EMS701V0-R00

Remote Monitoring System

User Manual

This document applies to Product	9001-0149
Build Version	3600-xxxx
Firmware Version	5000-0458

Version History:

S. No.	Version No.	Changes Made	Date Modified	Modified By	Approved By
1					
2					
3					

www.ems.gen.nz

Contents

EMS701V0-R00

Remote Monitoring System

1. Introduction

The unit is a data logger and communications device which allows widely distributed cellular sites to be monitored. The unit is intended to monitor on site power sources, including Mains Power conditions, Diesel Generator performance, site security, and other critical site conditions.

The collected data is automatically transferred to a central server via GPRS connectivity, where warnings and alarms can be actioned, and site performance data collated and analysed for reporting purposes.

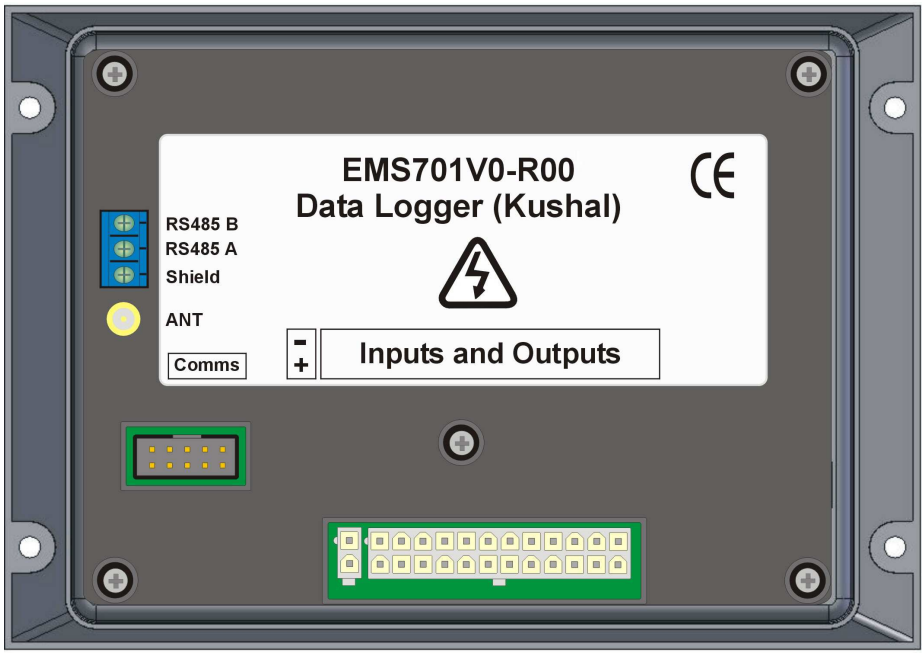
The unit is intended to be fitted into an enclosure so that it provides a ready to use solution.

2. Benefits

- Provides comprehensive real time knowledge of the network supporting infrastructure.
- Improves fuel and service management.
- Provides immediate knowledge of infrastructure failure to ensure maximum availability.
- Improves network reliability.
- Provides automatic SMS messages to local service providers in the event of site failure.
- Reduces network operating costs.

3. Physical Form

Front View



Rear View

4. Functions

4.1 Monitoring

Function	Description
Mains Availability	Logs mains availability.
Engine monitoring.	Logs engine status, operating conditions and hours.
Generator monitoring	Logs generator status and operating conditions.
Contactor monitoring	Logs mains and generator contactor status.
Battery and Charging	Logs battery and charger operating conditions.
Fuel Level monitoring	Logs fuel level and warns of abnormal level changes and consumption
Warnings and Alarms	Logs all warnings and alarms. Selectable SMS messaging on alarms.

4.2 Digital Inputs

Function	Description
Digital Inputs	General purpose digital inputs are provided to allow remote status detection of connected inputs.

5. Operation

Front Layout

5.1 Buttons

Button	Function Description
	**Menu Previous** 1. Used as system menu previous button
	**Menu Next** 1. Used as system menu next button
	**Accept button / Setup Menu Entry** 1. Used to accept system events and silence the sounder 2. Used to enter the Setup mode
	**Screen Scroll up / Setup menu up Button** 1. Screen Scroll up Button 2. Used as the system menu up and value increment button
	**Screen Scroll down / Setup menu down Button** 1. Screen Scroll up 2. Used as the system menu down and value decrement button

5.2 LEDs

Button	Function Description
Alarm	**Alarm** Indicates system alarm

5.3 Initial Power Up

On power up, the unit displays the Logo.

