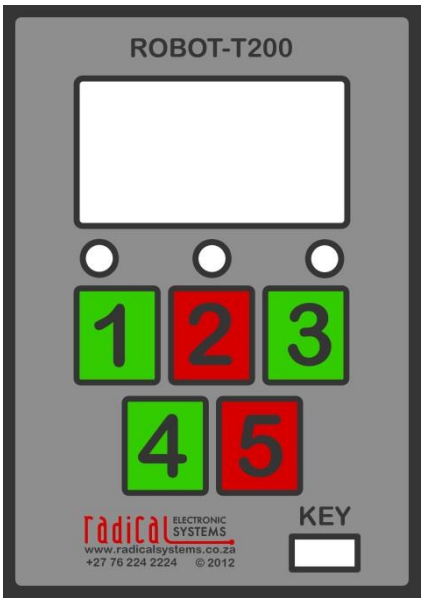
Robot-T201

User & Programmers Manual



Revision 1a – 28 September 2020

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1 HUMAN MACHINE INTERFACE (HMI)

The Robot-T201 a small network terminal with LCD screen, LED indicators, buttons and a KEY port. Internally the Robot has two serial ports to which scanners and scales can be connected.

The Robot interacts with an operator to performs different tasks such as on-demand barcode printing, palletizing stations and SOLAS scale applications. An HTTP server is needed to serve the Robot to perform network related transactions. These transactions can be used to service processes within a factory or pack house. The Robot operating system implements a RESTful API to provide interoperability between conventional equipment or tasks and a web server. This single ability provides the glue between traditional manual tasks and information technology.

Through its LCD screen and LED indicators the Robot can visually notify the user and in turn with the buttons and KEY port the user can interact with processes, logon/logoff on a server and provide feedback to the web server.

A built-in webserver serves a user interface that is used to configure the robot. The webserver also exports an CGI endpoint to control the Robot or to retrieve information about it. This make it easy to configure via a web browser.

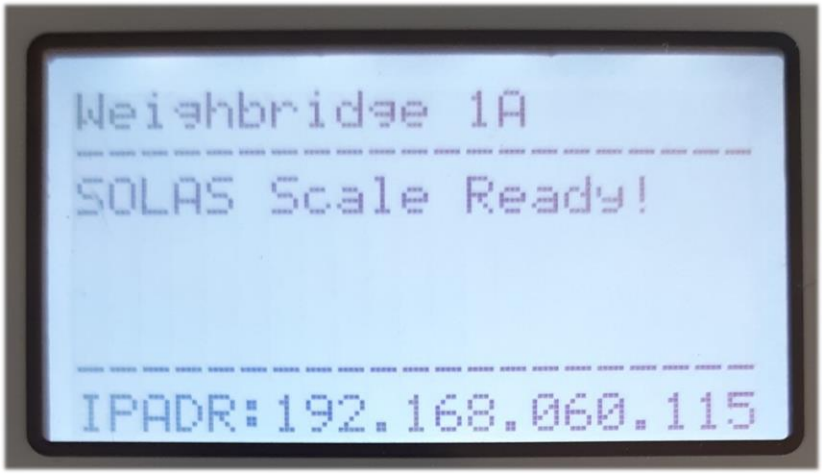
A general example is an operator that weighs a pallet, scan the barcode and the transaction gets logged on the server. The KEY port identifies the user and an exact timestamp is recorded of whom weighed the pallet and which pallet it was.

2 APPLICATIONS

- SOLAS Scale Interface
- Palletizing
- Carting Weighing and QC
- Fruit Packing Station
- Dynamic Labelling
- General Packer Interface
- Incentive Based Packing
- Packer at Station Logging
- Stock movement
- Vehicle terminals

3 ROBOT HUMAN INTERFACES

3.1 LCD SCREEN



An LCD screen with a resolution of 128 x 64 pixels is organized into 8 lines by 20 rows of characters. General format of the screen is as follows:

