

ST8120 Rally Turbo Display System

User's Guide Addendum

Preface

Congratulations

Congratulations on choosing the Stack ST8120 Rally Turbo Display System. This system will give you a wealth of information to enable you to obtain the maximum safe performance from your vehicle.

Purpose of this addendum

In conjunction with the ST8100 User's Guide, this addendum will help you install and use the Stack ST8120 Display System. It explains how to set up and configure the system for your vehicle.

Edition Notice

This edition is for all versions of the ST8120 Display System distributed to customers world wide. The units of measurement used to illustrate the use of the Display System in this edition are for the UK version. Units used in the various versions are shown in the following table.

Parameter Type	UK Version	US Version	EC Version
Boost	psi/Bar	psi/Bar	psi/Bar
Temperature	Degrees C	Degrees F	Degrees C
Pressure	psi	psi	Bar

Stack is a registered trademark of Stack Limited.

Information in this publication is subject to change without notice and does not represent a commitment on the part of Stack Limited. No responsibility is accepted for error or omission.

Copyright © 2000 Stack Limited

United Kingdom Telephone Numbers:

Sales: 01869 240404.

Technical Support: 01869 240420

Fax: 01869 245500

Contents

PREFACE	III
CONTENTS	IV
Chapter 1. Introducing the Display System	1
How to Use this Manual	2
Chapter 2. Getting Started	3
Wiring Harness	4
Chapter 3. Operating the Display System	5
Changing the display layers	5
Peak Values (Tell Tales)	8
Alarms	9
Lap times	9
Chapter 4. Configuring the Display System	10
Configuration mode	10
Leaving configuration mode	13
Chapter 5. Installing the Display System	14
Boost Pressure sensor	14
Air Temperature sensor	14
Chapter 6. Troubleshooting	15
Appendix B. Wiring Harness Schematic Diagram	16
Index	17

Chapter 1. Introducing the Display System

The Stack ST8120 Display System monitors and displays a range of values, known as performance parameters, needed for effective car and driver management in most competitive situations.

The system combines an analog tachometer with a digital display for the following performance parameters:

1. Engine speed (RPM)
2. Boost pressure
3. Intake Air temperature
4. Oil pressure
5. Oil temperature
6. Water temperature
7. Fuel pressure
8. Battery voltage
9. Lap times (optional)

You can view the peak values (tell-tales) for all the parameters.

The system provides a range of warning messages based on preset alarm values for the following performance parameters:

1. Oil pressure
2. Oil temperature
3. Boost pressure
4. Intake Air temperature
5. Fuel pressure
6. Water temperature
7. Battery voltage

You can enable or disable the warning system for each parameter individually.

You can redefine the preset alarm value for each parameter to a value that is more suitable for your vehicle.

The system provides a gear shift warning light that is based on an RPM value that you define for your vehicle.

How to Use this Manual

Stack recommends that you unpack and connect the components in the system **before** you install it in your vehicle. This will enable you to familiarize yourself with operating the display and configuring it for the vehicle in which you intend to install it.

Please use the ST8100 User's Guide to install the system, referring to the corresponding section in this addendum to see whether there are special requirements for the ST8120 system.

Chapter 2. Getting Started

The sensors supplied with the ST8120 system differ from those supplied for the ST8100.

Standard ST8120 Display System Items

The ST8120 Display System is supplied with the following standard components:

Quantity	Description
1	Display Module (ST867) with 2 mounting brackets
1	Wiring Harness (ST872)
1	Oil Pressure Sensor (ST744, ST745)
1	Fuel Pressure Sensor (ST741, ST742, ST744, ST745, ST746)
2	Temperature Sensors (ST762, ST764)
1	Boost Sensor (ST453)
1	Air Temperature Sensor (ST765)
1	1.4m Extender Cable for Boost Sensors (918021)
4	Switches (supplied with and to be connected to the wiring harness)

Optional ST8120 Display System Items

The ST8120 Display System can be used with the following optional components:

Quantity	Description
1	RPM Sensor (ST696 Opto Isolator or ST697 H.T. Pick-up)
1	Infra-red Lap Time Receiver (ST543)
1	Infra-red Lap Time Beacon (ST544)
1	External Gear Shift Warning Lamp
1	External Alarm Warning Lamp

Wiring Harness

The ST8120 harness is slightly different to that of the ST8100.

