has 512kbyte of internal Flash memory used to store boot code and application code. The Flash memory array has error correction logic (ECC) available capable of single bit correction and double bit detection.

The flash memory can be write-protected (by removing the flash memory write supply voltage) in order to prevent accidental writes to the flash memory.

SRAM:
The MPC5514 has 64kbyte of internal SRAM. The SRAM has error correction logic (ECC) available capable of single bit correction and double bit detection.

EEPROM:
The unit includes a 64kbyte serial EEPROM device. The device is specified for 1,000,000 write cycles. Data retention is specified as greater than 200 years.

4.11 Watchdog Feature

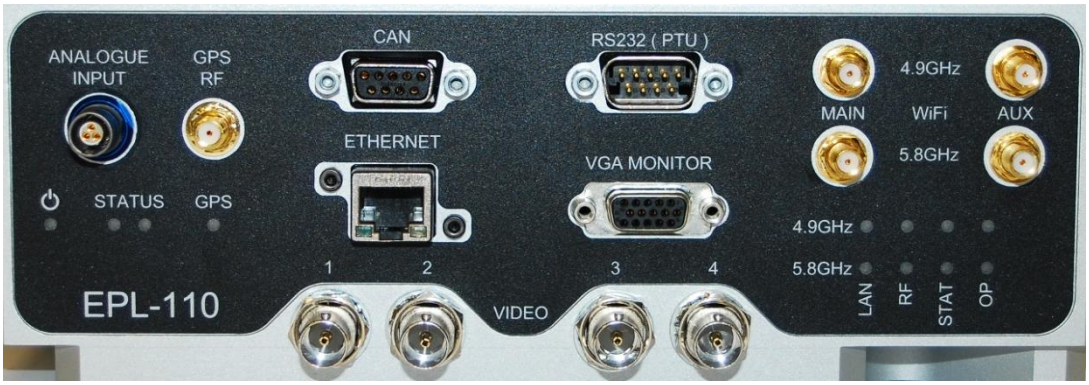
The unit has a hardware watchdog provided which will reset the unit if the watchdog is not 'serviced' within the watchdog timeout period. Should the embedded software 'hang' and the watchdog is not serviced then the unit's hardware will reset the unit. The servicing of the watchdog is usually included within the embedded software provided with the unit. Diagnostics within the BIOS software can help to identify when a reset has occurred and the type/cause of reset (further information can be found in the software functional specification).

Watchdog Timeout Period:	262ms (typical)

4.12 Unit Programming & Application Software

The EPL-110 is supplied with pre-loaded application software designed to meet the requirements of the customer's application. To discuss specific requirements or enquire about what can be provided please contact McLaren Electronic Systems Limited.

5 UNIT LED INDICATORS



When contacting McLaren Electronic Systems (or your local service representative) for assistance or queries, it will be useful to note down the state of the various LED indicators. In particular, power and status LEDs may provide useful information to aid technical personnel in solving any issues.

5.1 POWER LED

When the power supply to the unit is on this LED should be on and be amber in colour initially. The other indications are shown in the table below.

POWER LED STATE	DESCRIPTION
AMBER on:	Indicates power supply present / system initialising. Should only be in this state briefly at power up.
GREEN on:	Initialised, including SBC
GREEN / AMBER flash:	Power rail in alarm state. Indicates if one or more supply rails are out of the expected range. If the problem is the unit supply check that the supply to the unit correct. If the problem is with one of the other supply rails contact the manufacturer or your local service representative for assistance.

5.2 STATUS LEDs

Two general status LEDs are provided on the front of the unit. These are intended to aid operators and service personnel to quickly identify the operational status of the unit. The table below shows the default scheme.

STATUS LED	DESCRIPTION	
LEFT LED SBC status	Conditions defined by SBC application code	
RIGHT LED Base Board status	GREEN flash (fast)	Microcontroller is running boot code
	GREEN flash (1Hz)	Microcontroller is running, state = normal
	GREEN / RED flash (1Hz)	Microcontroller is running, but is reinitialising the SBC, state = watchdog
	RED flash (1Hz)	Microcontroller is running, but lost contact with SBC, state = AWOL
	RED flash (5Hz, short ON)	Microcontroller is running, supply low, state = standby
	OFF	Microcontroller is not running Contact the manufacturer or your local service representative for assistance.