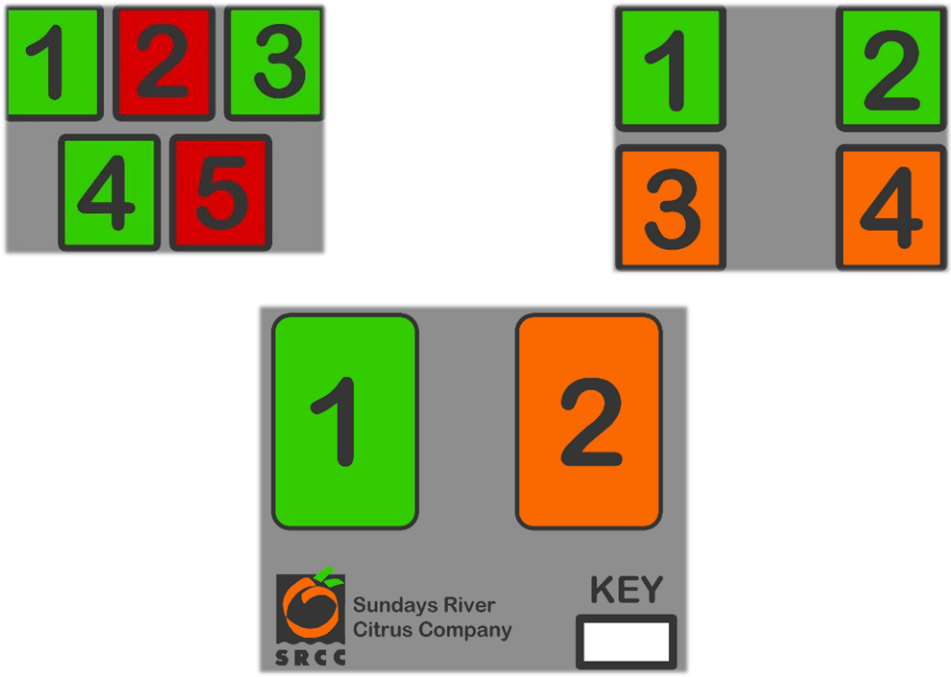
Name of the Station, as provided during the setup phase at boot time
LCD line 1, as provided by the server response
LCD line 2, as provided by the server response
LCD line 3, as provided by the server response
LCD line 4, as provided by the server response
IP Address in IDLE mode or View name in normal mode

3.2 LED INDICATORS [RED | ORANGE | GREEN]

The LED indicators has different function depending the screen view of the Robot. In the Station and User views the server response determines which LED is lit. In scale view the orange LED indicates scale activity. In this same view the red LED means a weight error and green means the weight is within limits.

3.3 KEYPAD

Various keypad options are available from two button to 6 buttons depending on the application. A full keypad can also be installed in applications where the operator needs to type in numbers or characters. Below are examples of different keypads.



3.4 KEY PORT

In applications where controlled access is needed or a terminal must be logged on for activity a dongle can be assigned to a user. The dongle must be plugged into the port before the user can operate the station. This solution is perfect for incentive schemes where operator activity can be logged. This provides and extra level of QC and carton history.

4 ROBOT-T201 & SCALE

The ROBOT-T201 offers an excellent solution capturing pallet or container weights for SOLAS adherence and certification. The image below shows a typical process scanning a pallet barcode while a certified SOLAS scale is sending weights to the ROBOT.

A ROBOT scale setup consists of a ROBOT-T201, a serial hand barcode scanner and a certified SOLAS scale.

To generate HTTP transactions the ROBOT requires and operator to load the scale with an acceptable weight and scan a barcode related to the product. This RESTful process will save the weight against the barcode.

4.1 SCALE

The ROBOT can support any scale with an RS232 serial connection. A special cable is normally made up to connect the scale to the ROBOT. Currently only the Micro-A12E scale head is supported. But on request we can easily add support for different scales.

Figure 1 Micro-A12E

Below is a picture of a Micro-A12E with pallet platform.

Figure 2 Micro-A12E Platform

4.2 BARCODE SCANNER

A barcode scanner with a serial RS232 interface or USB is supported. The scanner must be powered by +5V and 500mA maximum. A special cable is made up to provide power to the scanner. Make sure to configure the scanner to post-fix a carriage return (CR) to each barcode packet.