The unit then displays the Serial number, Application Code and Firmware version.

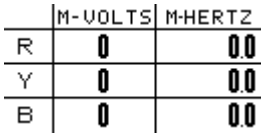
The unit remains on for 1 minute and if nothing is attached with it, it goes into sleep mode to conserve battery power. In this mode the unit wakes periodically to check the availability of analog/digital inputs or data on its RS485 port and if it finds something it starts logging data.

6. Display Operation

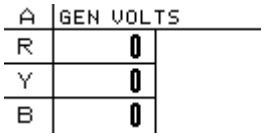
6.1 When the unit is on:

Screen - 1

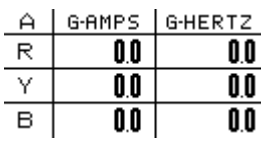
Screen – 2

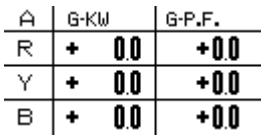


Screen – 3

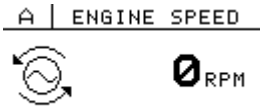


Screen - 4



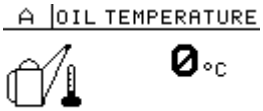


Screen – 5

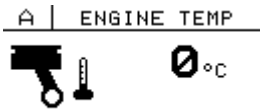


Screen – 6

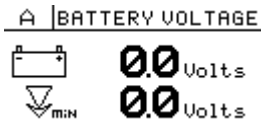
Screen – 7



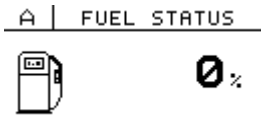
Screen – 8



Screen – 9



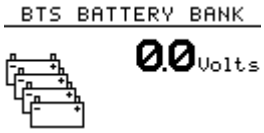
Screen – 10



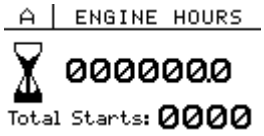
Screen – 11

Screen – 12

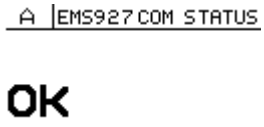
Screen – 13



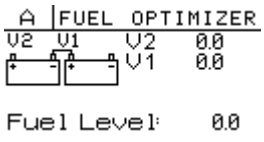
Screen – 14



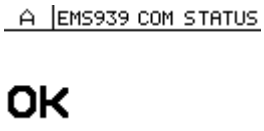
Screen – 15



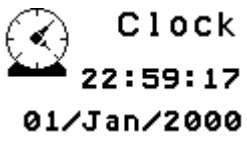
Screen – 16



Screen – 17



Screen – 18



7. Alarms

The digital inputs alarms which are generated by the site are send as an SMS to the configurable cell number. Alarms are indicated by fast flashing of the ALARM LED and displaying the appropriate message on the LCD.

Message	Function description
Fuel cap switch	The Fuel cap switch input was activated.
Door open switch	The Door open switch input was activated.
Shelter door open	The Door open switch input was activated.
Canopy temperature switch	The Canopy Temperature switch input was activated.
Radiator temperature switch	The Radiator Temperature switch input was activated.

8. Inputs Electrical Specification

Input	Type	Comment
Battery + Volts	Power	Nominal 12VDC or 24VDC or Station Battery Supply Max 36VDC
0V Common	Power	0VDC, Common
Input I/P1	Digital	Suitable for switch input. Becomes active when closed to 0V

9. Navigating in the setup menu

The setup menu comprises a range of columns where each column comprises of a list of items and each item has a range of settable values.

Column Headings are as follows.

System	Logging	Comms	SMS Phone Num1	SMS Phone Num2	SMS Phone Num3	SMS Phone Num4
SMS Phone Num5	Server SMS.	Server-Addr	Server Port	Storage URL	APN	APN User
APN Pass	Latitude	Longitude	Date and Time			

The  button is used to select the previous column, Item, or to increment a value.

