Scrapman Trailer Weighing System Manual (Revision 13)

This manual should be read in association with *Calibration Notes* which are available for download at http://www.scrap-man.com/files/Calibration_Notes_Rev1.pdf

The *Calibration Notes* document gives background information on load cell operation and calibration techniques.

Overview

The Scrapman weighing system incorporates a number of sophisticated elements that in combination produce an accurate and reliable mobile weighing system.

1 Load cells

Used to support the weighing platform; there is one under each corner of the weighing platform and *digital* load data is transmitted from individual load cells to the central computer in the trailer swan neck.

2 Embedded Computer Assembly

This resides in the computer enclosure in the LH-side of the trailer swan neck. This embedded PC runs under a Windows CE operating system and the application program resides in a compact flash memory. The CPU processes the data from the load cells and orchestrates communication to external computer equipment via WiFi (or optional RS232); it also provides a focal point for all the wiring and power supplies.

3 Wireless LAN

WiFi technology is used on site to communicate between the trailers, tractors and cranes as well as the central database. Alternatively, we can offer RS232 Radio Modem data communication.

4 Batteries

Battery packs are used to energise the equipment using two 12V, 85Ah deep-cycle batteries which are housed in the RH-side of the trailer swan neck.
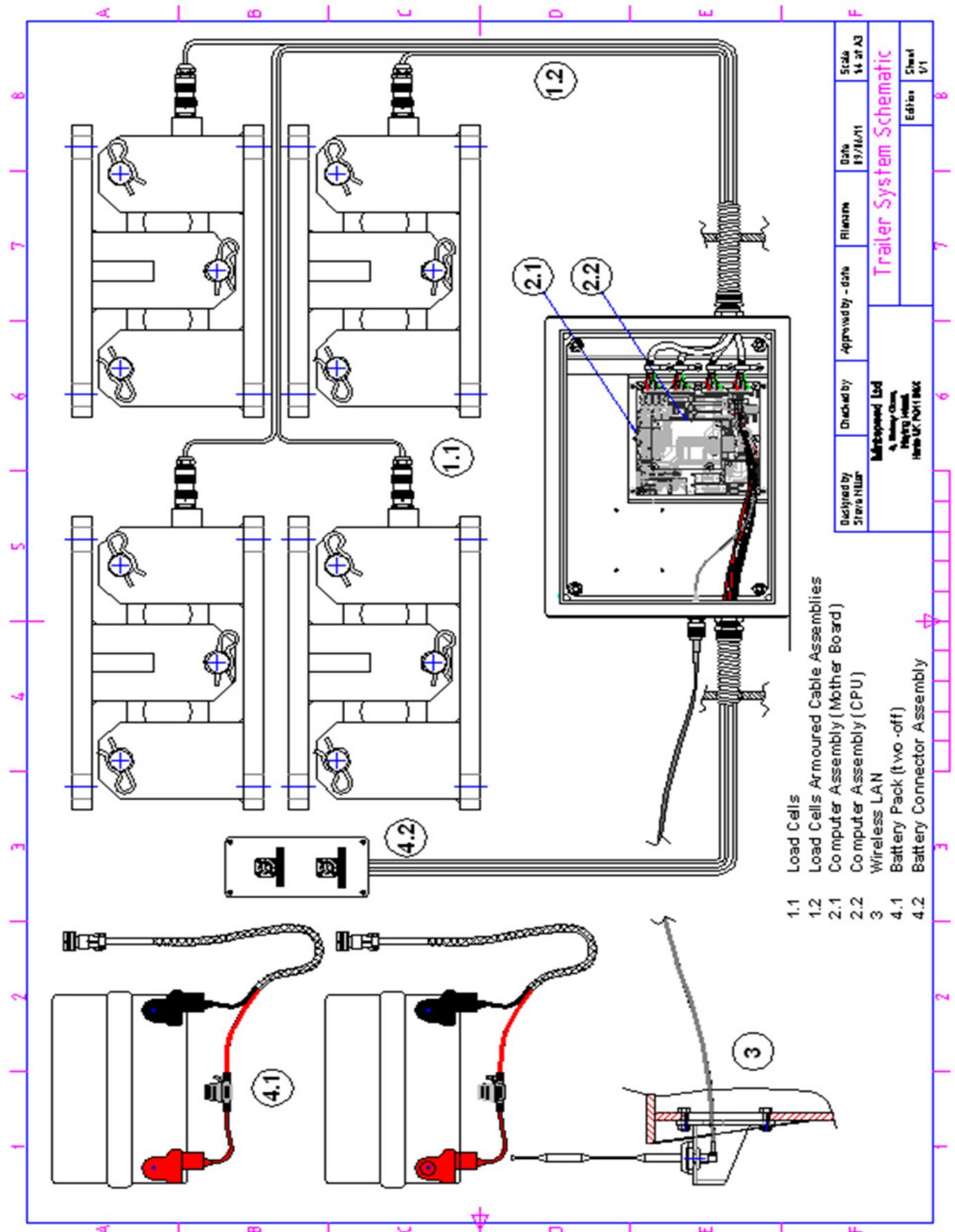
5 Fault-finding & Repairs

Load Cell Replacement and configuration

6 Calibration

Methods enabling data communication to the trailer weighing system and procedures for calibration

For all software integration issues, please see the *PlayStation Manual*
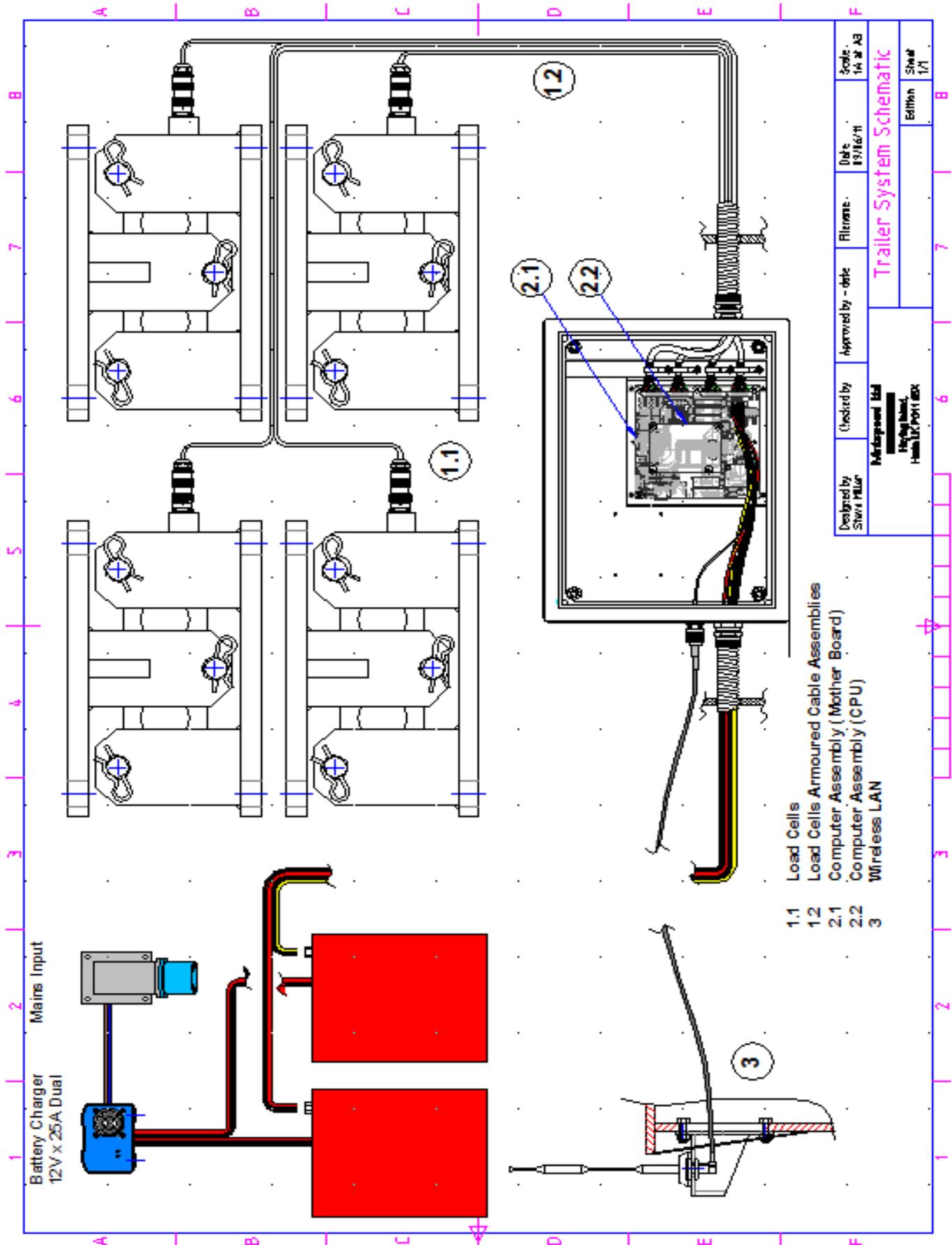
Trailer Schematic Overview—Replaceable Batteries

Trailer System Schematic

1.1	Load Cells
1.2	Load Cells Armoured Cable Assemblies
2.1	Computer Assembly (Mother Board)
2.2	Computer Assembly (CPU)
3	Wireless LAN
4.1	Battery Pack (two-off)
4.2	Battery Connector Assembly

# Trailer Schematic Overview—Batteries with on-board charger

Trailer System Schematic

Designed by Steve Miller	Checked by	Approved by – date
	Multispeed Ltd	
	Flying Island, Hants UK PO41 0DX	

Scale	Date	Alternate
1:4 at A3	19/16/11	

Edition   Sheet 1/1

1.1   Load Cells
1.2   Load Cells Armoured Cable Assemblies
2.1   Computer Assembly (Mother Board)
2.2   Computer Assembly (CPU)
3   Wireless LAN