Figure 3 - Scanner

5 ROBOT USER INTERFACE

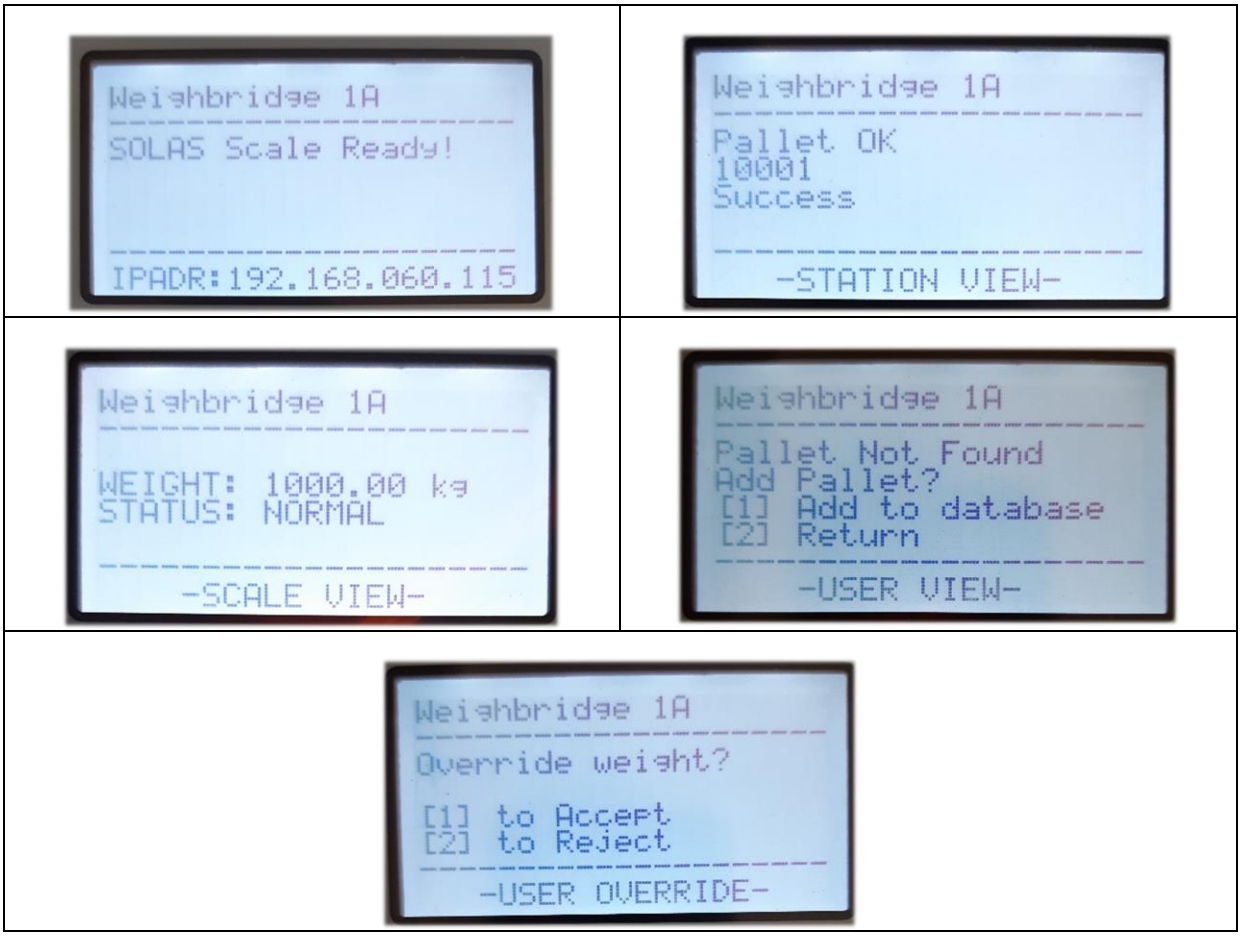
A definite state machine defines the view or screen that is presented to the operator. Certain screens provide user interaction and other are automated. It is important to understand the function of each view.

5.1 OPERATIONAL SCREEN VIEWS

The following views are present in the Robot operating system under normal operating conditions, after the setup was provide from the server. The table below defines the function of each view.

Name	Function
IDLE	This view is presented when the station is idle for more than 60 seconds
STATION	Station view represents a result from the server. Generally, this view is showed just after a server transaction. Buttons has no effect in this view.
SCALE	As soon as scale activity is detected or a weight more than 10 kg it will immediately turn to this view. If the scale becomes inactive or very low weight is recorded it will return to the station view. Buttons has no effect in this view. A barcode scanned with the handheld scanner will generate a new REST API call. The server can then direct the screen view to Station view or User view.
USER	The User view provides some way to interact with the user. Buttons activity will be published to the server, upon which the server can redirect the view to an updated User view or back to Station view.
OVERRIDE	Override will become active right after a scan in Scale view. If the weight is not within the low and high limit set by the server, the operator can choose to still publish the weight to the server.

Example of the different views are below.