5.3 GPS LED

The GPS LED can be controlled by the application running on the single board computer (SBC). It is envisaged that the application will use this LED to indicate the status of the GPS module. The status may include GPS attempting to acquire a signal, GPS satellite fix obtained, error / could not get fix, etc.

The LED is a bi-colour device providing green and red colours. Switching both red and green on will provide an amber colour. This together with the option to flash the LED at various rates provides a range of indication options.

The exact use of this LED is under the control of the SBC software application. Please refer to the SBC application specifications for details regarding the GPS LED indications.

5.4 Unit Ethernet Port LEDs

There are two LEDs integrated as part of the unit Ethernet connector. The table below describes what their various states indicate.

ETHERNET PORT LED	STATE	DESCRIPTION
AMBER / YELLOW LED (Link / Activity)	On	Link detected
	Off	No link detected
	Flashing	Activity
GREEN LED (100 Mbps / 10 Mbps)	On	100 Mbps Mode
	Off	10 Mbps Mode

5.5 WiFi LEDs

The group of LEDs (two rows of four LEDs) towards the right side of the unit provide status information regarding the Cisco WMIC / WiFi modules. These are driven by the WiFi modules directly. The table below describes what the various LEDs show (reproduced here for convenience from Cisco documentation).

Message Type	LAN (Ethernet) Indicator	STAT (Status) Indicator	RF (Radio) Indicator	Meaning
Boot Loader Status	Green	—	Green	DRAM memory test.
	—	Amber	Red	Board initialization test.
	—	Blinking Green	Blinking Green	Flash memory test.
	Amber	Green	—	Ethernet initialization test.
	Green	Green	Green	Starting Cisco IOS software.
Association Status	—	Green	—	At least one wireless client device is associated with the unit.
	—	Blinking Green	—	No client devices are associated; check the wireless device service set identifier (SSID) and Wired Equivalent Privacy (WEP) settings.

Message Type	LAN (Ethernet) Indicator	STAT (Status) Indicator	RF (Radio) Indicator	Meaning
Operating Status	—	Green	Blinking Green	Transmitting/receiving radio packets.
	Green	—	—	Ethernet link is operational.
	Blinking Green	—	—	Transmitting/receiving Ethernet packets.
Boot Loader Errors	Red	—	Red	DRAM memory test failure.
	—	Red	Red	File system failure.
	Red	Red	—	Ethernet failure during image recovery.
	Amber	Green	Amber	Boot environment error.
	Red	Green	Red	No Cisco IOS image file.
	Amber	Amber	Amber	Boot failure.
Operation Errors	–	Green	Blinking Amber	Maximum retries or buffer full occurred on the radio.
	Blinking Amber	–	–	Transmit/receive Ethernet errors.
	–	Blinking Amber	–	General warning.
Configuration Reset	–	Amber	–	Resetting the configuration options to factory defaults.
Failures	Red	Red	Red	Firmware failure; try disconnecting and reconnecting unit power.
	Blinking Red	–	–	Hardware failure. The wireless device must be replaced.
Firmware Upgrade	–	Red	–	Loading new firmware image.

Note: No information provided in the Cisco documentation regarding the OP LED (labelled as Installation / Operation LED in the Cisco documentation).

6 ANTENNA INSTALLATION

6.1 Installers

Antennas for this unit must be installed by an appropriately trained professional only and intended as a permanent attachment/installation with the unit.

Each of the WiFi modules are provided with two antenna connections – main and auxiliary. In order to function the 'main' antenna connection must be provided with a suitable antenna. An auxiliary antenna will help to provide better coverage and reliability.

See the Cisco 3200 series documentation (www.cisco.com) for further information and antenna installation instructions / guidance.