Mains Input

Battery Charger 12V x 25A Dual

1   Load Cells and Cables

1.1   Load Cells

All are rated at 50% of the total trailer capacity to counter the effects of transient shock loads that may be encountered during loading and moving in the scrap yard; they are mounted in a cradle that allows some limited lateral movement to compensate for uneven terrain. Load measurement is carried out by a microcomputer fitted in each load cell for converting the load measurement into digital form called a *D-Cell*. Physically, the complete load cell is in three major parts as shown in the following drawing and photographs; the **load cell** itself which includes the **D-Cell** and connector, the **lower cradle** and **upper cradle** mounted between the chassis and weighing platform. The load cell is held captive in the cradle assembly by large hardened pins which in turn are held captive by washers and "R" clips. These R clips and washers should be checked periodically for signs of wear and they should be replaced if necessary. The complete load cell assembly should be periodically cleaned to prevent a build-up of dust and mud which can form a concretion hard enough to affect the measured weight if not removed.
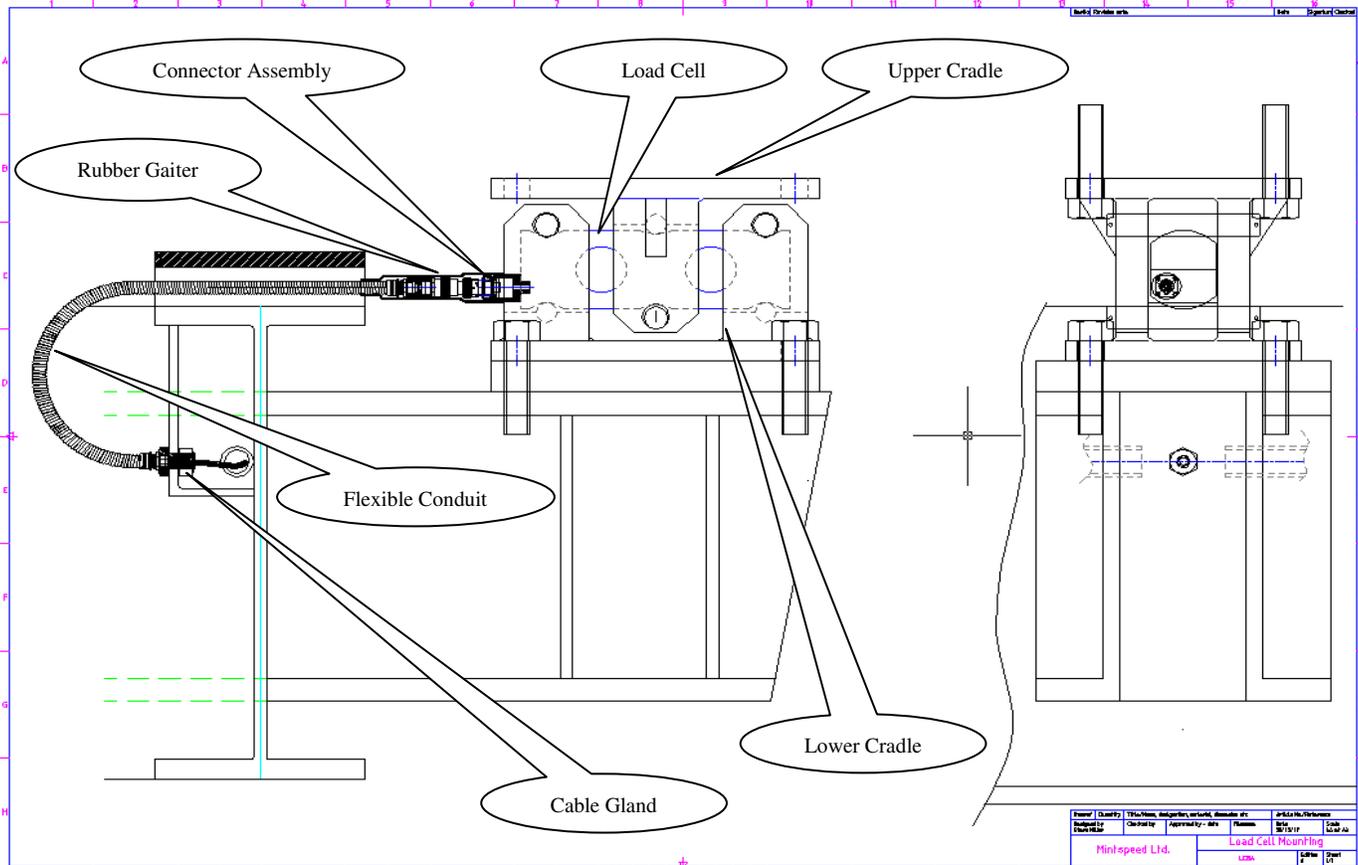
The **D-Cell** (shown below) is a bought-in, very small microcomputer housed in the machined, stainless steel cylindrical enclosure at the inboard end of the load cell, this **D-Cell** module includes the following functionality;

    Strain Gauge Amplifier that conditions the analogue voltage from the strain gauge itself

    Analogue-to-Digital Converter (ADC) that digitises the analogue signal from the strain gauge amp

    Microcomputer that orchestrates sample rate, and all communications functions - RS485 interface

    Non-Volatile memory for holding calibration values, Baud Rate etc. etc.

Each load cell and its associated **D-Cell** are irrevocably tied together during factory calibration with settings of **zero load** to **Full Scale Deflection** (depending on the Trailer Load Rating) in 10Kg increments) retained in the non-volatile memory. Consequently, they are effectively *digital* in that <u>no additional calibration or scaling should be required on installation or replacement</u>.

<p style="text-align:center;color:red">This laboratory calibration is to a very high standard that would be virtually <u>impossible</u> to replicate or duplicate in the Scrap Yard.</p>

There is some provision for on-site minor adjustment (see Checking and Adjusting Weighing System in the Software Section) but this should NOT be undertaken lightly and without first reading the **Calibration Notes** document. Periodic *checking* can be done whenever required.

Sectional detail of D-Cell housing in Load Cell
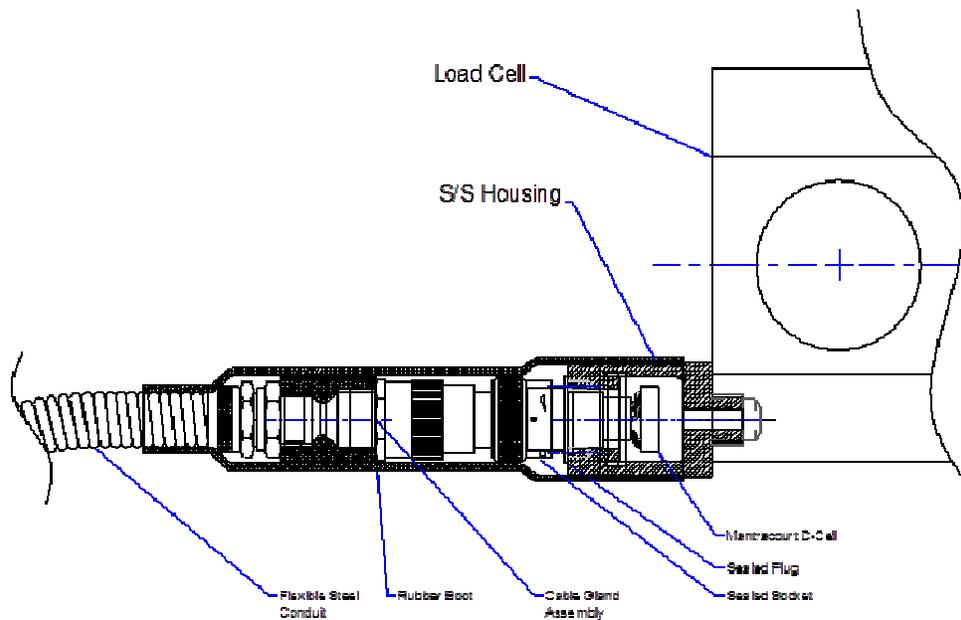
Load Cell with the weighing platform in-situ showing 3 retaining pins with R clips and washers.

The R clips and washers can be removed and if the weight is taken off, this will allow removal of the retaining pins and will permit the load cell to be slid out of the cradle.
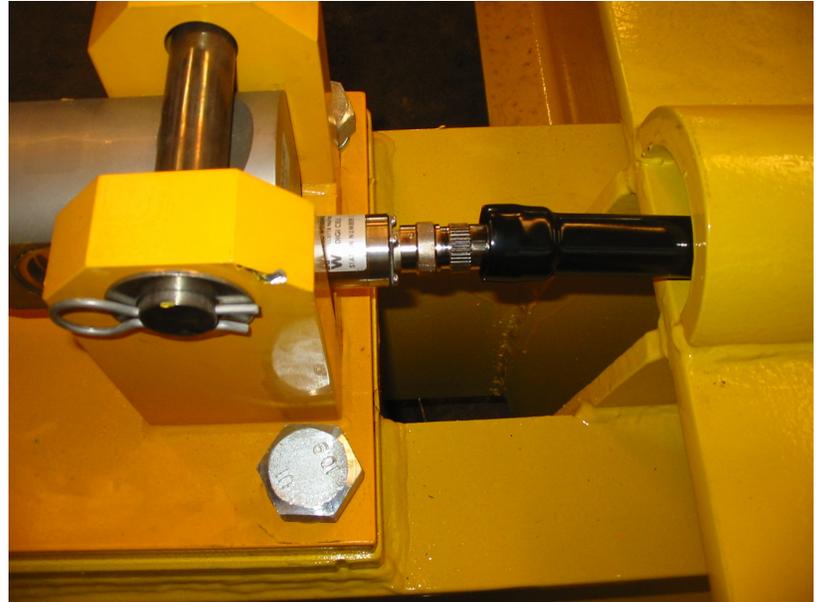

N.B. It is good practice to periodically clean the load cells from any debris. Any build-up of detritus that affects the deflection of the load cell will also affect the accuracy.
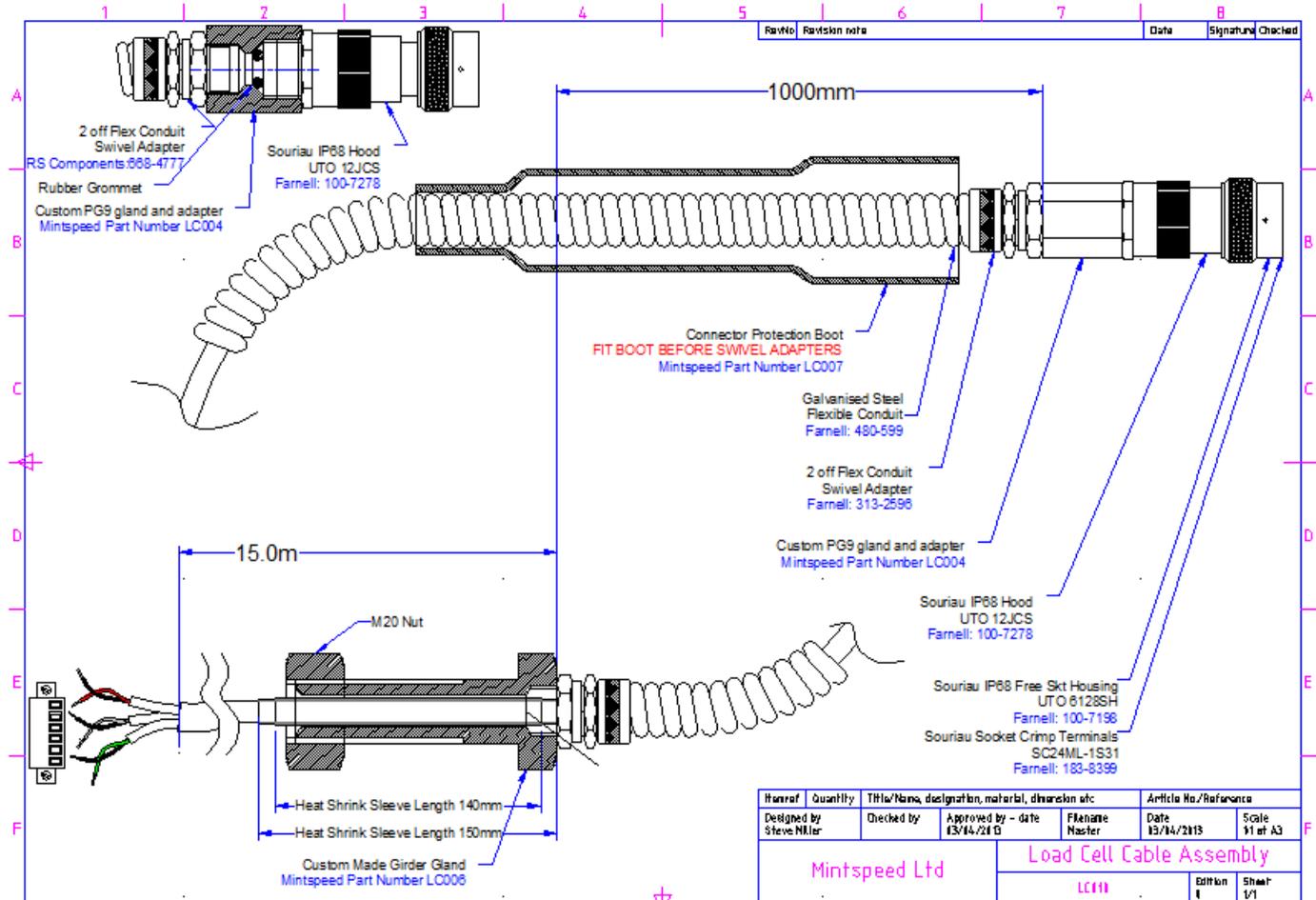
1.2 Load Cell Armoured Cables

Six-core (3 x *twisted pair*) screened cable is used to connect the load cells to the central computer and to prevent damage this is ducted in heavy duty steel tube welded to the chassis. The final half metre cable run from the chassis to individual load cells is sheathed in flexible steel conduit with waterproof connectors used to make the final connection to the load cell. The complete connector assembly at the load cell is sheathed by a rubber boot and this is illustrated in the previous section drawing.