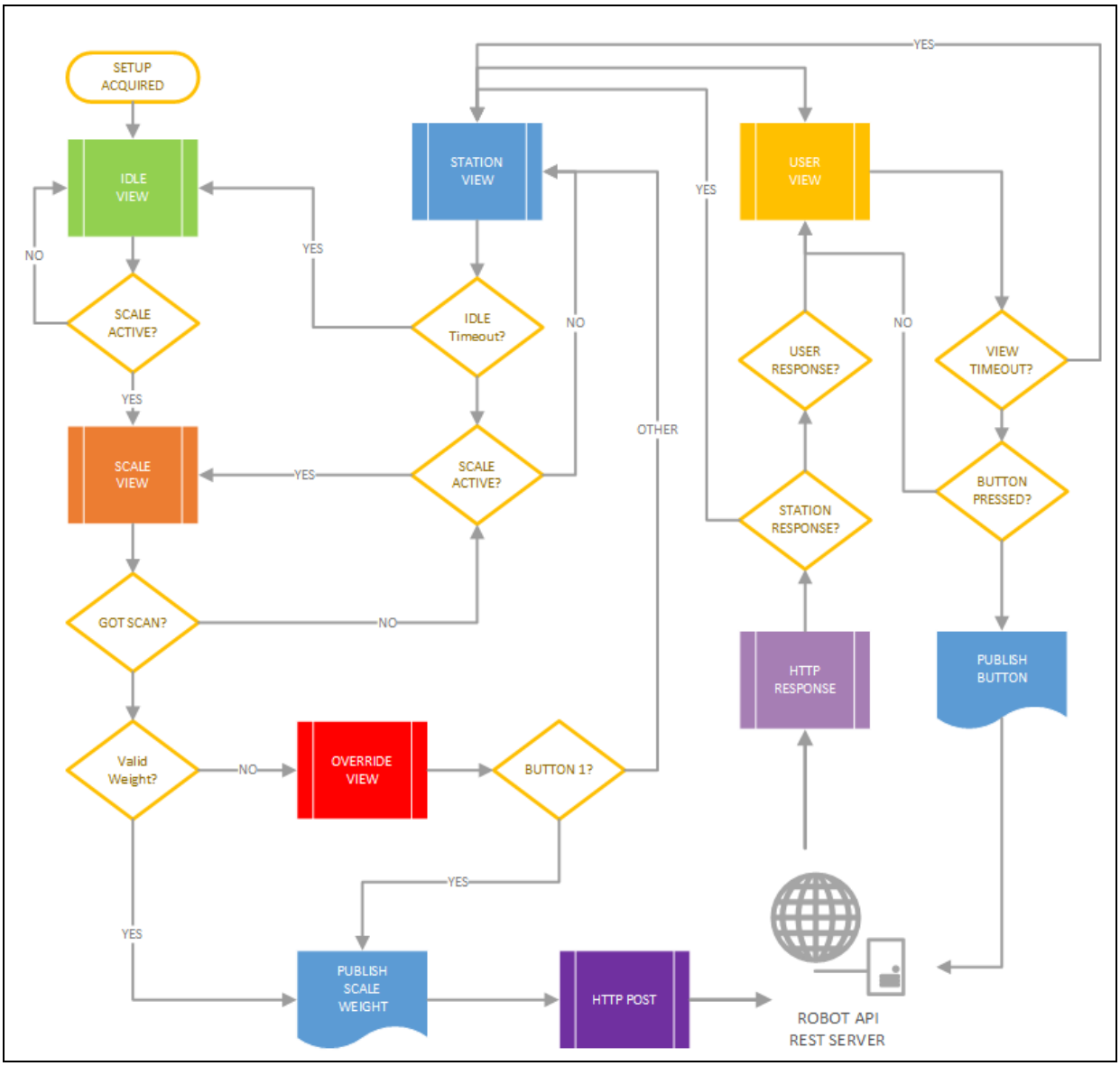
5.2 LED FUNCTIONS [RED | ORANGE | GREEN]

The following table show the function of the LEDs in each view.

Name	Function
IDLE	All off
STATION	Server determines which LED if on.
SCALE	The orange LED will toggle when scale activity is detected. The red LED is on when the weight is out of range. The green LED is on when the weight is within set limits.
USER	Server determines the LED states.
OVERRIDE	The RED led will be on indicating an error state

5.3 OPERATIONAL FLOW DIAGRAM

The following diagram shows the logic flow of the operating system.



To understand the Robot / Server interaction better study the web services chapter.

5.4 SCALE BASIC OPERATION

Most of the time the Robot will be on the IDLE screen. When scale activity is detected it will jump to the SCALE view. Here it will weight for a barcode to be scanned by operator. When the weight is valid it is forwarded to the server. If not, the operator is taken to the override screen and a decision can be taken to accept the error condition. The weight with a status is then published to the server.

The server can decide the flow of screen views. For instance, if a barcode is invalid the operator view can be directed to the User view. Here button input can be accepted to make a human decision. Under normal circumstances the view will return to Station view with a result message of the transaction.

The scale will stay in station mode while the load is present on the scale. First remove it to be able to start a new transaction.

5.5 SCALE OPERATOR PROCEDURE

1. Start with an empty scale. The Robot view should be in IDLE or STATION.
2. Place the pallet or load onto the scale. The Robot should display to the SCALE view with the weight matching that of the scale.
3. Wait until the weight is stable and the green LED is on. The red LED indicates the weight is out of range. Scan the barcode on the pallet when ready.
4. Wait for the screen to be updated from the server.
5. To start a new scan the load must first be removed from the scale.

6 ROBOT RESTFUL WEB SERVICES

The ROBOT generates HTTP transactions through POST verbs on specific REST endpoints. The API is a request-response type with data in JSON format. A suitable web service is needed to decode each transaction, generate the necessary business logic and reply with a JSON response packet to the ROBOT. The response packet is a command packet to the Robot that can change its logic behaviour and view.

It is necessary to understand how the Robot present different views to a user and what the purpose of each is. It is also important to know the logic behaviour of each view. Three basic views are IDLE, STATION & USER. For example, the USER-VIEW is used to interact directly with the user. STATION-VIEW will show details from the server about the last transaction.