The  button is used to select the next column, item, or to decrement a value.

The  button changes from Column to item to value editor.

The  button changes from Item to column and exit setup mode.

The  button is used to accept value changes.

Setup mode automatically terminates if no button in pressed for 60 seconds, or when you press the  button with the column headers list visible.

9.1 System Column

Item	Range	Default	Description
Contrast	0 - 11	4	LCD Contrast
Site ID	0 – 30000	0	Site Identifier. May also be used for asset numbering.
Defaults	NO YES	NO	Setting to Yes will load all configuration items to their factory default values. Note: Engine calibration will be lost.
Disp Update	OFF 2 – 60 sec	3	Display Cycle Time, sets frequency of display update. If set to Off, display scrolling is disabled. For manual scrolling press the ^ for the previous measurement screen and the v next measurement screen.
Disp Hold	5 – 60 sec	30	Display hold time. Sets the duration of display hold when the alarm button is pressed to halt the scrolling
Cust Logo	Yes	Yes	Show or hide the Customer Logo
LCD Reverse	No Yes Cycle	Cycle	No = LCD is adjusted to work best in daylight Yes = LCD is adjusted to word best at night Cycle = LCD Day and Night Adjustments are cycled

9.2 Logging

Item	Range	Default	Description
LogTime	5-120M	5M	It is the time set the by user for data logging.
Rem EMS927A	1-240	1317	Modbus address
Rem EMS927B	1-240 Off	Off	Modbus address
Rem EMS939A	1-240	116	Modbus address
Rem EMS939B	1-240 Off	Off	Modbus address

9.3 (Communications) Setup Column

Item	Range	Default	Description
Comms ID	1 - 240	118	Comms Address. Required for remote communications
Baud Rate	1200 2400 4800 9600 19200 38400 57600	9600	Comms Port Baud Rate
Data Bits	7 – 9	8	Number of Data Bits
Parity	Even Odd None	None	Parity Select
Stop Bits	1 or 2	1	Number of Stop Bits
UART Mode	None Modem	None	RS232 Handshaking Mode None = No RTS/CTS control. 3 wire connection. Modem = Uses RTS/CTS flow control. 5 wire connection.
SMS Enable	Off On	On	Off = No SMS's are sent when the engine stops for an Alarm On = Sends SMS's when engine stops for a alarm and when the engine starts

9.4 SMS Phone Number 1 Column.

Item	Range	Default	Description
SMSPh Dig 1	0 – 9 END +	0	"0 – 9" = Numerical part of a phone number "END" = digit not used "+" = Used to get an international dial tone " " = Used to get a delay when a Pager system is used instead of SMS system
SMSPh Dig2		2	
SMSPh Dig3		1	
SMSPh Dig4		0	
SMSPh Dig5		2	
SMSPh Dig6		9	
SMSPh Dig7		7	
SMSPh Dig8		0	
SMSPh Dig9		6	
SMSPh Dig10		9	
SMSPh Dig11		7	
SMSPh Dig12		END	
SMSPh Dig13		END	
SMSPh Dig14		END	
SMSPh Dig15		END	
SMSPh Dig16		END	
SMSPh Dig17		END	
SMSPh Dig18		END	
SMSPh Dig19		END	
SMSPh Dig20		END	
SMSPh Dig21		END	
SMSPh Dig22		END	
SMSPh Dig23		END	
SMSPh Dig24		END	

9.5 SMS Phone Num 2 Column.

Item	Range	Default	Description
SMSPh Dig 1	0 – 9 END +	END	"0 – 9" = Numerical part of a phone number "END" = digit not used "+" = Used to get an international dial tone " " = Used to get a delay when a Pager system is used instead of SMS system
SMSPh Dig2		END	
SMSPh Dig3		END	
SMSPh Dig4		END	
SMSPh Dig5		END	
SMSPh Dig6		END	
SMSPh Dig7		END	
SMSPh Dig8		END	
SMSPh Dig9		END	
SMSPh Dig10		END	
SMSPh Dig11		END	
SMSPh Dig12		END	
SMSPh Dig13		END	
SMSPh Dig14		END	
SMSPh Dig15		END	
SMSPh Dig16		END	
SMSPh Dig17		END	
SMSPh Dig18		END	
SMSPh Dig19		END	
SMSPh Dig20		END	
SMSPh Dig21		END	
SMSPh Dig22		END	
SMSPh Dig23		END	
SMSPh Dig24		END	