Labels on short cables	Connection To
S1 to S4	Switches 1 to 4
WS	Boost sensor
LAP	Lap timing sensor
SL	Gear shift warning light
AL	Alarm warning light
NET	Data logging expansion pack

Labels on Long Cables:	Connection To
ES	Engine Speed (RPM)
OT	Oil temperature sensor
WT	Water temperature sensor
OP	Oil pressure sensor
F	Fuel pressure sensor
A	Intake Air temperature sensor
B +	Battery Positive
B -	Battery Negative (Earth)

Chapter 3. Operating the Display System

The operation of the ST8120 is basically the same as that of the ST8100. This section highlights any differences.

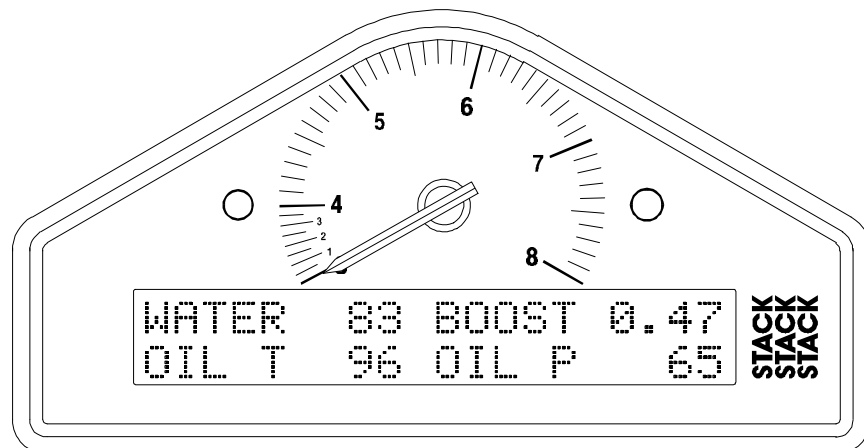
Changing the display layers

The ST8120 has four display layers. These differ significantly from those of the ST8100 and their layouts are shown below.

Each of the display layers can be displayed in turn by pressing switch 3. Press switch 3 when display layer 4 in order to return to display layer 1.

- ⇒ **The format of the values in these displays will vary for systems supplied outside the UK, as the parameters are displayed in different units.**

Display Layer 1



Display layer 1 shows:

- Water Temperature (WATER)
- Boost Pressure (BOOST)

Note: This illustration shows the Boost Pressure in Bar. In all units this can also be shown in either Bar or psi - refer to

Chapter 4. Configuring the Display System.

The number displayed is Gauge Pressure, where atmospheric is 0, boost shows as positive and vacuum as negative numbers. Due to atmospheric variations, the display may not show exactly 0.00 when the engine is stationary.

- Oil Temperature (OIL T)
- Oil Pressure (OIL P)

Press Switch 3 to see display layer 2.

Display Layer 2

WATER	88	BOOST	0.47
AIR T	65	FUELP	67

Display layer 2 shows:

- Water Temperature (WATER)
- Boost Pressure (BOOST)
- Intake Air Temperature (AIR T)
- Fuel Pressure (FUELP)

Note: When a low-range fuel pressure sensor (2Bar / 30psi) is fitted, the pressure is displayed as 0.1 PSI (US and UK) and as 0.01 Bar (EC)

Press Switch 3 to change display to layer 3

Display Layer 3

```
WATER  88 BOOST 0.47  
OIL T   96 BATT 13.1
```

Display layer 3 shows:

- Water Temperature (WATER)
- Boost Pressure (BOOST)
- Oil Temperature (OIL T)
- Battery Voltage (BATT)

Press Switch 3 to change display to layer 4

Display Layer 4

```
LAP No 14      1:20:96  
WATER  88 BEST:19:83
```

Display layer 4 shows:

- Lap number (LAP No) of last completed lap
- Lap time for last completed lap
- Water Temperature (WATER)
- Fastest lap time (BEST) (only the seconds and milliseconds parts of the lap time are shown)

Press Switch 3 to display layer 1 again.