6.2 Antenna Gain

4.9Ghz WiFi Module: Maximum antenna gain is 7.5dBi for mobile operation and 21dBi for fixed operation.

5.8Ghz WiFi Module: Refer to FCC grant documentation.

GPS Module: +10dB to +35dB suggested for optimum performance

6.3 Antenna Location

For mobile operation, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons. For fixed point-to-point operation, the antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 35 cm from all persons.

6.4 Antenna Co-Location Requirements

If the installation / application makes use of both WiFi modules special consideration must be given to the co-location of the required antennas and their power / gain settings.

Specific requirements and restrictions to be determined – FCC approvals for the product are pending. Please check with McLaren Electronic Systems Limited for the latest information and most up to date issue of this document.

7 CONNECTOR DEFINITIONS

7.1 Connectors

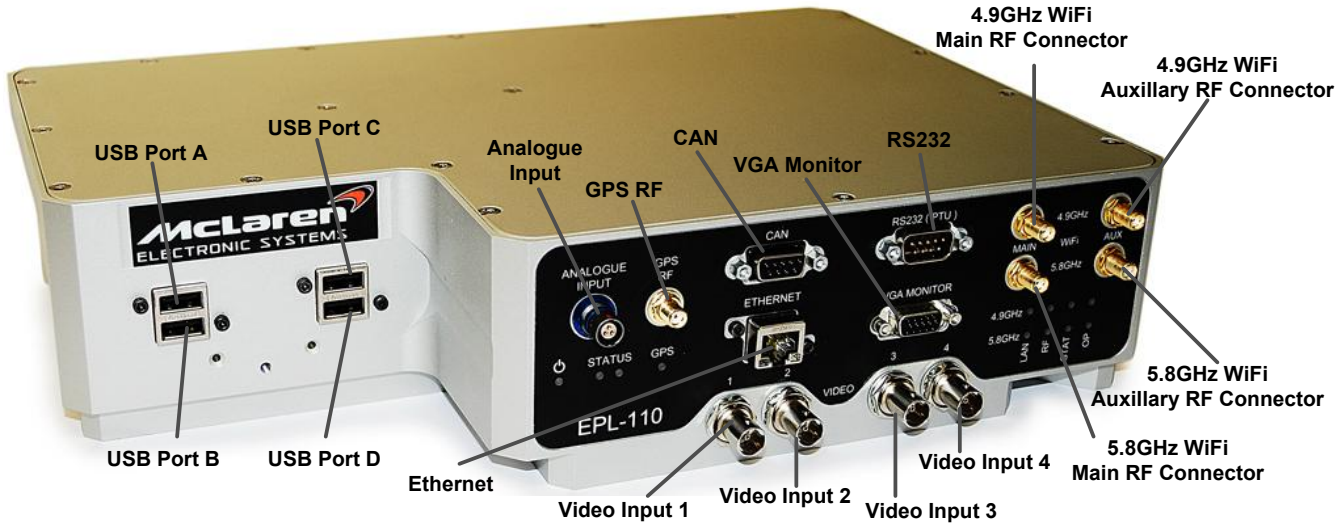
Connections to and from the unit are achieved via a mix of standard IT connectors and rugged motorsport style connectors.

The recommended mating connectors are indicated in section describing the connectors.