9.6 SMS Phone Num 3 Column.

Item	Range	Default	Description
SMSPh Dig 1	0 – 9 END +	END	"0 – 9" = Numerical part of a phone number "END" = digit not used "+" = Used to get an international dial tone " " = Used to get a delay when a Pager system is used instead of SMS system
SMSPh Dig2		END	
SMSPh Dig3		END	
SMSPh Dig4		END	
SMSPh Dig5		END	
SMSPh Dig6		END	
SMSPh Dig7		END	
SMSPh Dig8		END	
SMSPh Dig9		END	
SMSPh Dig10		END	
SMSPh Dig11		END	
SMSPh Dig12		END	
SMSPh Dig13		END	
SMSPh Dig14		END	
SMSPh Dig15		END	
SMSPh Dig16		END	
SMSPh Dig17		END	
SMSPh Dig18		END	
SMSPh Dig19		END	
SMSPh Dig20		END	
SMSPh Dig21		END	
SMSPh Dig22		END	
SMSPh Dig23		END	
SMSPh Dig24		END	

9.7 SMS Phone Num 4 Column.

Item	Range	Default	Description
SMSPh Dig 1	0 – 9 END +	END	"0 – 9" = Numerical part of a phone number "END" = digit not used "+" = Used to get an international dial tone " " = Used to get a delay when a Pager system is used instead of SMS system
SMSPh Dig2		END	
SMSPh Dig3		END	
SMSPh Dig4		END	
SMSPh Dig5		END	
SMSPh Dig6		END	
SMSPh Dig7		END	
SMSPh Dig8		END	
SMSPh Dig9		END	
SMSPh Dig10		END	
SMSPh Dig11		END	
SMSPh Dig12		END	
SMSPh Dig13		END	
SMSPh Dig14		END	
SMSPh Dig15		END	
SMSPh Dig16		END	
SMSPh Dig17		END	
SMSPh Dig18		END	
SMSPh Dig19		END	
SMSPh Dig20		END	
SMSPh Dig21		END	
SMSPh Dig22		END	
SMSPh Dig23		END	
SMSPh Dig24		END	

9.8 SMS Phone Num 5 Column.

Item	Range	Default	Description
SMSPh Dig 1	0 – 9 END +	END	"0 – 9" = Numerical part of a phone number "END" = digit not used "+" = Used to get an international dial tone " " = Used to get a delay when a Pager system is used instead of SMS system
SMSPh Dig2		END	
SMSPh Dig3		END	
SMSPh Dig4		END	
SMSPh Dig5		END	
SMSPh Dig6		END	
SMSPh Dig7		END	
SMSPh Dig8		END	
SMSPh Dig9		END	
SMSPh Dig10		END	
SMSPh Dig11		END	
SMSPh Dig12		END	
SMSPh Dig13		END	
SMSPh Dig14		END	
SMSPh Dig15		END	
SMSPh Dig16		END	
SMSPh Dig17		END	
SMSPh Dig18		END	
SMSPh Dig19		END	
SMSPh Dig20		END	
SMSPh Dig21		END	
SMSPh Dig22		END	
SMSPh Dig23		END	
SMSPh Dig24		END	

9.9 Server SMS.

Item	Range	Default	Description
Type	Any	Any Server	Any = SMS from any phone number will be actioned. Server = SMS from phone numbers which are on the list will be actioned.
SMSPh Dig 1	0 – 9 END +	0	"0 – 9" = Numerical part of a phone number "END" = digit not used "+" = Used to get an international dial tone " " = Used to get a delay when a Pager system is used instead of SMS system
SMSPh Dig2		2	
SMSPh Dig3		1	
SMSPh Dig4		0	
SMSPh Dig5		2	
SMSPh Dig6		9	
SMSPh Dig7		7	
SMSPh Dig8		0	
SMSPh Dig9		6	
SMSPh Dig10		9	
SMSPh Dig11		7	
SMSPh Dig12		END	
SMSPh Dig13		END	
SMSPh Dig14		END	
SMSPh Dig15		END	
SMSPh Dig16		END	
SMSPh Dig17		END	
SMSPh Dig18		END	
SMSPh Dig19		END	
SMSPh Dig20		END	
SMSPh Dig21		END	
SMSPh Dig22		END	
SMSPh Dig23		END	