Peak Values (Tell Tales)

The system stores either a maximum or a minimum value as the peak value, depending on the parameter, as follows:

Parameter	Type of Peak Value	Gated to RPM
Engine Speed (RPM)	Maximum	Yes
Oil Temperature	Maximum	Yes
Water Temperature	Maximum	Yes
Oil Pressure	Minimum	Yes
Fuel Pressure	Minimum	Yes
Battery Voltage	Minimum	Yes
Boost Pressure	Maximum	Yes
Air Temperature	Maximum	Yes

Resetting the Peak Values

The peak values for the channels will reset as follows:

Parameter	New Peak Value
Engine RPM	0 RPM
Boost Pressure	-999 psi or -99.9 Bar
Oil Pressure	999 PSI or 99.9 Bar
Fuel Pressure	999 PSI or 99.9 Bar or 99.9 PSI or 9.99 Bar
Oil Temperature	0C or 0F
Water Temperature	0C or 0F
Intake Air Temperature	-99C or -99F
Battery Voltage	26.0V

Alarms

The ST8120 Display System has the following built-in alarms:

Parameter	Alarm is triggered when the:	Gated to RPM
Oil Temperature	current value exceeds the preset value	Yes
Water Temperature	current value exceeds the preset value	Yes
Oil Pressure	current value drops below the preset value	No
Fuel Pressure	current value drops below the preset value	Yes
Battery Voltage	current value drops below the preset value	No
Boost Pressure	current value exceeds the preset value	No
Intake Air Temperature	current value exceeds the preset value	No

Lap times

The lap time is displayed for eight seconds either when triggered by the infra-red lap time sensor on passing the lap time beacon or when the driver presses Switch 4. The popup duration can be changed, or this popup can be turned off completely using the configuration menu (see *Chapter 4. Configuring the Display System*).

```
LAP      1:20:96
```

The most recent lap time is held in display layer 4. Press Switch 3 to see this display layer. This display gives you the lap number and time of the last recorded lap.

```
LAP No 14      1:20:96
WATER  88 BEST:19:83
```

Chapter 4. Configuring the Display System

Configuration mode

The list of configurable parameters has changed significantly from that of the ST8100. Please note that the settings for the 30PSI/150PSI FUELP SENSOR (2BAR/10BAR for EC) must match the sensor fitted or incorrect readings will be shown.

Configurable Parameter	Setting Required
E.S.Cylinders	Number of cylinders in engine (for RPM)
GATE RPM	Minimum RPM for the Fuel Pressure, Oil Temperature and Pressure, and Water Temperature warnings to operate.
LOG RPM	RPM at which the logging option is started.
SHIFT RPM	RPM at which gear shift light is to come on
HIGH WATER	Maximum water temperature alarm
HIGH OIL T	Maximum oil temperature alarm
30PSI/150PSI FUELP SENSOR	To match the sensor fitted - ST744,ST745 & ST746 are 150psi/10Bar, ST741 & ST742 are 30psi/2Bar. After changing this setting, always check the following LOW FUEL P setting
LOW FUEL P	Minimum fuel pressure alarm
LOW OIL P	Minimum oil pressure alarm
LOW BATT	Minimum battery voltage alarm
BOOST BAR/PSI	BAR/PSI determines which units are displayed and used for the over-boost test. After changing this setting, always check the following HIGH BOOST setting
HIGH BOOST	Maximum boost pressure alarm
HIGH AIR T	Maximum intake air temperature alarm
LAP TIME	Lap time popup duration, or disable

Setting or resetting configuration values

Use Switch 1 to decrease the value being configured and Switch 2 to increase it. The rate at which the value increases or decreases itself increases while the switch is being held down. Example of the displays for each of the configuration items are shown below.

Engine speed cylinders:

```
E.S. Cylinders 4
```

Gate RPM:

```
EDIT TEST  
GATE RPM 3000 on
```

Logging RPM:

```
EDIT TEST  
LOG RPM 7000 on
```

Shift RPM:

```
EDIT TEST  
SHIFT RPM 7000 on
```

High water temperature:

```
EDIT TEST  
HIGH WATER 105 on
```

High oil temperature:

```
EDIT TEST  
HIGH OIL T 130 on
```

High/Low fuel pressure sensor setting:

```
EDIT OPTION
30PSI FUELP SENSOR
```

Low fuel pressure:

```
EDIT TEST
LOW FUEL P    10  on
```

Low oil pressure:

```
EDIT TEST
LOW OIL P    35  on
```

Low battery voltage

```
EDIT TEST
LOW BATT    10.0  on
```

Boost pressure units setting:

```
EDIT OPTION
BOOST UNITS - BAR
```

High boost pressure

```
EDIT TEST
HIGH BOOST  0.80  on
```

High intake air temperature

```
EDIT TEST
HIGH AIR T  100  on
```


Lap Time popup



```
EDIT POPUP
LAP TIME 8.0 on
```

Switching Alarms / Lap Time Popup on or off

You can be enable (switch on) or disable (switch off) each of the alarm warnings or the Lap Time popup by pressing and holding Switch 1 and then pressing Switch 2.