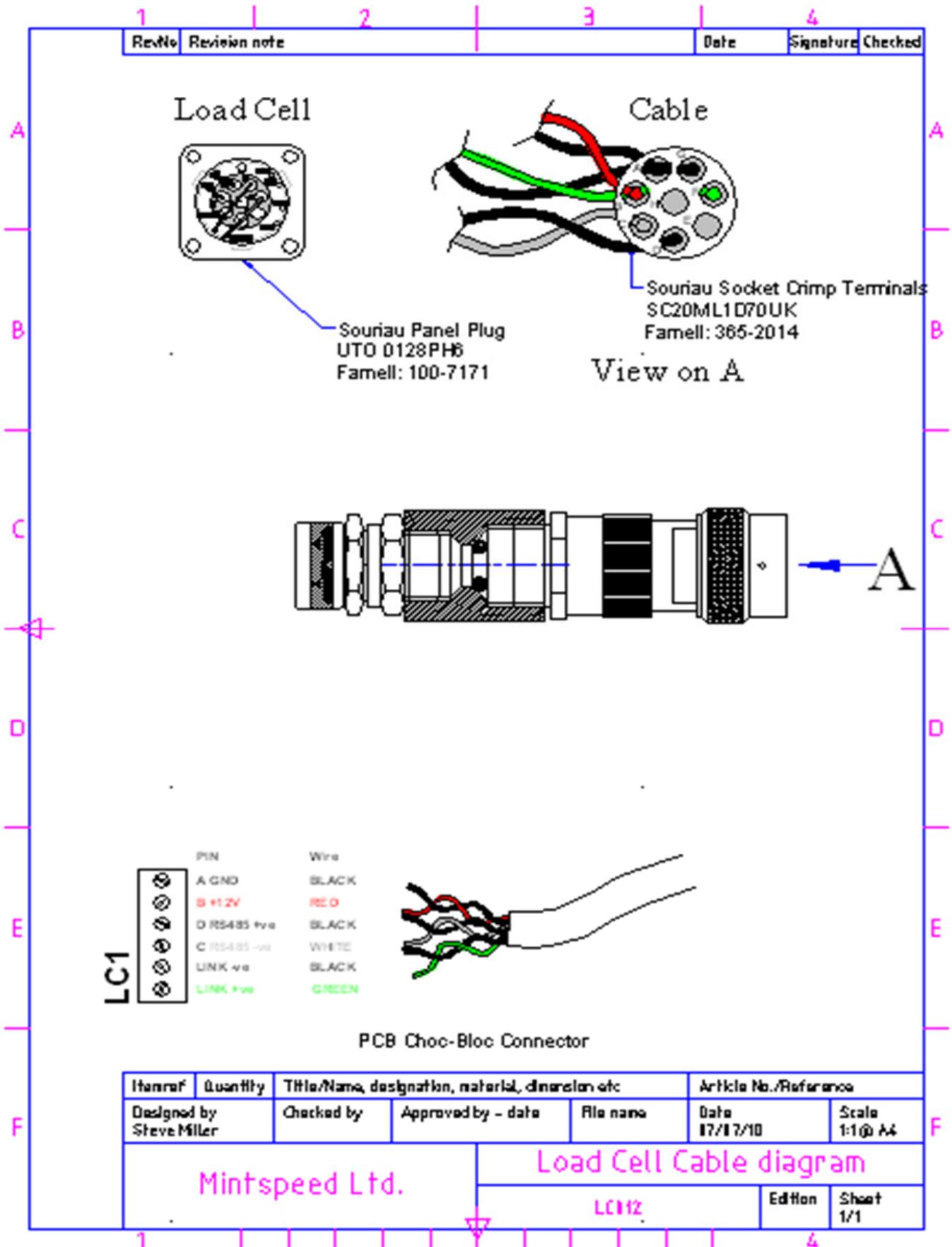The Load Cell Cable is protected with a flexible steel conduit running from the chassis to the load cell.

The waterproof connector is under the black rubber boot. This area should be cleaned carefully before the rubber gaiter is slid backwards and the connector unplugged. Any dirt or grit may contaminate the contacts and cause intermittent load readings.

Cable Assembly Drawing

Load Cell Connector Assembly and wiring detail

RevNo	Revision note			Date	Signature	Checked
1		2	3		4	

Load Cell

Cable

Souriau Panel Plug
UTO 0128PH6
Farnell: 100-7171

Souriau Socket Crimp Terminals
SC20ML1D70UK
Farnell: 365-2014

View on A

A

LC1		
PIN		Wire
A GND		BLACK
B +12V		RED
D RS485 +ve		BLACK
C RS485 -ve		WHITE
LINK -ve		BLACK
LINK +ve		GREEN

PCB Choc-Bloc Connector

| Itemref	Quantity	Title/Name, designation, material, dimension etc		Article No./Reference	
Designed by Steve Miller	Checked by	Approved by – date	File name	Date 17/17/10	Scale 1:1 @ A4
Mintspeed Ltd.			Load Cell Cable diagram		
			LCM2	Edition	Sheet 1/1

2   The Computer Assembly

This comprises two separate sub-assemblies mounted to a small aluminium chassis and this in turn is bolted onto to a plate which is part of a pressed steel enclosure with rubber, shock-absorbing mounts.

2.1   **The Mother Board**. This provides a focal point for all the wiring and interface to all the peripheral systems required and includes, Power Supplies, Wireless LAN, Ethernet, USB and two serial com ports; not all of these are actively used. It also supports and provides connectivity to the CPU board.

2.2   **The CPU board**. This is an embedded PC with a windows CE operating system; this manages the entire system housekeeping including external communication. The application program resides in Compact Flash Memory (2 GB or 4GB) and is retained in its socket by a locking post which must be removed before sliding upwards out of the socket. The memory includes a unique *Trailer ID* (1 – X) so that if the computer assembly is changed, the Flash Memory must be put into the new board. In addition to the application program, the Flash Memory also includes the WiFi parameters which allow it to reside and communicate on the WiFi network. The CPU board also includes an Analogue to Digital Converter which is used to measure the battery voltages.

The CPU card SHOULD NOT BE REMOVED from the Mother Board unless authorised by Mintspeed; there are a number of extremely delicate components beneath the CPU which could be irreversibly damaged if handled incorrectly. In the event of a fault, the COMPLETE ASSEMBLY (as illustrated in the following photograph) should be returned as one unit.

The application program performs all the Mathematical processing to correctly sum all four individual load cell readings, apply damping etc. Furthermore, it operates the LED's which indicate the load cell status and other operational functions.
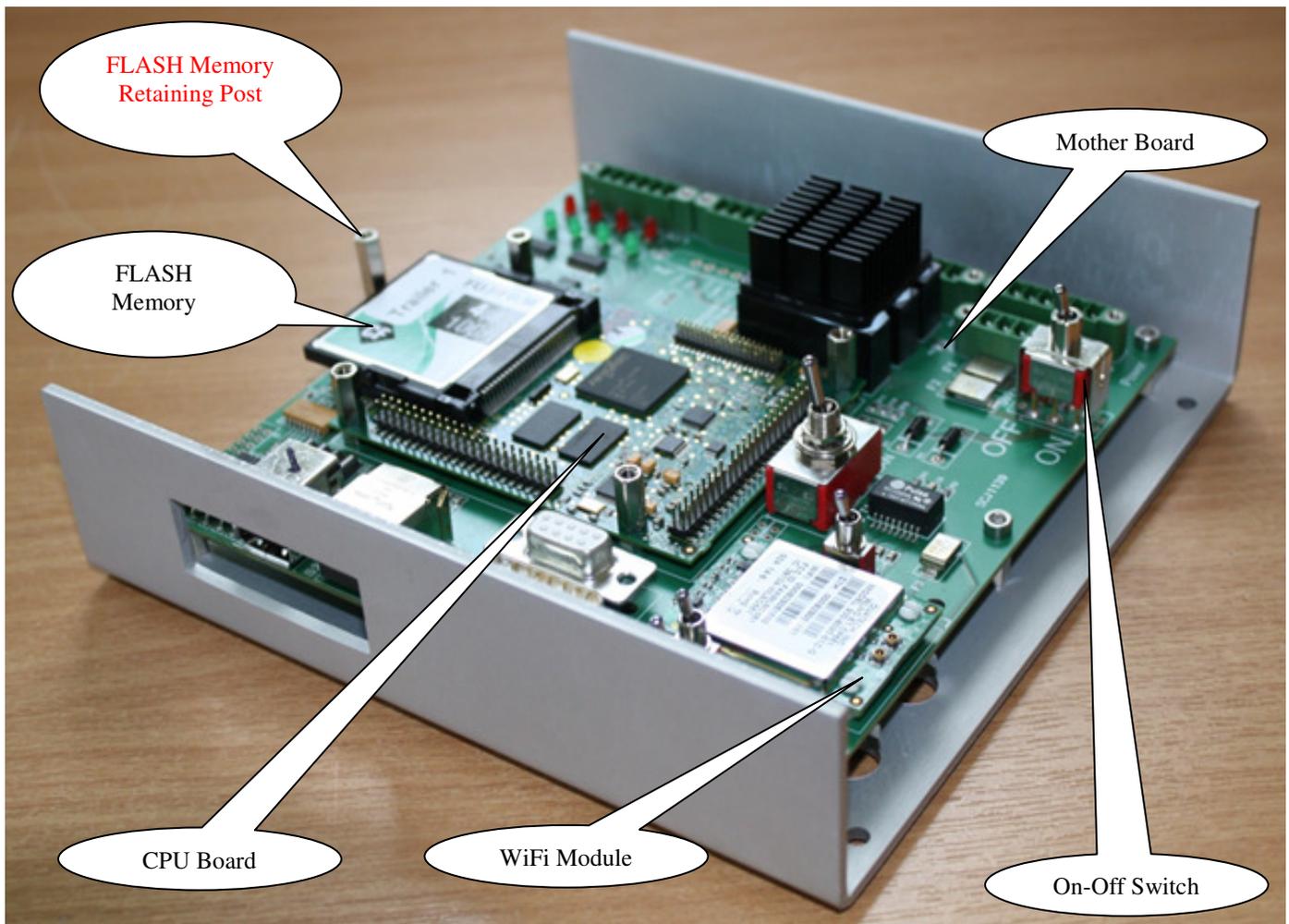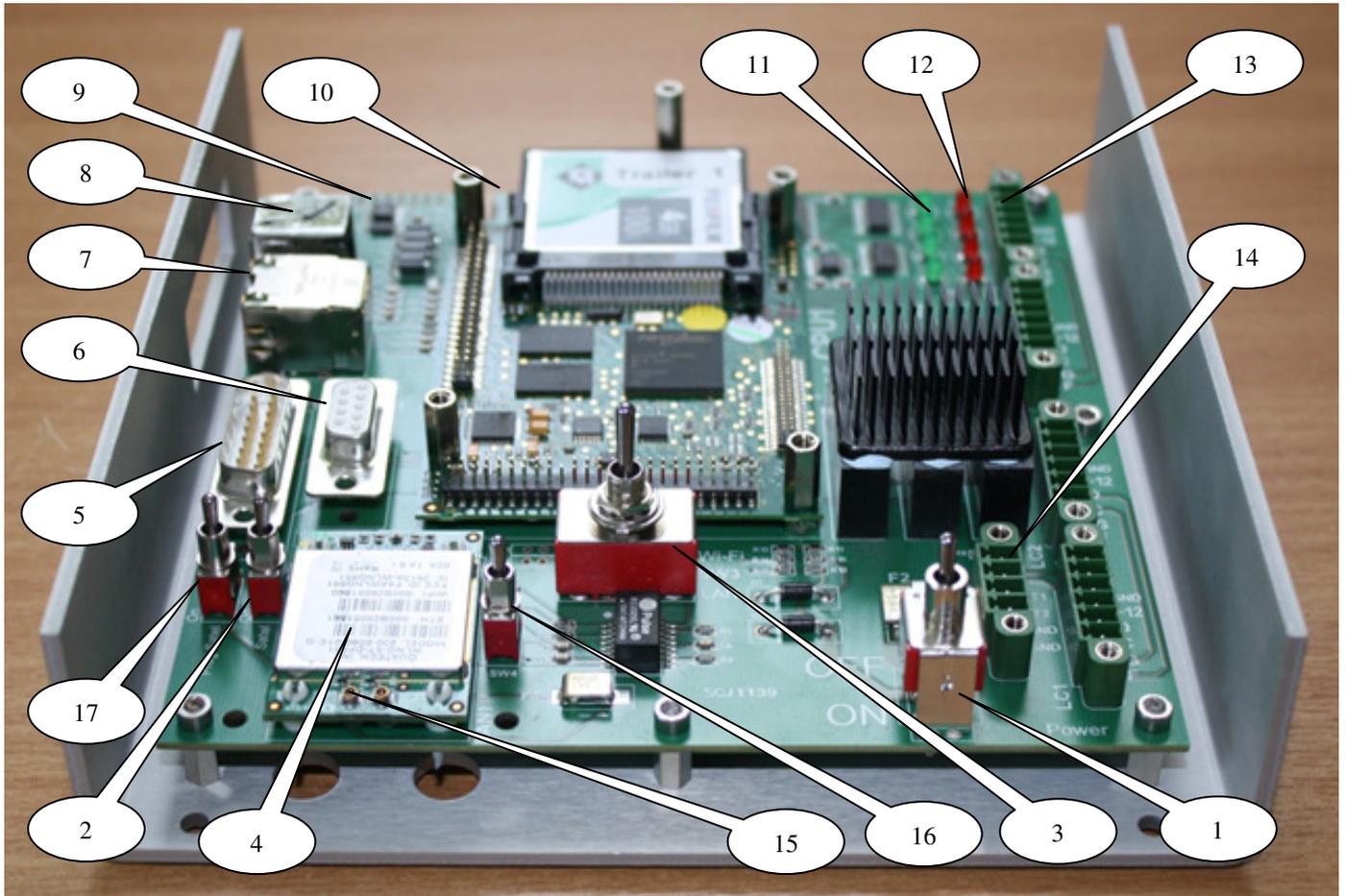
1) On/Off Switch — **Main Power Feed from the batteries**
2) Satel Modem On/off Switch — (Not Used for this application)
3) WiFi / Ethernet Selection Switch. — Normally left in the WiFi position
4) Wireless LAN module
5) RS232 Port reserved for Satel Modem — (Not Used for this application)
6) RS232 Port — (Not Used for this application)
7) USB Port x 2 — (Not Used for this application)
8) Ethernet Connector — Normally only used for diagnostics
9) Digital Output — (Not Used for this application)
10) Digital Input — (Not Used for this application)
11) Green Status LED's indicate correct operation. — (See Trailer Software)
12) Red Status LED's indicate a possible problem. — (See Trailer Software)
13) Load Cell Connection (Choc-Bloc x 4)
14) Power Connection
15) Pig-tail coax cable connector
16) Factory Reset WiFi switch
17) Program Satel Switch — (Not Used for this application)