SMSPh Dig24		END	

9.10 Server-Addr

Item	Range	Default	Description
SA1	0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,.,-,END	e	0,1,2,3,4,5,6,7,8,9= Numerical part of a IP address a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z =Alphabetical part of a URL address .= Character part of Server address and URL address -= Character part of URL address END= digit not used
SA2		m	
SA3		s	
SA4		-	
SA5		n	
SA6		z	
SA7		.	
SA8		n	
SA9		o	
SA10		-	
SA11		i	
SA12		p	
SA13		.	
SA14		b	
SA15		i	
SA16		z	
SA17		END	
SA18		END	
SA19		END	
SA20		END	
SA21		END	
SA22		END	
SA23		END	
SA24		END	

SA25		END	
SA26		END	
SA27		END	
SA28		END	
SA29		END	
SA30		END	
SA31		END	

9.11 Server Port

Item	Range	Default	Description
Port	1-30000	80	TCP Port for communication.

9.12 Storage URL

Item	Range	Default	Description
SU1	0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z,.,-,/,END	/	0,1,2,3,4,5,6,7,8,9= Numerical part of a IP address a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z =Lower case alphabetical part of a URL address A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z =Upper case alphabetical part of a URL address .= Character part of Server address and URL address -= Character part of URL address /= Character part of URL address END= digit not used
SU2		D	
SU3		a	
SU4		t	
SU5		a	
SU6		L	
SU7		o	
SU8		g	
SU9		g	
SU10		e	
SU11		r	
SU12		/	
SU13		A	
SU14		P	
SU15		I	

SU16		S	
SU17		t	
SU18		o	
SU19		r	
SU20		e	
SU21		D	
SU22		a	
SU23		t	
SU24		a	
SU25		.	
SU26		p	
SU27		h	
SU28		p	
SU29		END	
SU30		END	
SU31		END	
SU32		END	
SU33		END	
SU34		END	
SU35		END	
SU36		END	
SU37		END	
SU38		END	
SU39		END	
SU40		END	
SU41		END	
SU42		END	
SU43		END	

SU44		END	
SU45		END	
SU46		END	
SU47		END	
SU48		END	
SU49		END	

9.13 APN

Item	Range	Default	Description
APN1	0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,.,-,END	2	0,1,2,3,4,5,6,7,8,9= Numerical part of a APN address a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z = Alphabetical part of a APN address. .= Character part of APN address -= Character part of APN address END= digit not used
APN2		D	
APN3		E	
APN4		G	
APN5		R	
APN6		E	
APN7		E	
APN8		S	
APN9		e	
APN10		END	
APN11		END	
APN12		END	
APN13		END	
APN14		END	
APN15		END	
APN16		END	
APN17		END	
APN18		END	
APN19		END	

APN20		END	
APN21		END	
APN22		END	
APN23		END	
APN24		END	
APN25		END	
APN26		END	
APN27		END	
APN28		END	
APN29		END	
APN30		END	
APN31		END	

9.14 APN User

Item	Range	Default	Description
User1	0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,.,-,END	N	0,1,2,3,4,5,6,7,8,9== Numerical part of an username. a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z = Alphabetical part of an username. .= Character part of an username -= Character part of an username END= digit not used
User2		O	
User3		N	
User4		e	
User5		END	
User6		END	
User7		END	
User8		END	
User9		END	
User10		END	
User11		END	
User12		END	
User13		END	

User14		END	
User15		END	
User16		END	
User17		END	
User18		END	
User19		END	
User20		END	
User21		END	
User22		END	
User23		END	
User24		END	
User25		END	
User26		END	
User27		END	
User28		END	
User29		END	
User30		END	
User31		END	