All HTTP payloads are JSON formatted and identifies the command to be processed. All packets contain the MAC address of the Robot to uniquely identify the station and to be able to implement stateless gateways. Packets are categorised into REQUEST, RESPONSE and PUBLISH objects and contain specific data within each object.

A built-in web server in the Robot operating system will serve the user interface via a web browser. This web server will also process a similar set of REST API functions.

6.1 JSON PAYLOAD BASICS

The Robot REST API has a set of request and response packets to provide a stateless communication mechanism between the Robot and a web server. The Robot also exposes a REST endpoint with a similar API command set.

Payloads will be of a flattened structure containing a single payload descriptor object with various name value pair properties and sub objects. But the basic structure is always as such there will be one main object in the payload.

JSON payload PSEUDO format. JSON name convention

```
"payloadType" : {
    "propertyName" : "propertyValue",
    "subObject" : {
       "subProperyName" : "subPropertyValue"
    }
}
```

6.2 HTTP WEB SERVICE API

A HTTP server with appropriate web service is needed to service requests generated by the ROBOT application. This section deals with the details for successful communication between the ROBOT (the client) and the web service (the webserver). The connection is a normal HTTP client generating POST requests with a JSON payload. All data logic is in the payload and no URL parameters are used. All JSON packets contain the MAC address of the station that generated the request.

6.2.1 SERVER URLS

The Robot distinguish between two different URL when operating. One is required to retrieve an operation setup for the ROBOT and the other to generate transactions. It is not necessary to use two different URLs, but in larger setups the configuration provider can be different from the transacting server.

```
http://192.168.0.1/setup.cgi
```

This means the ROBOT application will connect to IP address 192.168.0.100 on port 80. The path will be ***setup.cgi*** to which the ROBOT will try and communicate.

On bootup this URL will be contacted to retrieve the Robot's running setup. And in this setup the server can provide and different URL for transactions.

Take note that the endpoints do not serve a specific function, but the payload does. Communication are done with HTTP POST verbs. The server needs to interpret the packet to determine the type for response.

6.2.2 SETUP REQUEST

Setup is the very first POST HTTP verb that will be sent. The details are as follows:

6.2.2.1 SETUP POST REQUEST

A *requestSetup* is send from the Robot to the server and contains the MAC address of the station requesting the setup. A new request's status will be marked as "REQUEST". Type will contain the type of application that is running on the station and needs a specifically formatted *responseSetup* packet.

```
"requestSetup" : {
        "MAC"    : "AA:BB:CC:00:11:22",
        "type"   : "SOLAS-Scale",
        "status" : "REQUEST/ACCEPT"
}
```

6.2.2.2 SETUP SOLAS-SCALE RESPONSE

The response packet, served from the server, contains the details needed for a SOLAS scale to operate.

```
"responseSetup" : {
```

```
        "status"    : "OK/FAIL",
        "MAC"       : "AA:BB:CC:00:11:22",
        "lowLimit"  : "850",
        "highLimit" : "1150",
        "units"     : "kg",
        "name"      : "Weighbridge 1",
        "security"  : "OPEN/REQUIRED",
        "date"      : "yyyy-mm-dd",
        "time"      : "12:00:00",
        "serverURL" : "http://192.168.0.1/scale.cgi"
    }
```

The table below describe the important JSON property names and values. Other values are optional.

status	OK: setup provided FAIL: setup not provided
lowLimit	Lower limit for an acceptable scale transaction
highLimit	Higher limit for an acceptable scale transaction
units	Units for appended to the value
name	The name of the station. This will appear at the top of the screen. The name is used to easily identify the station the operator is at.
security	OPEN: No key required in the KEY port of the Robot. REQUIRED: A key must be plugged into the KEY port of the Robot
name	The name of the station. This will appear at the top of the screen

6.2.3 SCALE WEIGHT PUBLISH

When the scale is loaded with a valid weight and the operator scans the barcode the Robot will generate a POST to publish the weight to the server. A response from the server can either be a response to present the Station View or a User View.

6.2.3.1 PUBLISH SCALE WEIGHT

The following packet show the JSON name value pairs for a *publishScaleWeight* packet.

```
"publishScaleWeight" : {
     "MAC"       : "AA:BB:CC:00:11:22",
      "id"       : "0123456789abcdef",
      "barcode"  : "0123456789abcdef",
      "weight"   : "1100.00",
      "units"    : "kg/NOT-SET",
      "status"   : "NORMAL/OVERRIDE"
}
```

Description of attributes as follows:

MAC	MAC address of the station
ID	User ID provided by the KEY port
barcode	Barcode that was scanned
Weight	Stable weight at the time of the scan
Units	Units that was provided in the initial setup
Status	When the weight is within in the set limits the status will be marked NORMAL. But when the weight is to high or low and the operator choose to override it, the status will be marked OVERRIDE.

6.2.3.2 STATION RESPONSE

A station response provides valuable feedback to the operator. Under normal circumstances the server will respond with this packet. When this respons is received the Robot will return to the station view and update the details on screen as provides in the packet.