LED Operation

On initial boot the LED's will appear to flash somewhat at random until all four red LED's illuminate. At which point the software goes into its 'find load cells' sequence. Each LED pair (red and green) represents a load cell, the pair nearest the top edge of the board being load cell '1'. If the load cell is found the green LED will illuminate, otherwise the red LED will illuminate. This progresses up through all four load cells and LED pairs. Once all four load Cells are found and the weighing thread starts to poll them the green LED's will flash together. All red LED's will not be illuminated.

Four GREEN flashing LED's indicates normal operation

The Computer assembly in its enclosure showing the load cells, antenna and power wires connected.
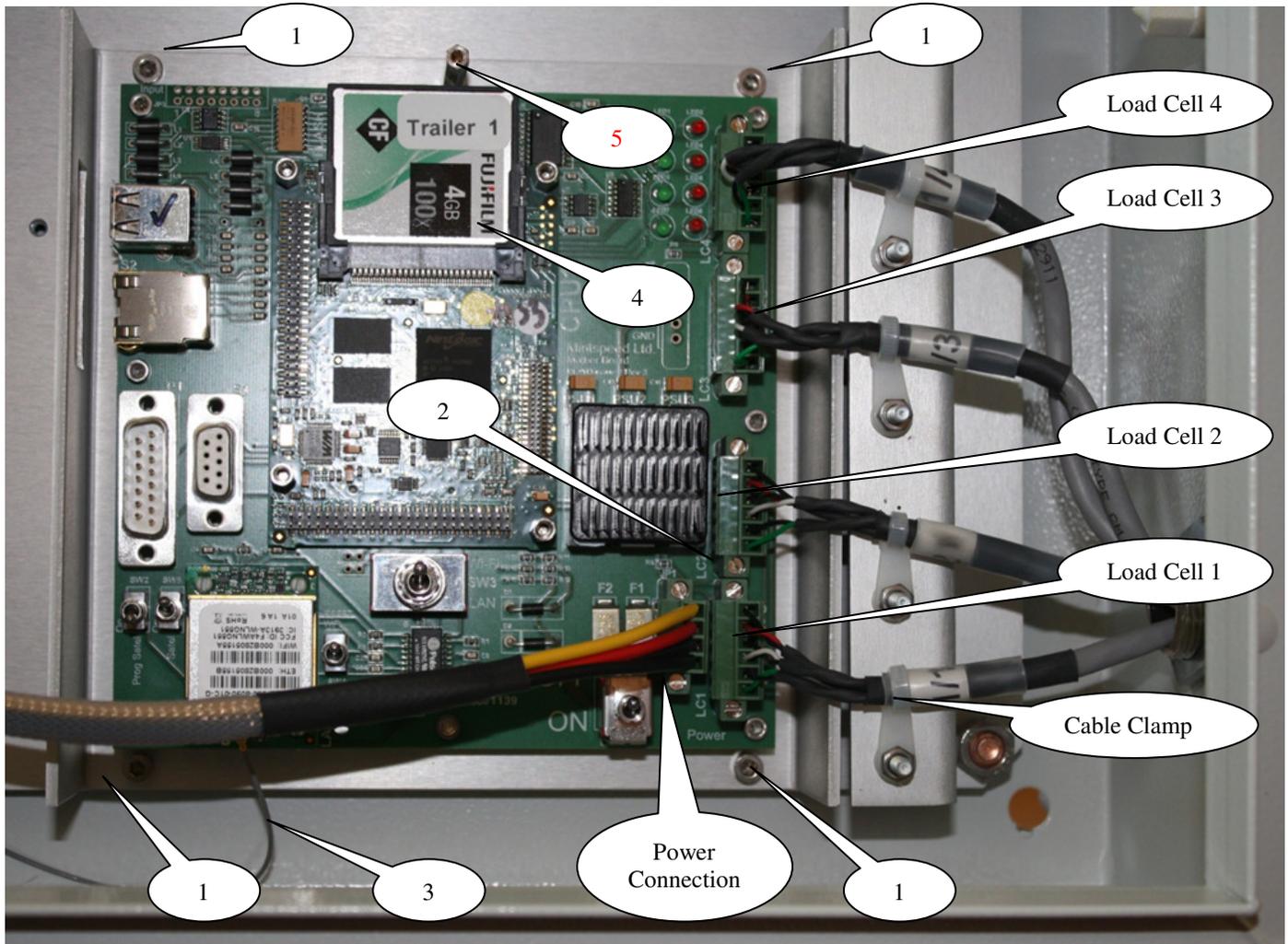
1) The computer assembly is held in place by four, M4 x 6mm Socket Screws in each corner
2) All the Green cable connectors are retained in place by screws at either end
3) The antenna connection is via a "pig-tail" coax cable. The cable and its connector are VERY FRAGILE
4) The application program resides in FLASH memory
5) The FLASH memory is retained in position by an M3 x 30mm long post. **DO NOT ATTEMPT REMOVAL OF FLASH MEMORY UNTIL THIS POST HAS BEEN REMOVED**.

3 Wireless LAN (WiFi)

The WiFi interface used on the Trailer Weighing Systems is virtually *identical* to that used on laptops, Tablet PC's, I-Pads, smart phones etc. and conforms to the same IEEE 802.1.1 b/g standard, it operates at 2.4 Ghz. However, a chief difference is that all these consumer devices have a *display* and some form of *keyboard* that permits a good user-dialogue to set-up the WiFi to connect with the appropriate network; the computer in the trailer weighing system doesn't have these peripheral device because they are **NOT** normally needed. The trailer weighing system includes a "PC" but a stripped-down version called an *embedded PC* with a minimal operating system called *Windows CE*. This PC and its operating system is perfectly adequate for the task in hand but does have some limitations when connecting to a WiFi network because of the lack of display and keyboard however, this operation is only normally done once on initial installation.

The WiFi in a laptop will scan the airwaves and produce a list of available networks (names, called **SSID**'s) with the associated wireless signal strength; a choice is made and the user will also be required to enter a **password** before gaining access. The principles are exactly the same for the weighing system **BUT** the choice of network and password is buried into a *configuration file*; this is a text file residing in the compact flash card in the trailer computer. The flash card is withdrawn and inserted into a suitable read/write unit and the file called "scrapman.cfb" is edited with *Notepad* or similar to type-in the correct **SSID** (Network Name) and appropriate **password**; security settings are also **pre-ordained** (**See footnote**).

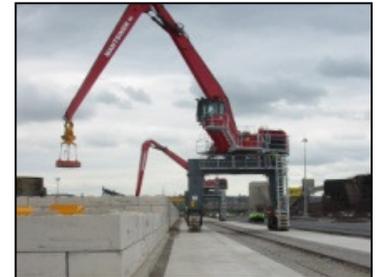**Typical Steelworks WiFi Network**

Crane Display

WiFi Network Access Point

Crane operators get a clear display of what material needs to be loaded and how much.

Tractor Display

WiFi Network Access Point

Tractor drivers get a clear display of what needs to be moved and where it needs to be moved to.

WiFi Network Access Point

Trailers weigh raw material and loads are transmitted to the Host

Host PC with application program (such as ScrapMan Manager) is the nucleus of the system; a database application that is constantly monitoring trailers, tractors and cranes. It gathers and transmits data to and from the database and PC terminals in mobile plant via the WiFi network.

The WiFi module has a number of settings which are normally configured by means of data stored within the FLASH memory card. Refer to the Mintspeed 'PlayStation' manual for details of configuring these files.

The Antenna is designed to operate in the open air at 2.4GHZ and is mounted to a bracket at the very front of the trailer roof; this is the safest place for the antenna but inevitably some will get broken. The antenna screws into the base as shown in the centre photograph. The base is complete with a coaxial cable that runs from the underside of the bracket to the computer enclosure where it terminates in a "N" type connector. Connection from the enclosure to the W-LAN Module on the Mother Board is from a *pig-tail* coax cable using a UFL right angle crimp gold-plated connector; IT IS IMPORTANT THAT THE LEFT-HAND CONNECTOR IS USED ON THE WIFI MODULE marked "CH2". This connector and cable are VERY fragile and delicate and considerable care must be used when dealing with these parts.