9.15 APN Pass

Item	Range	Default	Description
Pass	0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z,.,-,END	n	0,1,2,3,4,5,6,7,8,9= Numerical part of a password a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z = Alphabetical part of a password .= Character part of a password -= Character part of a password END= digit not used
Pass		o	
Pass		n	
Pass		e	
Pass		END	
Pass		END	
Pass		END	

Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	
Pass		END	

9.16 Latitude

Item	Range	Default	Description
Lat1	0,1,2,3,4,5,6,7,8,9,.,+,-,END	-	0,1,2,3,4,5,6,7,8,9= Numerical part of a password a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z = Alphabetical part of a password .= Character part of a password -= Character part of a password += Character part of a password END= digit not used
Lat2		3	
Lat3		6	
Lat4		.	
Lat5		9	
Lat6		0	
Lat7		6	
Lat8		5	
Lat9		6	
Lat10		2	
Lat11		END	
Lat12		END	
Lat13		END	
Lat14		END	
Lat15		END	

9.17 Longitude

Item	Range	Default	Description
Long1	0,1,2,3,4,5,6,7,8,9,.,+,-,END	+	0,1,2,3,4,5,6,7,8,9= Numerical part of a password a,b,c,d,e,f,g,h,I,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z = Alphabetical part of a password .= Character part of a password -= Character part of a password += Character part of a password END= digit not used
Long2		1	
Long3		7	
Long4		4	
Long5		.	
Long6		6	
Long7		6	
Long8		0	

Long9		7	
Long10		6	
Long11		6	
Long12		END	
Long13		END	
Long14		END	
Long15		END	

9.18 Date and Time

Item	Range	Default	Description
Hour	0-23	11	Set the hours in data logger.
Minute	0-59	4	Set the Minutes in data logger
Second	0-59	38	Set the Seconds in data logger
Day	1-28	5	Set the Day in data logger
Month	Jan, Feb, Mar, Apr, May, Jun, July, Aug, Set, Oct, Nov, Dec.		Set the Month in data logger
Year	2000-3000	2014	Set the Year in data logger
Week Day	Sun, Mon, Tue, Wed, Thr, Fri, Sat	Wed	Set the Week Day in data logger

10. Communications

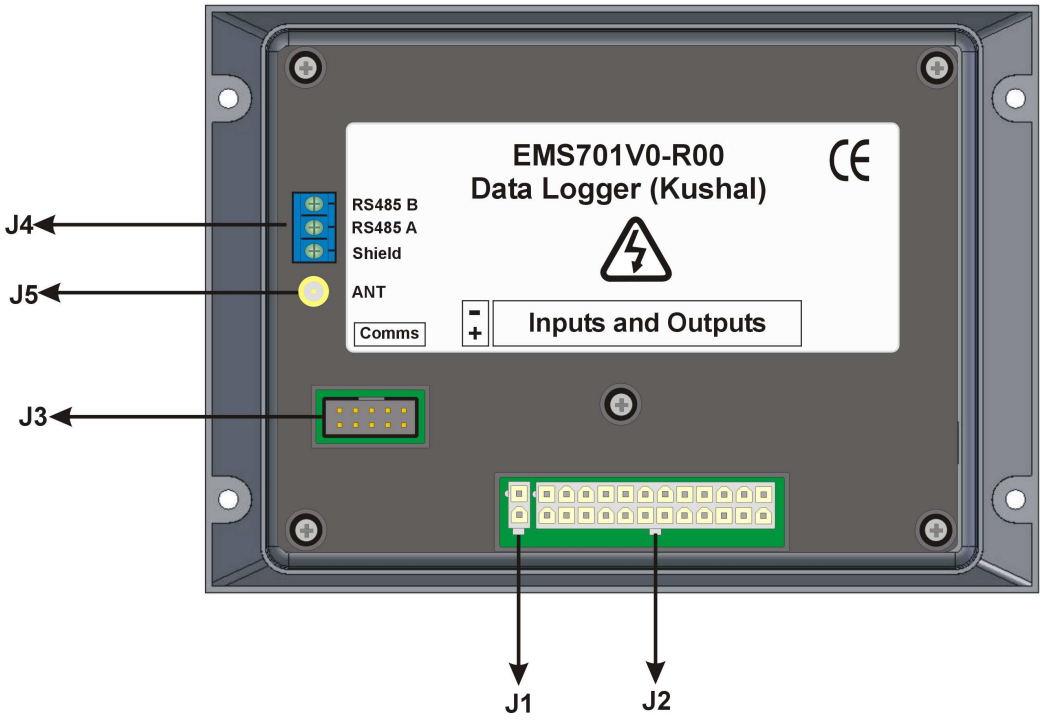
The unit is fitted with fully functional communication ports (J3 & J4) which communicate using Modbus ASCII and RTU protocols. The J4 is a RS485 port which is used to talk to the DG controller to get all the Engine & Alternator related parameters and send to remote server. The J3 port may be plugged into RS232 or RS485 communication adaptors and through these to I/O expander module (EMS930) or to talk to some other system/product on the site.