Note that you might change the preset value of the parameter slightly while pressing both switches. This does not matter if you are switching the alarm warning off and, if necessary, you can correct the preset value after you switch it on again.

Leaving configuration mode

When you wish to return to the normal display, press Switch 4.

Chapter 5. Installing the Display System

Boost Pressure sensor

Fitting the Boost Pressure sensors

The Display System is supplied with a ST453 (0-3.5Bar) sensor.

Installing the pressure sensors

Please refer to the installation instructions supplied in the sensor package.

Air Temperature sensor

As well as the ST76x sensors supplied for Oil and Water temperatures, the ST8120 Display System is also supplied with an ST765 sensor for intake air temperature monitoring.

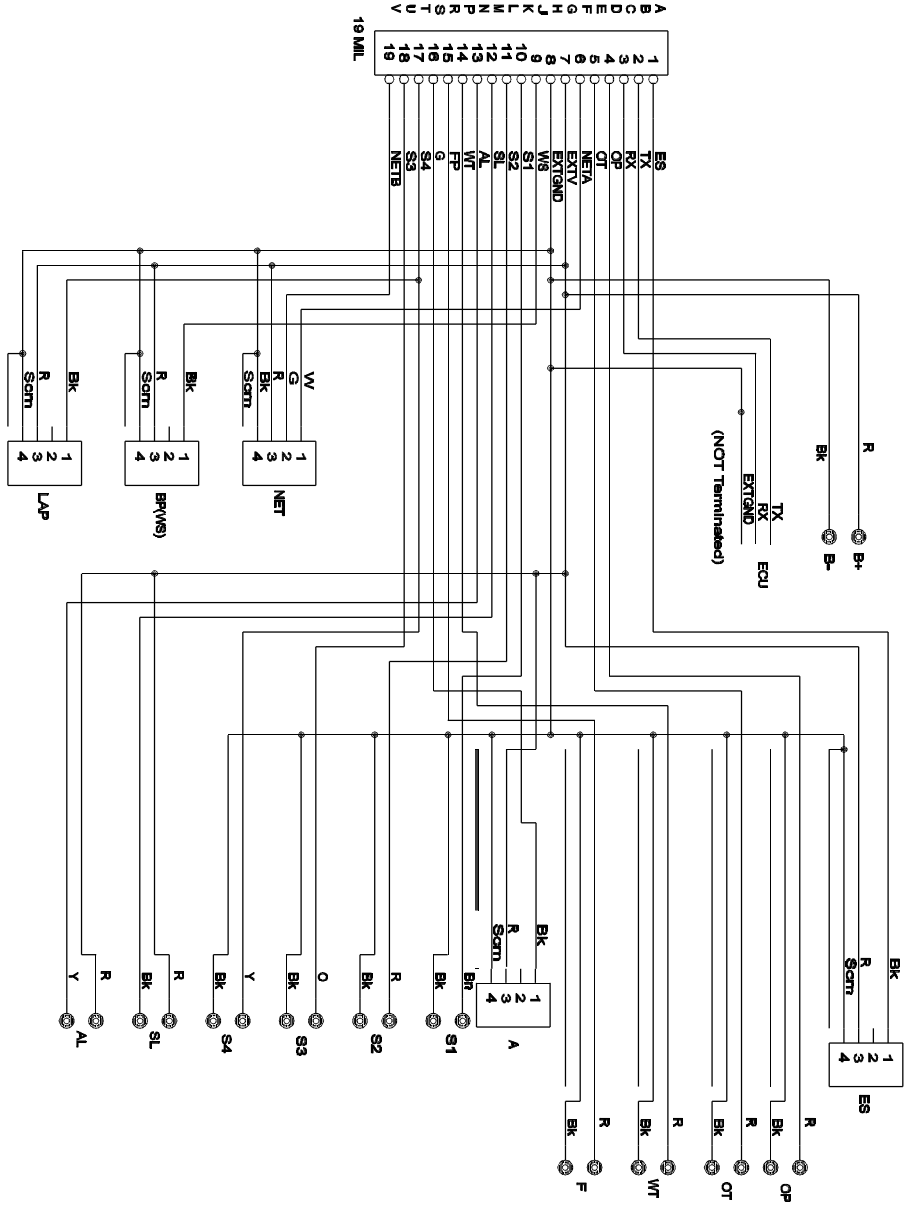
Instructions for its installation are provided in the sensor package.