Fragile Connector. USE LH position marked CH2

The WiFi module has a number of settings which are normally configured by means of data stored within the FLASH memory card. Refer to the Mintspeed 'PlayStation' manual for details of configuring these files.

4 Batteries

The trailer weighing systems are battery powered and available in two options: a) replaceable or b) with in-built charger; these are illustrated in the trailer schematics (pages 1 and 2). In either case, the batteries are 12V DC and either 85Ah for the a) option or 105Ah for the b) option.

The two batteries are *effectively* connected in parallel but the termination on the mother board includes a diode to prevent a *good* battery from charging a *bad* one.

Each battery has flying-leads with a Bayonet-style, MIL spec connector; these connectors are polarised to ensure correct connection and once engaged, the knurled cover must be twisted clockwise into position to lock the connector in place. The Red positive lead includes a 7.5Amp Automotive Style fuse holder and fuse link.

The Battery voltage is available for transmission to Tractor and Crane Cabs as well as a host system.

Warning systems should be included to prevent the batteries becoming fully discharged

Battery Life will be considerably shortened if the voltage is allowed to fall below 12.00 Volts before recharging. Allowing the voltage to fall as far as 9 or 10 Volts may result in buckled plates; this is irreversible damage and the battery must be replaced.

4.1   Battery Pack (option a)

The Trailer weighing system is powered by two, 12V DC, 85 Ah Deep Cycle Batteries and these slide into the right-hand side of the trailer swan-neck as shown above. If both batteries are fully charged the weighing system should operate correctly for between 2 and 3 days before further recharging or replacement is required although this can be influenced by ambient temperature. If the trailer is going to be unused for a time, the computer should be switched off to conserve power and removed from the "active list" of trailers in use to prevent unnecessary polling.

4.2   Connection to Trailer (Option a)
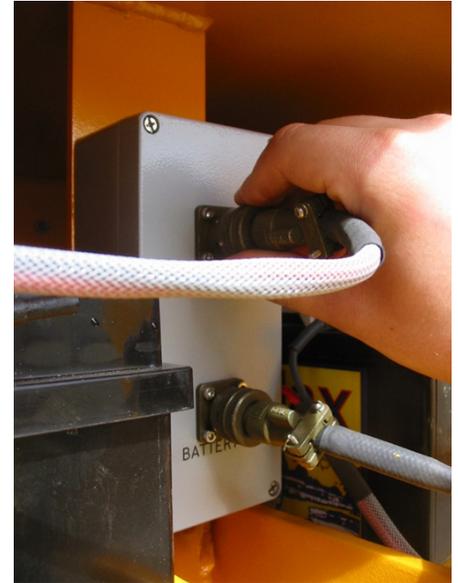
Connection to the trailer is made using a "MIL" spec, Bayonet style connector. The connector is polarised and so must be rotated until it is correctly located and then the locking ring is pushed in and rotated about 1/3rd of a turn clockwise.

The batteries can be *Hot Swapped*; it is **not** necessary to turn the computer off when changing.

The battery positions are numbered on the connection box and the *only significance* to this is the ID or *assignment* of the reported voltage.

For Example…….
Battery 1;   12.2V
Battery 2;   12.6V

Connection to Charger

The connector on the charger is identical to that used on the trailer. There are four LED's on the panel and the top RED one indicates Power ON. There are three STATUS LED's which show the state of charge of the connected battery.

GREEN   Charged (Ready for use)
AMBER   Charging
RED   Needs Charging

N.B.
If **none** of STATUS LED's come on the when the battery is connected it means the current battery voltage is too low to start the charge cycle (less than 10V).

This means the battery is not charging.

To *fool* the charger, temporarily connect a good battery in parallel for a few seconds – this should start the cycle and the good battery can be removed.

There are NO USER
SERVICEABLE CONTROLS

Refer to charger manual at www.scrap-man.com

4.2   Connection to Trailer (Option b) Batteries with in-built charging system

This trailer has two, 12V x 105Ah sealed AGM batteries and integral charger. The charger is powered from a mains supply (190—240V AC) which should include suitable protection; umbilical connection to the trailer is via an IP44, 2Pole + Earth Connector and the door must be left open when charging to provide ventilation for the charger.

The computer can be left On or Off whilst charging.
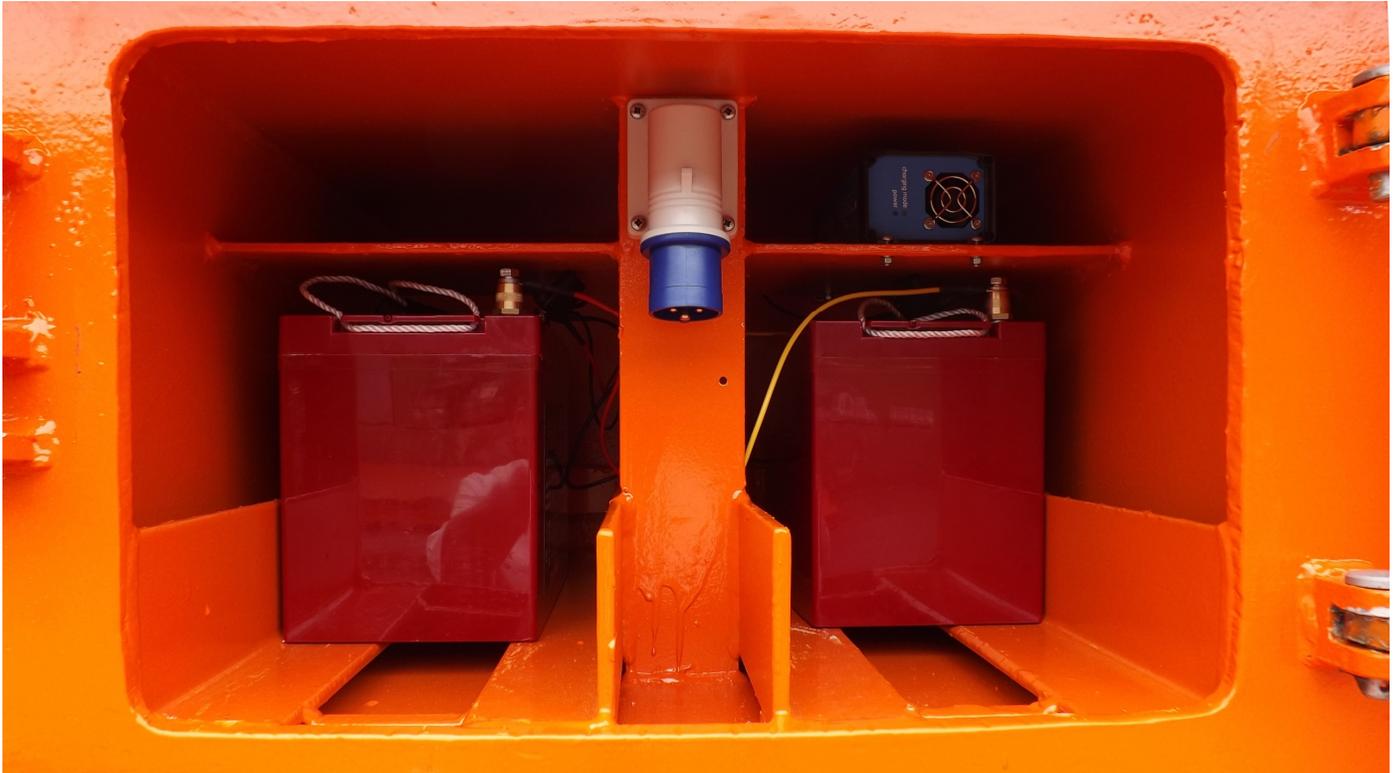
Battery Charger
The charger has three separate outputs although only two are used

5   Fault-finding & Repairs

The most invaluable tool in finding a problem with a weighing system is using the in-built software in each trailer which can be accessed wirelessly using a web browser such as *Microsoft Internet Explorer* or *Google Chrome…*

Launch a web browser and in the address box type the URL for the trailer you wish to check. For illustration purposes only, a table showing the factory-set URL for each of four trailers is shown below; the **ACTUAL** URL's may have been changed and will need to be obtained from the IT department.
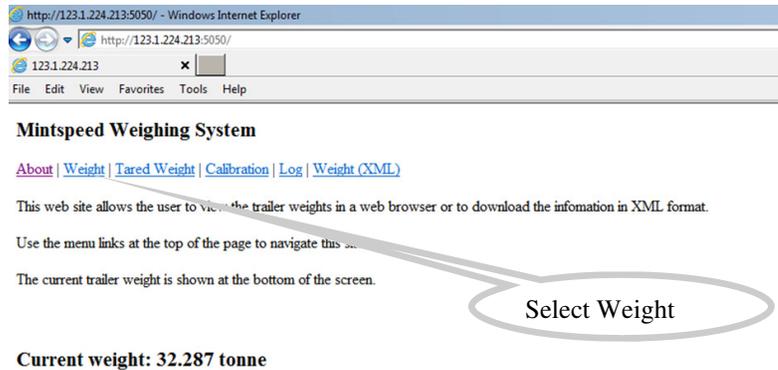
Illustration Only…..

Trailer 1 http://123.1.224.214:5050/

Trailer 2 http://123.1.224.215:5050/

Trailer 3 http://123.1.224.216:5050/

Trailer 4 http://123.1.224.217:5050/

The Home Page is shown on the right; using a mouse, select "Weight", this will show the *Weight* Screen (below)

Mintspeed Weighing System

About | Weight | Tared Weight | Calibration | Log | Weight (XML)

This web site allows the user to view the trailer weights in a web browser or to download the information in XML format.

Use the menu links at the top of the page to navigate this ...

The current trailer weight is shown at the bottom of the screen.

Select Weight

Current weight: 32.287 tonne

Mintspeed Weighing System

About | Weight | Tared Weight | Calibration | Log | Weight (XML)

Current Weights:

	Min	Ave	Max	Curr
Total	22759	22760	22760	22760
SN101	5369	5369	5369	5369
SN102	6219	6220	6220	6220
SN103	4781	4781	4781	4781
SN104	6390	6390	6390	6390

Serial Numbers:

	Serial No
SN101	16928625
SN102	16962111
SN103	16935631
SN104	16962135

Battery Voltage:

	Voltage
Battery 1	12.09
Battery 2	12.13

Current weight: 22.76 tonne

Current Weights Table
This show individual load cell readings and is most important for establishing whether or not all the load cells are working correctly. If the trailer is on level ground all four load cells should be taking a share of the load.

Readings that are negative are suspicious as are readings that are very high compared to the others.

Serial Numbers Table
The first column is the number of the load cell on the trailer; SN101 is the front, left-hand side, SN104 is the front, right-hand side. The Serial Number Column displays the serial number of the microcomputer that is in each load cell. If one of these is blank, it may indicate a fault with the cables or a load cell.

Battery Voltage Table
Is the readings obtained from the batteries and provides an indication of battery status. Batteries should NOT be allowed to fall below 11.00 VDC

5.1   Load cell Replacement (Mechanical)

If a load cell is deemed to be faulty it is first necessary to remove the basket if one is in place; obviously, this can usually only be done in the melt shop using the overhead gantry crane. The trailer electronics should be switched off and the batteries disconnected until the configuration process.

Cleanliness

There will inevitably be a large build-up of lime dust and general mud that may have produced a concretion around the load cell mountings and cable exit. It is important to carefully and thoroughly clean this area **BEFORE** starting dismantling. Cleanliness is essential to prevent contamination of the connectors with dust and grit which will certainly cause erosion of the gold contacts and hence adversely affect system reliability and longevity in the long term.