11. Unit General Specifications

Feature	Specification
Overall Dimensions	180 x 126 x 51mm
Mounting Hole	155 x 117mm
IP rating	IP56 front, IP20 rear
Supply Voltage	8 V to 36V DC Nominal Automotive
Operating Temperature	-20 to +70°C
Storage Temperature	-20 to +70°C
Relative Humidity	95% non condensing
Supply Current	Standby < 10mA Running 70mA
Overall Accuracy	Class 1
Digital Input Rating	Opto-coupler isolated. Whetting current 10mA at 12 V DC. DC input protection for +/- 30V DC Transient Protected.
Analog Input Rating	Current limited outputs approx 15mA or less as required by sensors/ Short circuit and reverse voltage protected.
Input Reference	0V Common
Set-up and Adjustment	All features may be adjusted using set-up buttons and LCD menu or via a PC Windows based utility
Terminations	Amp DUAC / Molex Mini Fit JNR

Feature	Specification
Testing	Environmental Tests: IEC68 Part2 EMC Compliance: EN50081-1, EN50081-2, IEC6100-4-3 Electrical Safety AS 3100 and AS 3260

12. Installation and Wiring

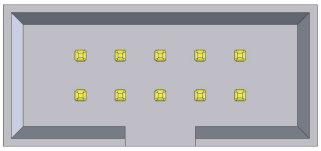
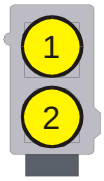
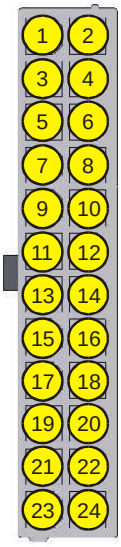


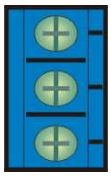
NB: The unit is a complex electronic device and caution should be taken to ensure correct wiring before power is applied.

The unit is fitted with 2, and 24 way Molex Minifit or equivalent socket connectors for which mating plugs can be selected from the Amp PE, or TPK range.

The unit is also fitted with RS485 connector and Antenna.

12.1 Connector Detail

Connector Assignment	Connection Information	
J3: Data Port 	Programming and Auxiliary Unit data port. **NB: Connect ONLY manufacturer approved equipment to this port**	
J1: DC Power Supply 	**Pin**	**Connection**
	1	Common –ve. ***(Note 1)***
	2	Battery +ve. ***(Note 2)***
J2: I/O 	**Pin**	**Connection**
	1	N/A
	2	N/A
	3	N/A
	4	N/A
	5	N/A
	6	N/A
	7	N/A
	8	N/A
	9	Fuel cap switch
	10	Preheat External
	11	Door open switch
	12	Shelter door open
	13	Canopy temperature switch
	14	Radiator temperature switch
	15	N/A
	16	N/A
	17	N/A

Connector Assignment	Connection Information	
	18	N/A
	19	N/A
	20	N/A
	21	N/A
	22	N/A
	23	N/A
	24	N/A
J4: RS485 	**Pin**	**Connection (See above for pin numbers)**
	1	RS 485 B
	2	RS 485 A
	3	Shield
J5: Antenna	**Pin**	**Connection (See above for pin numbers)**
	1	Antenna

Notes:s.

1. *This connection must be made directly to the positive terminal of the battery for best performance. Do not make this connection to the positive terminal on the Starting Motor.*

13. System Diagram