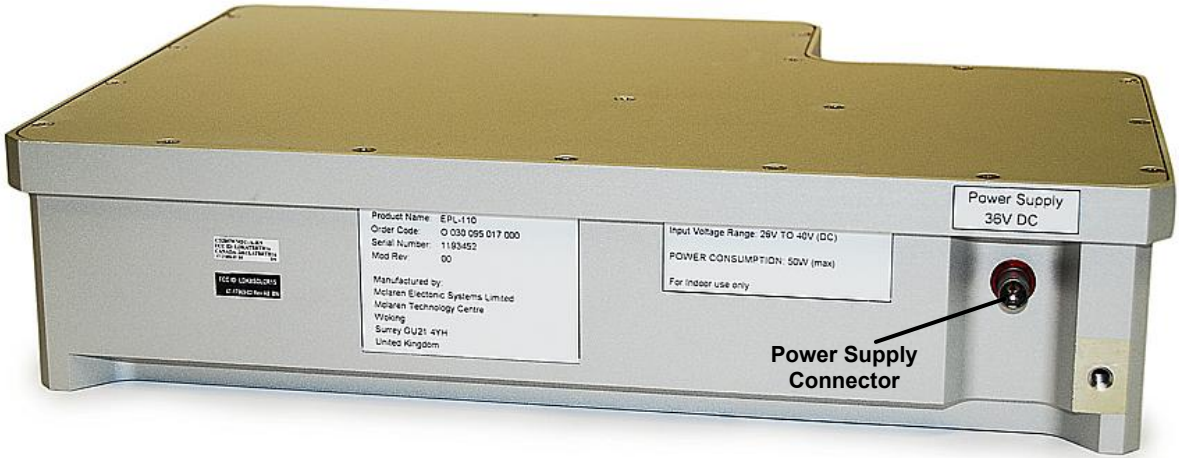
7.2 Connector Locations

The diagram below indicates the approximate locations of the various connectors.

FRONT FACE



REAR FACE



7.3 Power Supply Connector

Connector Type: LEMO 2 way F-series (size 0F)
Part Number: HEN.0F.302.XLDP

Mating Connector: LEMO FGS.0F.302.XLM

Maximum Wire Gauge: 20AWG
(for mating half crimps)

Minimum Wire Gauge: 24AWG
(for mating half crimps)

POWER CONNECTOR CONNECTOR: LEMO HEN.0F.302.XLDP			
Pin No.	**Function / Description**	**Filter Capacitor**	**Notes / Comments**
1	Unit Supply +ve	1nF	
2	Unit Supply Ground	1nF	

7.4 Analogue Input Connector

Connector Type: LEMO 3 way F-series (size 0F)
Part Number: HEN.0F.303.XLNP

Mating Connector: LEMO FGN.0F.303.YLC

Maximum Wire Gauge: 20AWG
(for mating half crimps)

Minimum Wire Gauge: 24AWG
(for mating half crimps)

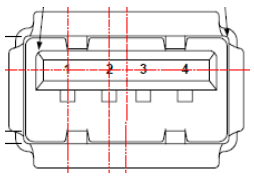
ANALOGUE INPUT CONNECTOR CONNECTOR: LEMO HEN.0F.303.XLNP			
Pin No.	**Function / Description**	**Filter Capacitor**	**Notes / Comments**
1	Analogue Input 1	1nF	
2	Analogue Ground	1nF	
3	No Connection	1nF	

7.5 External USB Connectors

Connector Type: Double stacked USB type A receptacle

Mating Connector: USB type A plug

Rubber dust caps provided to cover and protect any unused USB ports.



USB Port Pin Number	Signal to Connect	Notes
1	VBUS	-
2	DM	-
3	DP	-
4	USB_GND	-
Shell (if connection exists)	USB_GND	-

7.6 Ethernet Connector

Connector Type: RJ45 Receptacle (8 way)

Mating Connector: RJ45 Plug (8 way)

This connector has integrated LEDs to provide status and activity information.

A rubber dust cap is provided to cover and protect the Ethernet port when it is not in use.

The table below shows the required connections to this RJ45 connector.

RJ45 Connector	
Pin Number	**Signal Description**
1	RX+
2	RX-
3	TX+
4	N.C.
5	N.C.
6	TX-
7	N.C.
8	N.C.