Dismantling

Mechanically, load cell replacement is very simple; it is NOT NECESSARY to remove either upper or lower parts of the cradle, consequently it is likely only a good pair of pliers or mole-grips is required. Having cleaned the area…………

1. Slide the rubber boot back down the flexible conduit from the load cell connector assembly

2. Grasp the connector locking ring and push inwards, simultaneously twisting anti-clockwise to release the connector. It is a "Bayonet" type locking.

3. Temporarily, put the connector end of the cable in a clean bag of some description to keep it free of dust / mud.

4. Use a screw or hydraulic jack to lift the weighing platform in the immediate vicinity of the faulty load cell. It is only necessary to take the weight off the load cells so that the three pins can be removed

5. Remove the R clips and washers from one side of the load cell and withdraw the pins

6. The load cell can now be removed from the cradle by sliding it out.

Use the opportunity to clean the cradle and surrounding area.

Reverse the above procedure with a new load cell.

5.2   Load cell Replacement (Configuration / Software)

It is now necessary to allocate an ID (Identity) to the new load cell. This is because the load cells each communicate with the trailer embedded PC using RS485 protocols and consequently each requires a unique ID or Address; 1 – 4. In fact, the identity assigned is 101,102,103 and 104 respectively but all **NEW** load cells or those returned from repair / recalibration will be assigned an **INITIAL ID of 1**. The procedure is semi-automatic but…………

It is important to remember that if two or more load cells are replaced simultaneously then only the lower number of 1 – 4 load cells is connected to the PC motherboard at a time.

Trailer viewed from above showing load cell numbering and assigned ID (Address); this is effectively a "Map" and is essential to diagnosing and locating a faulty load cell.
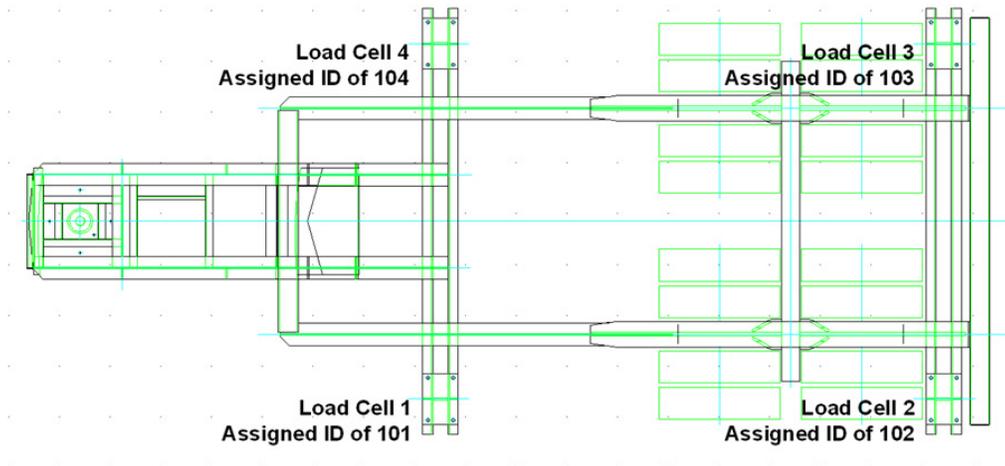
On powering up, the embedded computer will scan available load cells, recognise existing cells that have a valid ID / Address of 100 + the *actual number* (101,102,103 or 104) and then write a new address to the **first** new load cell found with an ID of "**1**". If replacing two cells at the same time only one at a time (the lower number) should be connected, the trailer should be turned off after completing the first setting. The second load cell connection made and then the trailer powered-up again. Like before, this will write a valid ID to the second new load cell. Example replacing load cells 2 **and** 3, load cells 1 and 4 are OK and already connected and have valid addresses.

    With load cell 3 disconnected, connect load cell number 2 (this will have an initial ID of 1)

    Power up which will then assign ID 102 to load cell number 2

    Power down, wait a few seconds

    Connect load cell number 3 (this will also have an initial ID of 1)

    Power up which will then assign ID 103 to load cell 3

    Power Down one more time, wait a few seconds then Power Up

    Configuration complete

It is important to understand this configuration procedure otherwise random assignment of load cell ID's on the trailer may occur which will erroneously "map" the position of the cells on the trailer making fault finding difficult. If a new embedded PC system is fitted to a trailer with pre-configured load cells then these will have already been assigned an ID and the boot program will recognise this and no further work should be required. If the load cell is being returned to the factory for repair / recalibration, it should subsequently arrive back from repair with its ID reset to "1". If however the load cell is being kept on site, unless it is deliberately changed it will retain the ID of its last position on a trailer. If it was in position 2 then its ID will be 102 and this will cause a problem if fitted to another trailer (unless by chance it was fitted in position 2).
The load cell must have its ID reset to "1" and this can be done using the Scrapman load cell programmer and the Mantracourt software discussed below.

Load cells can be disconnected either at the load cell end by unplugging the connector or the mother board end by removing the appropriate connector – the latter is easier and quicker.

For details about assigning an ID to a load cell see *Scrapman Load Cell Programming Manual*

Replacing the complete computer mother board assembly

Due to the integrated nature of the construction of the mother board and CPU board assembly it is considered ESSENTIAL to replace the whole assembly (as shown in the following photograph) NOT individual parts. Apart from the FLASH memory which should be retained, this assembly should be returned in the event of a fault.

Great care must be taken when replacing the board assembly; the most delicate part is the very fine co-ax cable running from the wireless LAN module on the board to the N-type bulkhead connector. The same also applies to the UMM gold-plated connector on the wireless LAN module itself – this is fragile and must be handled **very** carefully.
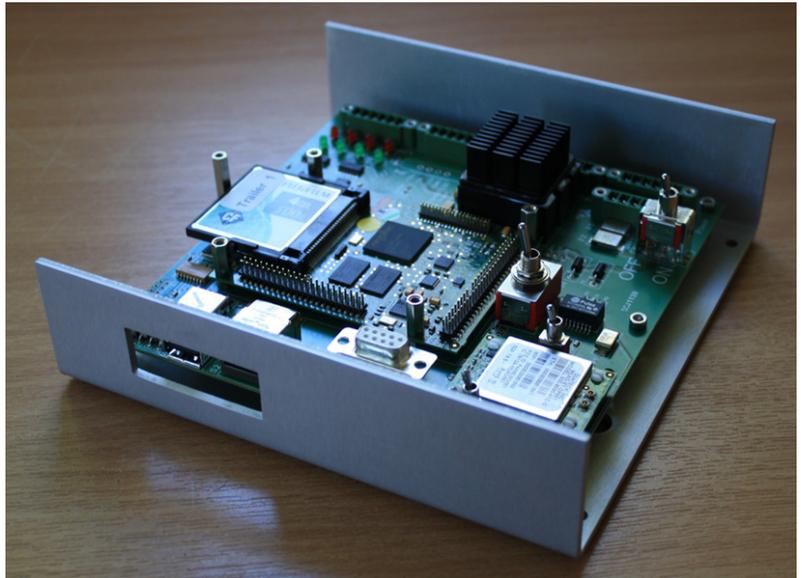
Switch the computer OFF and disconnect **BOTH** batteries in the battery compartment. If there is any doubt, make notes of the wiring and/or take a close-up digital photograph for future reference.

1) Using long-nose pliers, very carefully unplug the UMM pig-tail connector from the W-LAN module
2) Using a small screwdriver, undo the retaining screws in the ends of the green choc-bloc connectors and unplug them.
3) Using an Allen Key, remove the four M4 Hex socket screws in each corner of the CPU assembly
4) Remove the assembly and replace with a new unit taking care to safeguard the pig-tail coax cable.
5) Using a small box spanner, remove the Locking pin that retains the Flash Memory on both units.
6) Remove the Compact Flash Memory card from the faulty CPU and, taking care to ensure correct alignment and polarity, insert into the socket of the replacement CPU board.
7) Reverse the above instructions ensuring the right wires go in the right places. The miniature gold UMM connector must be fitted in the LEFT HAND position nearest the FRONT of the trailer. This position is marked "SEC" (Secondary). The wireless LAN connection will not work reliably if the other position is used.

From new, the load cell cables are all individually labelled as follows;

1/1	Trailer 1, Load Cell 1
2/1	Trailer 2, Load Cell 1
3/3	Trailer 3, Load Cell 3
4/1	Trailer 4, Load Cell 1 etc. etc.

The wiring is from "6-core, twisted-pair" cable. That is, three pairs of wires with each pair twisted together.
It is very important that these are not mixed up or crossed-over. The connections are as follows

GND	0 Volts	Black	
+12	+12 Volts	Red	This is one pair
D	+RS485	Black	
C	-RS485	White	This is one pair
F	-ve sense	Black	
G	+ve sense	Green	This is one pair

Once complete, the final stage is configuration of the WiFi module on the mother board. This is a semi-automatic process that uses configuration data held in the FLASH memory and is accomplished as follows;

1) Press and hold down (it is a sprung-loaded *biased* switch) the WiFi RESET switch

2) Simultaneously, switch the computer ON using the On/Off switch.

3) Wait about 15 seconds, this will flush the old WiFi settings away.

4) Release the WiFi RESET switch and turn the computer Off

5) After a moment, turn the computer back on and the WiFi self-configuration process will commence.

This process can take several minutes or more; the unit should be power cycled **Off** then **On** again before use.

6 Weight Checking and Calibration

Checking and adjusting weighing system with Dead Weights

The weighing system can be checked at any time using dead weights and the loads can be monitored via the corporate WiFi intranet using a web browser such as *Internet Explorer* in conjunction with the software within the trailer itself, this allows considerably more investigation at individual load cell level rather than just "Total Weight".

- The trailer <u>must</u> be positioned on flat, smooth and level ground.

- It is good practise to thoroughly clean the weighing platform of scrap and other spilled materials before starting. Any build-up of debris may cause instability or "local point loading" problems when loading weights.

- Use of many small dead weights piled high could constitute a **hazard** to staff working on and around the trailer

- For load checking purposes it is advisable to add weight as close as possible to the ***maximum rated weight of the trailer***. Loads less than 10T are meaningless since that is probably less than the weight of the scrap basket and hence lower than the main area of interest.

- It is important that the weights are loaded symmetrically on the weighing platform about the normal centre of gravity of the basket.

- Do not be surprised if the weight is not spread evenly across all four load cells.

Accessing the weighing system via the Web Browser (for connection with a LAN cable, see appendix a)

Launch a web browser and in the address box type the URL for the trailer you wish to check. For illustration purposes only, a table showing the factory-set URL for each of four trailers is shown below; the **ACTUAL** URL's may have been changed and will need to be obtained from the IT department.
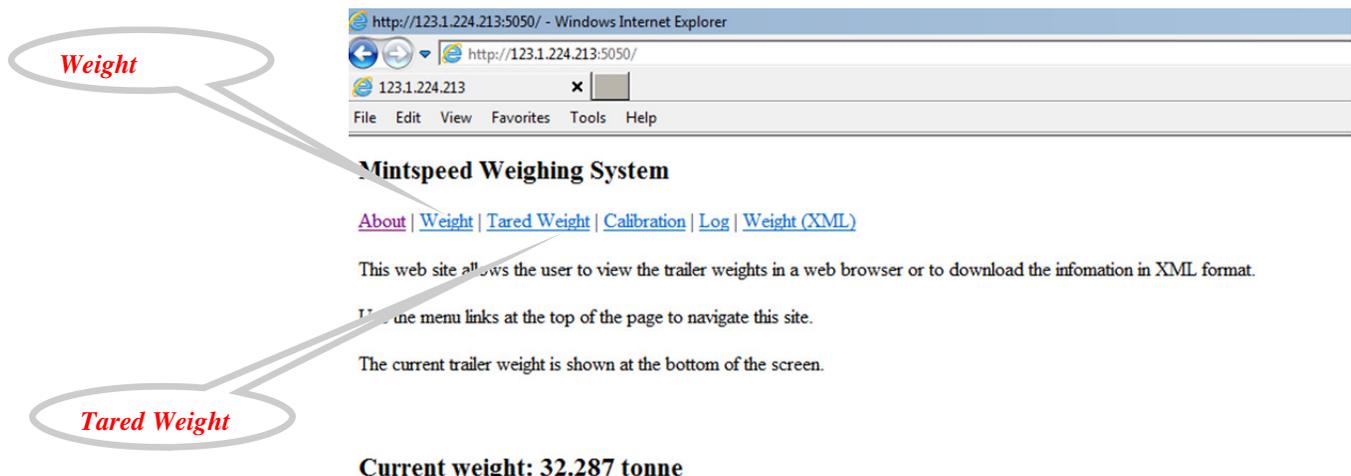
Illustration Only…..