The format is as follows:

```
"responseStation" : {
    "MAC"     : "AA:BB:CC:00:11:22",
    "LCD1"    : "Palet OK",
    "LCD2"    : "#1001010",
    "LCD3"    : "Weight:",
    "LCD4"    : "1000.0 kg",
     "green"  : "true/false",
     "orange" : "true/false",
     "red" : "true/false"
}
```

Description of attributes as follows:

MAC	MAC address of the station
LCD1-4	Text to be printed on LCD line 1 to 4, limited by 20 characters per line
Green	True is on, false is off
Orange	True is on, false is off
Red	True is on, false is off

6.2.3.3 USER RESPONSE

If the server business logic needs further operator input to complete the transaction the User Response can be returned with a relevant message. The operator can then respond by pressing a button. The button event will be published, and the server can make a logical decision accordingly.

The packet format is as follows:

```
"responseUser" : {
   "MAC"    : "AA:BB:CC:00:11:22",
   "LCD1"   : "Palet OK",
   "LCD2"   : "#1001010",
   "LCD3"   : "Weight:",
   "LCD4"   : "1000.0 kg",
   "green"  : "true/false",
   "orange" : "true/false",
   "red"    : "true/false"
}
```

The attributes names are identical to the station response.

6.2.4 OTHER PACKETS

There are few other packets to take note of.

6.2.4.1 PUBLISH BUTTON

A User view will publish a button payload.

```
"publishButton" : {
   "MAC"     : "AA:BB:CC:00:11:22",
   "id"      : "0123456789abcdef",
   "barcode" : "0123456789abcdef",
   "button"   : "B1/B2/B3/B4/B5"
}
```

MAC	MAC address of the station
ID	User key port ID
barcode	Last barcode scanned
button	Button that was pressed marked B1 to B5

The server can respond basically with any packet, but a station view or another user view make most logical sense.

6.2.4.2 PUBLISH STATUS

Upon bootup the Robot will publish that it has come online. This can be used to track the startup of the Robot.

```
"publishStatus" : {
   "status" : "READY/!READY",
   "MAC"    : "AA:BB:CC:00:11:22"
},
```

6.2.4.3 PING-PONG

The Robot uses the *requestPing* to determine if a server is still online. The server should respond with a *responsePong*. This packet only contains a MAC address.

```
"requestPing" : {
    "MAC" : "AA:BB:CC:00:11:22"
}

"responsePong" : {
    "MAC" : "AA:BB:CC:00:11:22"
}
```

6.2.4.4 DEVICE RESET

If a device configuration has changed or a server-robot session was lost, the Robot can be forced to reset. Any REST API request can be responded to with a device reset. Even a Ping can have a reset response to force the Robot to reset and retrieve a new setup. The only requirement is that the MAC address matches that of the station to be reset.

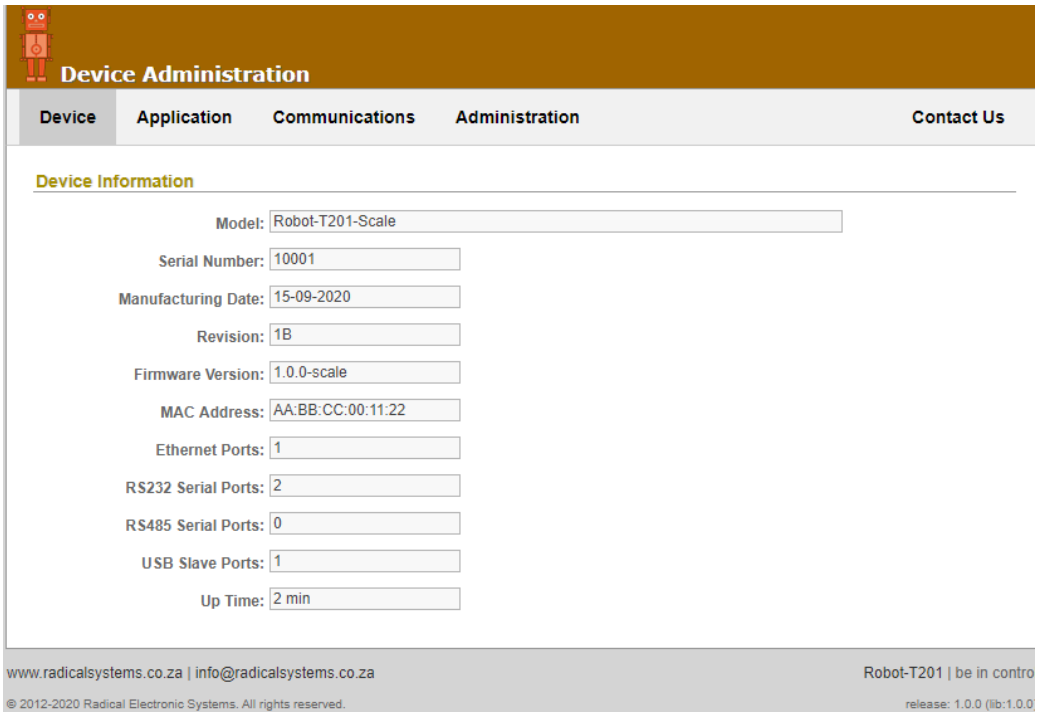
```
"requestReset" : {
     "MAC" : "AA:BB:CC:00:11:22:33"
}
```

This packet can also be send to the web server of the Robot to force a reset at any time.