7.7 RS232 Connector

Connector Type: 9 way D-sub Male / Plug

Mating Connector: 9 way D-sub Female / Socket

9 Way D-Sub Plug		Signal Direction	Description	Notes / Filter
Pin Number	**Signal**			
1	-			1nF
2	RxD	Input to Unit	Data In	1nF
3	TxD	Output from Unit	Data Out	1nF
4				1nF
5	DGND	-	Common Ground	1nF
6	-			1nF
7	-			1nF
8	-			1nF
9	-			1nF

7.8 CAN Interface Connector

Connector Type: 9 way D-sub Female / Socket

Mating Connector: 9 way D-sub Male / Plug

9 Way D-Sub Plug		Notes / Filter
Pin Number	Signal	
1	NC	1nF
2	CAN-	100pF and common-mode choke
3	DGND	1nF
4	NC	1nF
5	FILT_GND	-
6	NC	1nF
7	CAN+	100pF and common-mode choke
8	NC	1nF
9	NC	1nF

120R twisted-pair cable must be used for the differential CAN communications connections (CAN+ and CAN-). There are no termination resistors fitted within the unit on the CAN channels. There should be two 120R termination resistors provided on each CAN bus (one at each end of the bus) regardless of how many units are attached. The termination resistors should be provided either in the wiring harness, or by placing a unit which does contain an internal terminator at the end of the bus. Any other units connected along the bus should not have stubs exceeding 0.3m in length.

7.9 VGA Monitor Interface Connector

Connector Type: 15-way High Density D-sub Female / Socket

Mating Connector: 15-way High Density D-sub Male / Plug

Pins 4, 9, and 11 (ID0, KEY, ID2) are unconnected.

15 Way HD D-Sub Socket		Dir	Description	Notes / Filter
Pin Number	Signal			
1	Red	→	Red Video (75Ohm, 0.7Vp-p)	10pF
2	Green	→	Green Video (75Ohm, 0.7Vp-p)	10pF
3	Blue	→	Blue Video (75Ohm, 0.7Vp-p)	10pF
4	ID2	←	Monitor ID Bit 2 – Not Connected	1nF
5	DGND	-	Ground	1nF
6	RGBGND	-	RGB / Video DAC Ground. Star connected to DGND within the unit.	1nF
7	RGBGND	-		
8	RGBGND	-		
9	Key	-	Key (no pin) – Not Connected	1nF
10	DGND	-	Ground	1nF
11	ID0	←	Monitor ID Bit 0 – Not Connected	1nF
12	ID1 or SDA	←	Monitor ID Bit 1	100pF
13	HSYNC	→	Horizontal Sync	22pF
14	VSYNC	→	Vertical Sync	22pF
15	ID3 or SCL	←	Monitor ID Bit 3	100pF

7.10 Composite Video Input Connectors

Connector Type: BNC Jack (75Ω)

Mating Connector: BNC Plug (75Ω)

7.11 WMIC / WiFi Antenna Connectors

Connector Type: SMA Jack (50Ω)

Mating Connector: SMA Plug (50Ω)

Note: Connectors and cable assemblies must be suitable for use with the frequency bands of the 4.9GHz and 5.8GHz modules.

7.12 GPS Antenna Connector

Connector Type: SMA Jack (50Ω)

Mating Connector: SMA Plug (50Ω)

Note: Connector and cable assembly must be suitable for use with GPS frequencies (approximately 1.0GHz to 1.6GHz).

8 QUALITY SCHEME

8.1 Quality System

This product is designed and manufactured in accordance with the McLaren Electronic Systems quality system, as detailed in our quality manual TWPD0003.

8.2 Production Environmental Tests

The unit is fully tested to its production test procedure at room ambient temperature. It is then subjected to an elevated temperature test where the unit's internal temperature is elevated to 50ºC (as measured by the on board temperature sensor). The unit is then subjected to a cold start test where the unit is tested starting from an ambient temperature of 5ºC (unit is powered off and soaked at 5ºC for 2 hours before testing).

Results of the production tests are recorded in a Build History Record.

9 SERVICE SCHEME

9.1 Service Interval

There is no mandatory service interval specified.

There are no user / customer serviceable parts within the unit.

If the unit is returned for a service it will be given a full functional test at ambient room temperature. A visual inspection of the unit will also be performed.

Results of the tests are recorded in the unit's Build History Record.

11 ATTACHMENT 1 - MECHANICAL DETAIL

EPL-110 Standard Unit (Order Code: O 030 095 017 000)

All dimensions in millimetres unless otherwise stated.

[To be added]