Trailer 1 http://123.1.224.214:5050/

Trailer 2 http://123.1.224.215:5050/

Trailer 3 http://123.1.224.216:5050/

Trailer 4 http://123.1.224.217:5050/

Once a connection is established, the following screen should be seen; the home page of the weighing system and in this case, Trailer 0 – the Spare Computer.

The *Current Weight* (32.287 T) is the TOTAL WEIGHT seen by the system including the platform and <u>everything on it</u>. Depending upon the model of trailer, the weighing platform could weigh between 6 and 20 Tonnes when empty.

For Checking Weight accuracy, use either the *Weight* page or the *Tared Weight* page. DO NOT use the *Calibration* page without first reading and understanding the contents of the associated Calibration Notes document. This is available at http://www.scrap-man.com/files/Calibration Notes.pdf

Place the cursor over **weight** and select; the *weight* screen will appear to show the real-time (current) status of the trailer with Total and Individual load cell weights expressed in Kg. The battery voltage is also displayed.

Mintspeed Weighing System

About | Weight | Tared Weight | Calibration | Log | Weight (XML)

Current Weights:

	Min	Ave	Max	Curr
Total	32282	32282	32282	32282
SN101	11488	11488	11488	11488
SN102	5801	5801	5801	5801
SN103	9003	9003	9003	9003
SN104	5990	5990	5990	5990

Serial Numbers:

	Serial No
SN101	16834493
SN102	16834487
SN103	16834491
SN104	16834489

Battery Voltage:

	Voltage
Battery 1	12.14
Battery 2	12.23

Current weight: 32.282 tonne

Do not expect each load cell to be carrying 25% of the total weight; for this reason, **INDIVIDUAL** Load Cell calibration using dead weights cannot be carried out in-situ since it is impossible to reliably apportion accurate load to each load cell.

Fine Tuning the Calibration

This procedure allows some tweaking of the factory set calibration values. It **should not** be done to eliminate errors from a faulty load cell. The weigh check facility should be done first and if there is a problematical load cell discovered, it should be replaced. Calibration should only ever be attempted if the following conditions can be met;

1) The trailer **MUST** be on flat and level ground
2) The test weights **MUST** be close to the rated maximum load of the trailer (see following page)
3) Using lots of small weights is potentially dangerous; a small number of BIG weights is better
4) Suitable lifting gear MUST be available (melt-shop crane)
5) The weights need to be loaded to the platform symmetrically and close to the C of G of the scrap basket

The calibration procedure does NOT alter the calibrated values within the load cell but it DOES change the summed (Total) load that is transmitted back to the host system. The process is done against the application of a single, known dead weight and this weight should be close to the upper limit of the capacity of the trailer (80-100%). The weight should be applied as close to the centre of gravity of the normal basket position as possible and once complete, the weight will be entered into the SetIpAddressInfo.xml file in the FLASH memory under <CALWEIGHT>

1) Open up an Internet Explorer session
2) Enter IP address of relevant trailer. In this example we are accessing Trailer 0 – http://123.1.224.213:5050/ followed by Return (Enter)
3) You should get the home page for Trailer 0 as shown above
4) Select "Calibration" and you should get the screen below
5) Ensure bed is empty and clean then enter a user name and when stable answer "Yes"
6) Press "Submit"

Do NOT commence a calibration procedure without having read, and fully understood, the associated *Calibration Notes* document.
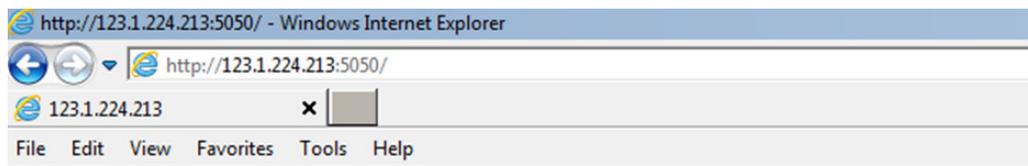
Mintspeed Weighing System

About | Weight | Tared Weight | Calibration | Log | Weight (XML)

Calibration (Stage 1)

Stage 1 calibration will determine a base line trailer weight without any weight on the trailer.

Username:

Is the weigh bed empty and is the weight stable?
⊙ No ○ Yes

[Submit]

Current weight: 32.288 tonne

Stage 2 requires a known test weight to be added to the platform and that value keyed into the box. THIS WEIGHT NEEDS TO BE AS BIG AS POSSIBLE (80 – 100% of the rated load of the system); this is the *area of interest*. Anything below about 15 Tonnes is almost irrelevant since that is the normal Tare weight of an empty basket.

After which; the display shows……….

In this case, a 90T weight is used and the number 90,000 (Kg) is entered). When stable, the "Yes" key is pressed followed by "Submit" and the display will show….
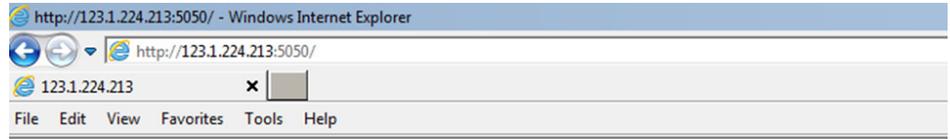
Mintspeed Weighing System

About | Weight | Tared Weight | Calibration | Log | Weight (XML)

Calibration (Stage 2)

Stage 2 calibration uses the measured weight of a known test weight to work out a correction factor

Known Test Weight (Kg): 90000

Is the calibration weight on the trailer bed:
○ No ⦿ Yes

[Submit]

Current weight: 122.519 tonne

Mintspeed Weighing System

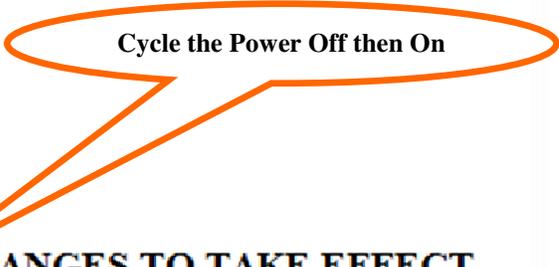About | Weight | Tared Weight | Calibration | Log | Weight (XML)

Calibration Done

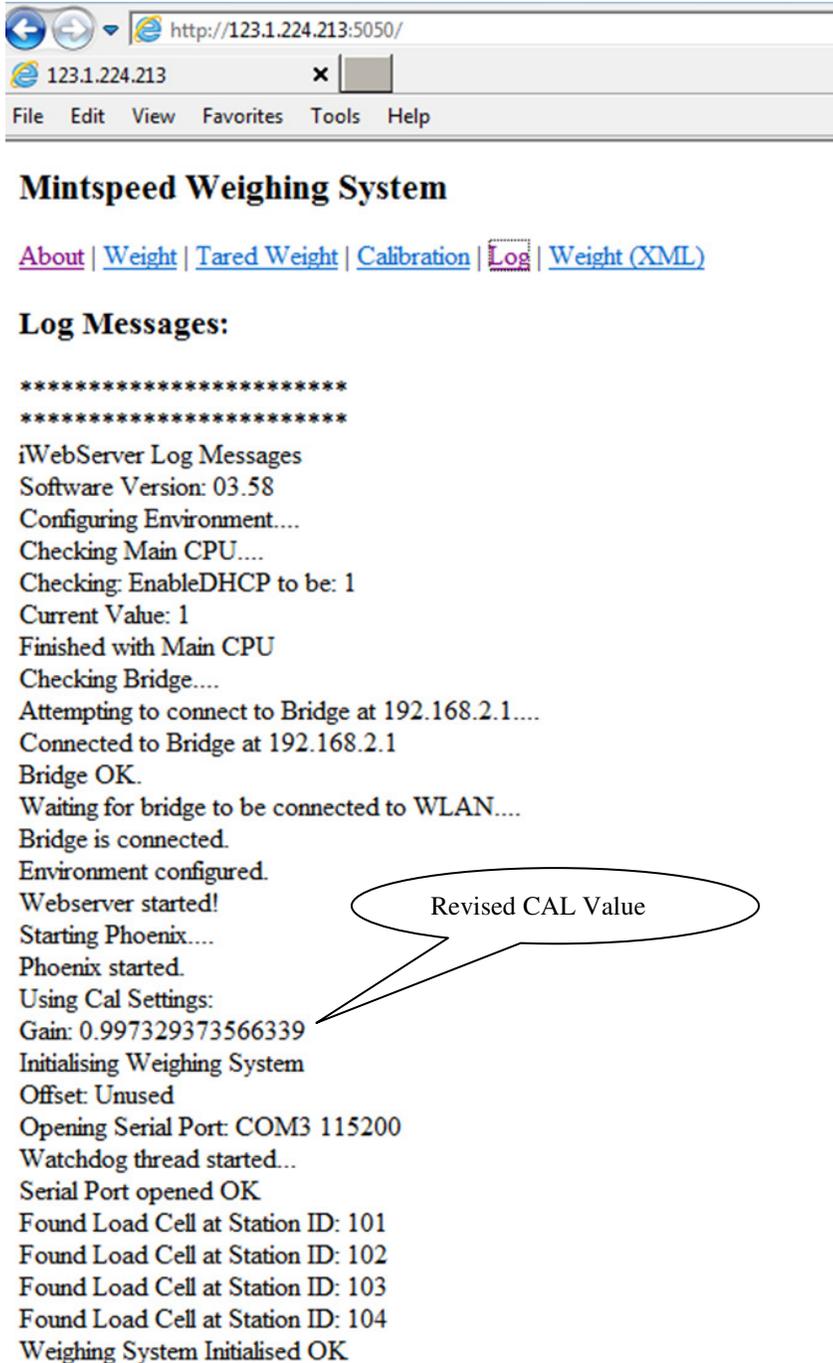The calibration process has been completed.

Calibration data has been updated

POWER CYCLE TRAILER FOR CHANGES TO TAKE EFFECT

Cycle the Power Off then On

Finally, go back to the Home Page and select "Log". This will display recent actions and the revised CAL (Gain) value.