Chapter 6. Troubleshooting

Use this table in conjunction with the ST8100 manual.

No.	Symptom	Possible Cause	Remedy	Notes
1	Boost shows -9.99 (Bar) or -99.9 (psi)	ST453 sensor disconnected	Reconnect	
		Faulty connections	Check connections	Refer to harness diagram
		ST453 faulty	Return for service	
2	Boost shows 0.00 (Bar) or 0.0 (psi) approximately	ST453 not connected to intake correctly	Check hose and fittings	
3	Boost display incorrect or inaccurate	Units (PSI/Bar) set wrongly	Modify setting	1 Bar is about 14.5 psi
4	Air Temperature Display gives a fixed temperature reading of 999°C or 999°F	Air Temperature sensor has failed	Replace sensor	Disconnect sensor. If reading changes to -99, replace sensor
		Faulty sensor connections	Check continuity of sensor leads	Otherwise check harness for short circuit
5	Air Temperature shows -99°C or	ST765 temperature sensor has failed	Replace sensor	
	-99°F when air temperature is above 0°C or 0°F	Faulty sensor connections	Check continuity of sensor leads for open circuits.	Check harness for open circuits (refer to the harness diagram)
6	Fuel Pressure display shows an incorrect reading	Wrong FUELP SENSOR setting	Modify setting	ST741,ST742 are 30psi/2Bar. Other sensors are 150psi/10Bar

Appendix B. Wiring Harness Schematic Diagram



Index

- air temperature
 - alarm, 9
 - display, 6
 - sensor, 14
- air temperature sensor
 - wiring label, 4
- alarm for
 - battery voltage, 9
 - boost pressure, 9
 - fuel pressure, 9
 - intake air temperature, 9
 - oil pressure, 9
 - oil temperature, 9
 - water temperature, 9
- alarm warning light
 - wiring label, 4
- alarms, 9
 - switching on or off, 13
- battery voltage, 7
 - alarm, 9, 10
- boost pressure, 5, 6, 7
 - alarm, 9, 10
 - sensor, 14
- boost pressure sensor
 - setting, 10
 - wiring label, 4
- configuring the display system, 10
- data logging subsystem
 - wiring label, 4
- display layers, 5
- engine cylinders, 10
- engine speed
 - wiring label, 4
- fastest lap time, 7
- fuel pressure, 6
 - alarm, 9, 10
- fuel pressure sensor
 - setting, 10
 - wiring label, 4
- FUELP SENSOR, 10
- gate RPM, 10
- GATE RPM, 10
- gear shift warning light
 - RPM setting, 10
- gear shift warning light, 2
 - wiring label, 4
- HIGH AIR T, 10
- HIGH BOOST, 10
- HIGH OIL T, 10
- HIGH WATER, 10
- installing the Stack ST8110, 14
- intake air temperature. *See* air temperature
- lap number, 7
- lap time, 7
 - display, 9
 - popup duration, 10
- Lap Time
 - Switching popup on or off, 13
- LAP TIME, 10
- lap timing switch
 - wiring label, 4
- logging rpm, 10
- LOW BATT, 10
- LOW FUEL P, 10
- LOW OIL P, 10
- oil pressure, 6
 - alarm, 9, 10
- oil pressure sensor
 - wiring label, 4
- oil temperature
 - alarm, 10
- oil temperature, 6, 7
 - alarm, 9
- oil temperature sensor
 - wiring label, 4
- optional components, 3
- peak values (tell-tales), 1, 8
 - resetting, 8
- performance parameters, 1
- resetting peak values, 8
- shift light. *See* gear shift warning light
- SHIFT RPM, 10
- ST453 setting, 10
- standard components, 3
- warning messages, 1
- water temperature, 5, 6, 7
 - alarm, 9, 10
- water temperature sensor
 - wiring label, 4
- wiring harness, 4
- wiring harness schematic diagram, 16