6.3 BUILT-IN WEBSERVER

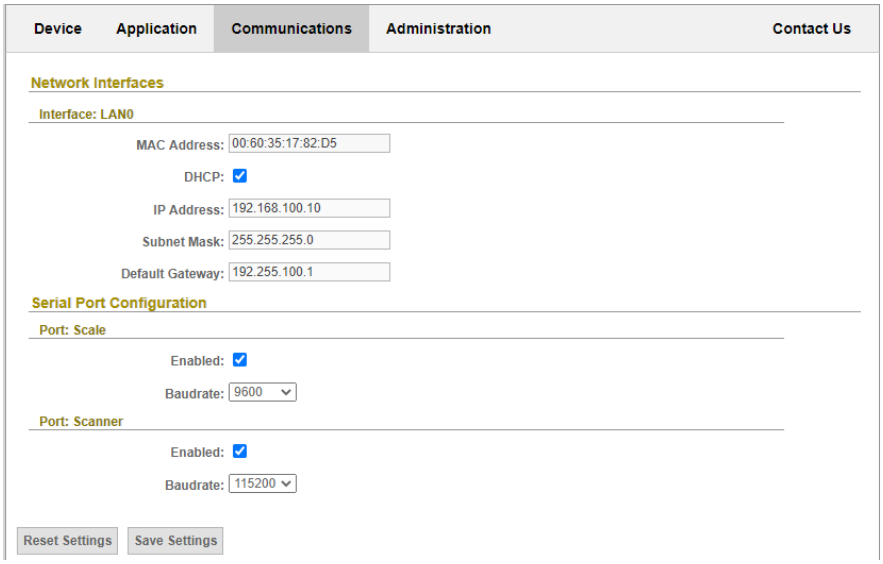
The Robot-T201 has webserver to perform basic setup related to network settings and application configuration.

Open your browser and point it to the ROBOT's IP address. It should come up with the web page below.



6.3.1 COMMUNICATIONS SETTINGS

The communication menu is used to configure the ROBOT network interface and serial ports. The ROBOT can have static IP settings or make use of a DHCP server. Serial ports are dedicated for scanner and scales.



6.3.1.1 RESET SETTINGS

If you have lost the ROBOT's static IP address it can be reset upon startup by holding down button #2.

Make sure the Robot is switch off. Apply power and immediately hold in button #2. This will signal the Robot at bootup to reset the ROBOT to its default settings.

6.3.2 APPLICATIONS SETTINGS

The Application menu is used to configure the ROBOT application profile. The Robot can support multiple profiles or can be programmed with single application profile.

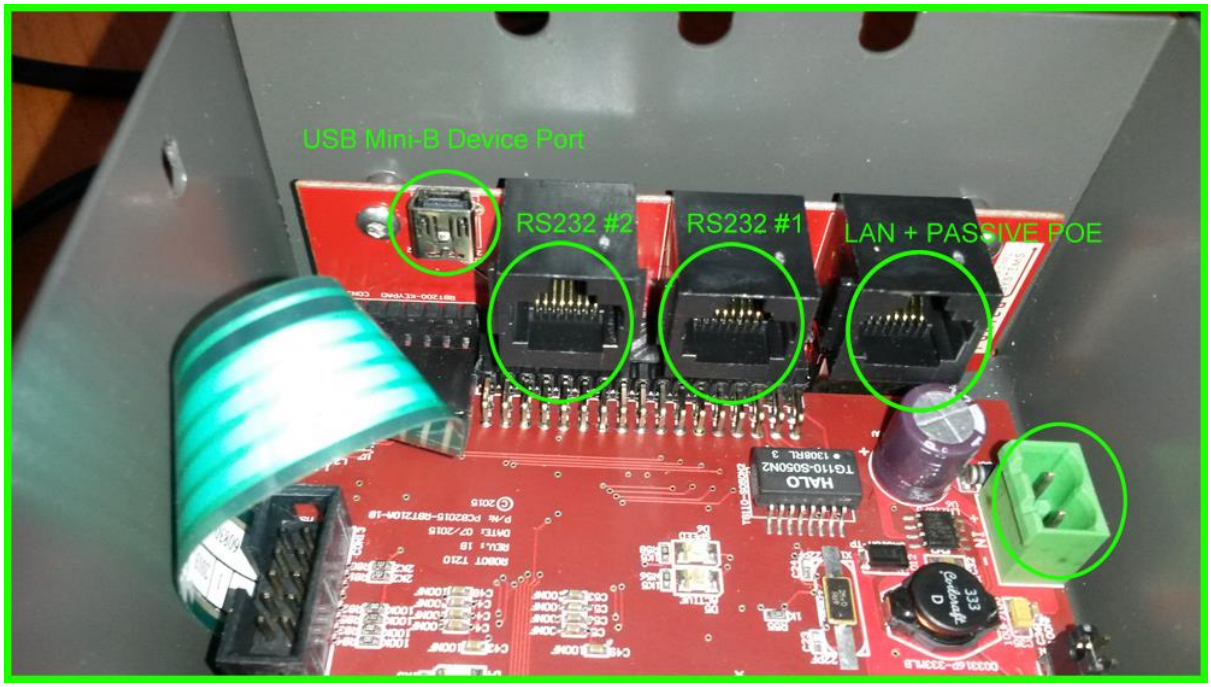
Related information is as follows:

Item	Description
Enabled	If the service is enabled
Setup URL	This is the initial URL that the ROBOT will contact when it starts up for the first time. If a redirect server URL is not provided in the setup packet the Robot will keep using this URL to publish scale weights

7 HARDWARE INTERFACE LOCATIONS

The Robot-T201 has interfaces for One Ethernet, Two RS232 ports and One USB Slave. The picture below shows the locations of these ports. The LAN and RS232 ports are terminated into RJ45 sockets. Care must be taken not to connect to the wrong socket.

WARNING: A passive POE cable carry a DC voltage of up to 32 volt. When connecting this cable to the RS232 port it can damage the Robot electronic circuitry.



* For a reference on the pin assignment see the ROBOT Technical manual.

7.1 SCALE – SERIAL PORT #1

The first serial port is dedicated for the scale. A special serial cable will be made up matching the scale serial port and ROBOT's RJ45 socket.

- **IMPORTANT**: Make sure the Micro-A12E is configured for 9600 BAUD and continuous transmission when the weight is stable.

7.2 BARCODE SCANNER – SERIAL PORT #2

The second serial port is dedicated for a scanner input. A hand scanner which is serial and +5V powered is compatible with the ROBOT. The maximum current is 500 mA.

- **IMPORTANT**: Make sure the scanner is configured to send a carriage return (CR) at the end of each packet.

8 SAFETY OF LIFE AT SEA - SOLAS

Extract from World Shipping Control's document detailing SOLAS.

8.1 INTRODUCTION

The International Maritime Organization (IMO) has amended the Safety of Life at Sea Convention (SOLAS) to require, as a condition for loading a packed container onto a ship for export, that the container has a verified weight. The shipper is responsible for the verification of the packed container's weight. This requirement will become legally effective on July 1, 2016. After that date, it would be a violation of SOLAS to load a packed container onto a vessel if the vessel operator and marine terminal operator do not have a verified container weight. The SOLAS amendments provide that there are two methods shippers may use to determine the container weight once the container packing process has taken place. This requirement will apply globally. Shippers, freight forwarders, vessel operators, and terminal operators will all need to establish policies and procedures to ensure the implementation of this regulatory change. Because there have been questions about what the specific nature of the SOLAS changes are, the World Shipping Council provides the following basic synopsis of the SOLAS requirement.

8.2 BASIC PRINCIPLES UNDER THE SOLAS REQUIREMENT

1. Before a packed container can be loaded onto a ship, its weight must be determined through weighing. It is a violation of SOLAS to load a packed container aboard a vessel to which SOLAS applies without a proper weight verification. There is no exception to this requirement.
2. Under the SOLAS amendments, there are two permissible methods for weighing: Method 1, which requires weighing the container after it has been packed, or Method 2, which requires weighing all the cargo and contents of the container and adding those weights to the container's tare weight as indicated on the door end of the container.
3. Estimating weight is not permitted. The shipper (or by arrangement of the shipper, a third party) has a responsibility to weigh the packed container or to weigh its contents. Under either Method, the weighing equipment used must meet national certification and calibration requirements. Further, the party packing the container cannot use the weight somebody else has provided, except in one specific set of defined circumstances.
4. A carrier may rely on a shipper's signed weight verification to be accurate. The carrier does not need to be a "verifier" of the shipper's weight verification. Nor do the SOLAS amendments require a carrier to verify that a shipper providing a verified weight according to Method 2 has used a method which has been certified and approved by the competent authority of the jurisdiction in which the packing and sealing of the container was completed. However, it is important to note that, for the shipper's weight verification to be compliant with the SOLAS requirement, it must be "signed", meaning a specific person representing the shipper is named and identified as having verified the accuracy of the weight calculation on behalf of the shipper

9 SUPPORT

Please contact us via email or telephone if you require support.

10 CONTACT INFORMATION

Please use the following to contact us.

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