Mintspeed Weighing System

About | Weight | Tared Weight | Calibration | Log | Weight (XML)

Log Messages:

```
************************
************************
iWebServer Log Messages
Software Version: 03.58
Configuring Environment....
Checking Main CPU....
Checking: EnableDHCP to be: 1
Current Value: 1
Finished with Main CPU
Checking Bridge....
Attempting to connect to Bridge at 192.168.2.1....
Connected to Bridge at 192.168.2.1
Bridge OK.
Waiting for bridge to be connected to WLAN....
Bridge is connected.
Environment configured.
Webserver started!
Starting Phoenix....
Phoenix started.
Using Cal Settings:
Gain: 0.997329373566339
Initialising Weighing System
Offset: Unused
Opening Serial Port: COM3 115200
Watchdog thread started...
Serial Port opened OK
Found Load Cell at Station ID: 101
Found Load Cell at Station ID: 102
Found Load Cell at Station ID: 103
Found Load Cell at Station ID: 104
Weighing System Initialised OK
```

Revised CAL Value

Before calibration, a typical *Calibration-Settings.xml* file may look like…..

```xml
<?xml version="1.0" encoding="utf-8"?>
<Settings>
  <Weight>
    <Gain>1.0</Gain>
    <UseOffset>false</UseOffset>
    <Offset>0</Offset>
    <!-- Cal weight in Kg -->
    <CalWeight>90000</CalWeight>
  </Weight>
  <Battery>
    <Gain>1.0</Gain>
  </Battery>
</Settings>
```

The default (Factory) setting for *Weight GAIN* is 1.0

After calibration, a typical *CalibrationSettings.xml* file may look like…..

```xml
<?xml version="1.0" encoding="utf-8"?>
<Settings>
  <Weight>
    <Gain>0.997329373566339</Gain>
    <UseOffset>false</UseOffset>
    <Offset>0</Offset>
    <!-- Cal weight in Kg -->
    <CalWeight>90000</CalWeight>
  </Weight>
  <Battery>
    <Gain>1.0</Gain>
  </Battery>
</Settings>
```

This CAL value will be stored in the CalibrationSettings.xml under the heading "Gain". It should be about "1" (Unity Gain). HOWEVER if the number is too large it is indicative of a load cell fault and further investigation is required.

Miscellaneous

Welding

If any welding is necessary to the chassis it is important to observe stringent precautions to prevent damage to the load cells or electronics. The computer should be switched off AND the batteries should be completely disconnected inside the battery compartment. The load cells should be disconnected and the easiest place to do this is at the load cell end as shown in the following photograph.

There will inevitably be a large build-up of lime dust and general mud that may have produced a concretion around the load cell mountings and cable exit. It is important to carefully and thoroughly clean this area BEFORE starting dismantling.

To disconnect the load cell…………..

1) Slide the rubber boot back down the flexible conduit from the load cell connector assembly

2) Grasp the connector locking ring and push inwards, simultaneously twisting anti-clockwise to release the connector. It is a "Bayonet" type locking.

3) Temporarily, put the connector end of the cable in a clean bag of some description to keep it free of dust / mud.

The earth point should be cleared of paint and as close as possible to the area being welded. If the area to be welded is on the weighing platform then the earth clamp should also be on the weighing platform and similarly with the main chassis. If the earth clamp is fixed to the chassis whilst welding the weighing platform the current path will be through the load cell / load cells and they will be seriously damaged.

After welding is complete, reverse the above procedure

Health & Safety Issues

Lead-Acid batteries

Lead-Acid batteries are a potential hazard and care must be taken in their handling.

Each replaceable battery weighs 18Kg (fixed batteries 25Kg) and therefore great care must be taken lifting and lowering these batteries to and from the trailer to prevent spinal or any other physical injury. Similarly, care must be taken when removing or replacing batteries in the rack at the charging facility.

Since batteries contain sulphuric acid, eye protection as well as industrial rubber gloves should be worn at all times during handling. Any acid spillage should be immediately washed with fresh water and medical attention sought.

Great care must be taken to ensure that no metallic or any conducting material comes into simultaneous contact with the +ve and –ve terminals during handling. This will cause a short-circuit and could possibly result in a battery explosion.

It is also extremely important that there should be no smoking or any naked flame permitted in the vicinity of the battery charging area since hydrogen (a very explosive gas) is produced in the charging process.

Load Cell Retaining Pins

The load cells are held in position by three hardened pins. Only two support the load cell (and hence the weight), the centre pin is normally free of any load and is only present to prevent the weighing platform being lifted off the chassis.

There is a degree of permissible lateral movement on these pins within the cradle itself and this movement is limited by large washers and R clips at either end. However, if the basket or trailer structure is involved in a collision, shock loads can be transmitted that can push the hardened pins to the limit of travel and if the impact is sufficient, shear the R clip as shown in this photograph.

It is dangerous to leave the trailer in this condition since the large, hardened pins could possibly creep out of the cradle causing the load cell to drop.

It is considered <u>essential</u> that there is a weekly visual inspection of all load cell pins, washers and R clips and especially if a trailer has been involved in a collision.

Appendix A
Connecting a PC to the weighing computer using a LAN Cable for Calibration and fault-finding.

It is usually much easier to connect to the trailer wirelessly but if this is not possible, a connection can be made to the weighing system using a CAT45 Cable between the PC and the Ethernet port on the weighing system. However, it is first necessary to change some of the configurations of the weighing system by editing one of the files on the compact flash card (C/F) using a C/F card read/write unit and a text editor such as Microsoft Notepad…

Name	Date modified ▲	Type	Size
.svn	19/12/2014 13:47	File folder	
CF2	19/12/2014 13:47	File folder	
MyWebServer	19/12/2014 13:47	File folder	
Startup	19/12/2014 13:47	File folder	
Utils	19/12/2014 13:47	File folder	
Airborne_Enterprise_Command_Line_Ref...	12/12/2014 15:...	Adobe Acrobat D...	2,711 KB
CalibrationSettings.xml	12/12/2014 15:24	XML Document	1 KB
LauncherSettings.xml	12/12/2014 15:24	XML Document	1 KB
ReadMe.txt	12/12/2014 15:24	Text Document	2 KB
scrapmanlite.cfb	12/12/2014 15:24	CFB File	1 KB
TimeSettings.xml	12/12/2014 15:24	XML Document	1 KB
CommsSettings.xml	19/12/2014 15:08	XML Document	1 KB
scrapman.cfb	21/12/2014 11:27	CFB File	1 KB
ceWeighLog.txt	29/12/2014 02:13	Text Document	21 KB

CommsSettings.xml

Switch the trailer OFF and load the C/F card to a read/write unit, the directory should look like the picture on the right.

The file that needs to be edited with the text editor is; *CommsSettings.xml* and the text **scrapman.cfb** to be removed from the 4th line.

```
CommsSettings.xml - Notepad
File  Edit  Format  View  Help
<?xml version="1.0" encoding="utf-8"?>
<Settings>
  <Bridge>
        <ConfigFile>scrapman.cfb</ConfigFile>
  </Bridge>
  <Ping>
        <Address>123.1.224.200</Address>
    <Interval>0</Interval>
    <Log>0</Log>
  </Ping>
  <WeightXML>
    <Format>concise</Format>
  </WeightXML>
</Settings>
```

Remove the text scrapman.cfb

```
CommsSettings.xml - Notepad
File  Edit  Format  View  Help
<?xml version="1.0" encoding="utf-8"?>
<Settings>
  <Bridge>
        <ConfigFile></ConfigFile>
  </Bridge>
  <Ping>
        <Address>123.1.2...200</Address>
    <Interval>0</Interval>
    <Log>0</Log>
  </Ping>
  <WeightXML>
    <Format>concise</For...>
  </WeightXML>
</Settings>
```

Should look like this

After saving the CommsSettings.xml file back to the C/F card, change SW3 from WiFi to LAN position; it is now necessary to change some settings within the PC top have a fixed I/P (Internet Protocol) address..

Ethernet Port

SW3
WiFi / LAN Switch
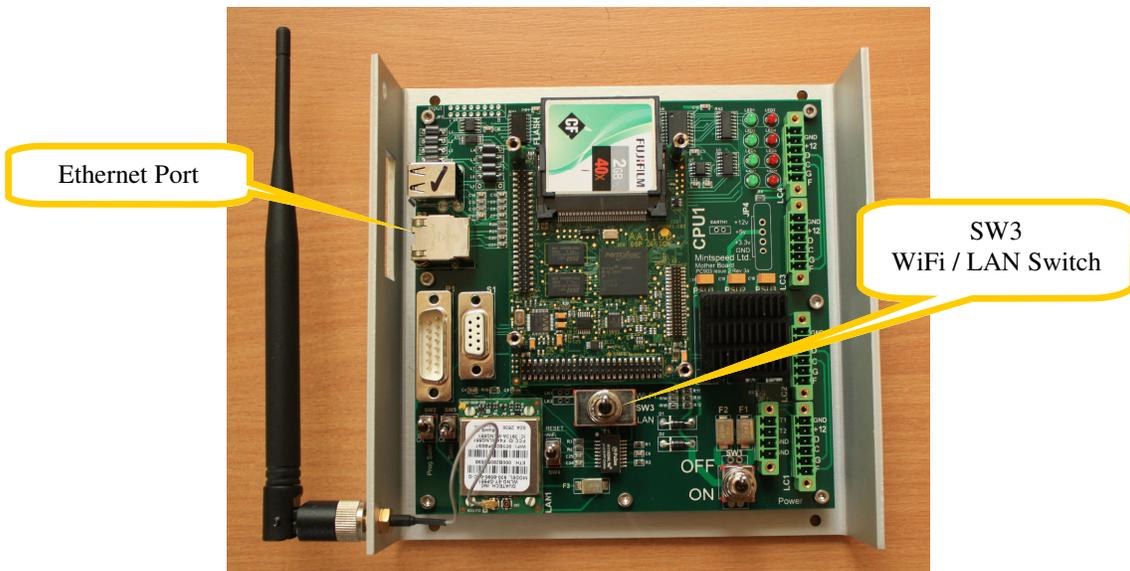
Changing the PC settings

The illustrations may vary from those on your PC due to the version of *Windows* you are running; if there is a problem, seek help from your IT department.

Modify the LAN port to have a fixed I/P Address...
1) Click the **Start Button** and then open **Control Panel**
2) Find and open **Network Connections**
3) Right-click the connection that you want to change, and then click **Properties**. If you're prompted for an administrator password or confirmation, type the password or provide confirmation.
4) Click the **Networking** tab. Under **This connection uses the following items**, click **Internet Protocol Version 4 (TCP/IPv4)**, and then click **Properties**.
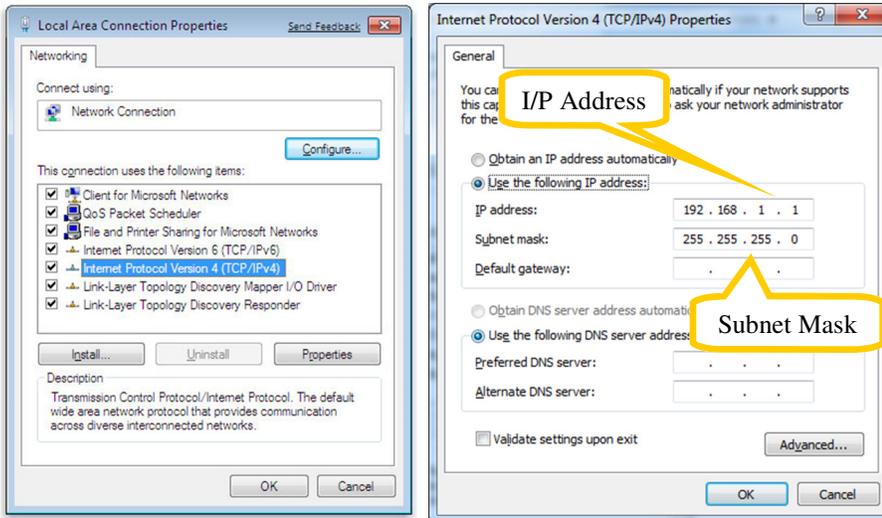
5) Click **Use the following IP Address** and then, in the **IP address** enter **192.168.1.1**, in the **Subnet mask** enter **255.255.255.0**, and then click **OK**.

6) Switch the Trailer ON using a full boot-up as described at the foot of Page 17 in this manual.

Browsing to the Weighing Systems setting page

Open a web-browser
In the address box enter 192.168.1.2:5050 cr
This should display the weighing system home page….

If this does not happen, then the trailer AND PC may need to be restarted to ensure the new settings have taken effect.

WHEN YOU HAVE FINISHED WITH THE LAN CONNECTION, REVERSE THE ABOVE ACTIONS
TO REINSTATE THE WiFi COMMUNICATION