



TELEGAN
gas monitoring

TEMPEST 100

Operating Manual

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1. INTRODUCTION

Congratulations on buying your **Tempest 100** combustion performance analyser. The unit has been carefully designed and includes the latest technology to give you an instrument that is easy to use, reliable and accurate.

The **Tempest 100** is part of a family of instruments from Telegan, a company with over 15 years of combustion instrumentation experience. It measures the oxygen (O₂) and carbon monoxide (CO) content of tested flue gas and the flue, ambient, inlet and nett temperatures. It calculates the carbon dioxide (CO₂) content of the flue gas as well as the nett or gross percentage boiler efficiencies for a wide range of different fuels. The unit includes a built in printer, pressure/draught measurement, data logging, RS233 communications and display backlight.

The **Tempest 100** is rugged and has been designed for a tough life with heating professionals. Its wipe-clean touch panel allows you to achieve the results you need quickly and simply, without the risk of moisture or dust damaging the contents. As you will see from this manual, much of the instrument's operation can be done with just three buttons.

Several options are available with the **TEMPEST 100**. These can be specified for delivery with the instrument or can be added later. They include additional sensors such as nitrogen dioxide (NO₂), sulphur dioxide (SO₂), hydrogen sulphide (H₂S) and unburnt hydrocarbons and calculation of stack losses. If you would like to add any of these options please contact our sales office (see back cover for details).

This manual will show you how to get the best out of your new **TEMPEST 100**. Section 3 shows you the layout of the instrument. Go straight to Section 4 to start using your **TEMPEST 100**. If you have any questions please contact us. Thank you very much for buying our product - we wish you many years of successful use.

2. INSTRUMENT FEATURES

2.1 Standard Features

TEMPEST 100 offers the following standard features and functions:

- flue, ambient, inlet and nett temperature measurement ($^{\circ}\text{C}$ or $^{\circ}\text{F}$)
- % oxygen (O_2) with calculated % carbon dioxide (CO_2) for a range of standard fuels i.e. natural gas, light oil, propane, heavy oil, coal and coke
- carbon monoxide (CO) in parts per million (ppm)
- nitric oxide (NO) in parts per million (ppm) and calculated NO_x
- combustion efficiency and excess air
- CO/CO_2 ratio
- real time clock
- advanced menu driven software
- tactile push button membrane keypad
- integral combined water-trap and particulate filter
- backlit display
- soft carrying case for instrument and probe
- data logging
- integral impact dot matrix printer
- pressure/draught measurement
- user-defined fuel
- reference oxygen and choice of concentration unit either ppm or mg/m^3
- RS232 communications

2.2 Options and Upgrades

- high level CO sensor (20 x concentration range)
- sample conditioning probe
- nitrogen dioxide sensor (NO_2)
- sulphur dioxide sensor (SO_2)
- hydrogen sulphide sensor (H_2S)
- stack losses calculation
- unburnt hydrocarbon measurement (ambient)

2.3 Accessories and Consumables

The following accessories and consumables are available:

	<u>Part Number</u>
Protective aluminium case	CAS20014
Smoke Tester Kit	OPT20038
Long probe (1 metre)	PRB20062
High temperature probe	PRB20061
Car charger lead	CHG99002
Particulate filters (minimum 5)	FIL20019
Coalescing filters (minimum 5)	FIL20021
Printer rolls	PAP20053

2.4 Default Settings

Feature	Default Setting	Alternatives	See Section
<i>Standard</i>			
Temperature	°C	°F	Key 7 in 6.2
Fuel	Natural Gas	(See 2.1)	Key 2 in 6.2
Efficiency Basis	Gross	Nett	Key 8 in 6.2
Time	UK time	Any	Key 0 in 6.1
Date	DD-MM-YY	MM-DD-YY	Key 0 in 6.1
Pressure Units	mbar	Inches WG	Key 2 in 6.3
Print-out interval	1 minute	1,3,5,10,20 30 minutes	Key 1 in 6.2
Backlit Display	Off	On	Key 4 in 6.1
<i>Options</i>			
Concentration Units	ppm	mg/m ³	

3. TEMPEST 100 GRAND TOUR

This chapter describes the layout of the **TEMPEST 100** unit and gives a brief introduction to the physical and electrical connections, the keypad details and functions and the various output devices which include the display, printer and indicator lights. The top panel is broadly divided into three sections as follows:

Left: Physical Connections which include the sample, pressure and vent ports and the thermocouple sockets.

Centre: Control Panel which includes the keypad layout and the associated keys and indicators.

Right: Printer and Communications Ports

3.1 Left: Physical Connections

This section shows how to connect the sampling probe, thermocouples and other accessories to the **TEMPEST 100** unit. Please refer to Figure 1 for the following reference numbers.

Ref No	Name	Description/Function
1	Sample Port	The port through which the sample gas to be analysed must pass. The sample line from the probe should be fitted to the spigot of the sampling port for emissions measurement.
2	Auxiliary Port	Used with a sample conditioning probe, if chosen as an option.
3	Pressure Port	The sample line from the probe should be fitted to the spigot of the pressure port for pressure/draught measurement, if chosen as an option.
4	Stack Thermocouple Socket	Socket for the thermocouple plug attached to the sampling probe. When connected the TEMPEST 100 will measure the temperature at the tip of the probe.
5.	Intake Thermocouple Socket	Socket for a thermocouple plug that may be attached to an auxiliary thermocouple placed in the intake gas stream. If this is not fitted a spot measurement of the temperature of the intake gas may be measured using the standard sampling probe.
6.	Vent	Auxiliary vent for use with the sample conditioning probe.

3.2 Centre: Control Panel

This section details the control panel area which is used to operate the **TEMPEST 100** unit. It incorporates a keypad, display and various indicators (Refer to Figure 2 Centre: Control Panel).

Ref No	Name	Description/Function
7	Power On/Off Keys	These two keys must be pressed simultaneously to switch the unit on and off. This prevents the unit from being turned off accidentally during operation.
8	Battery Recharge Indicator	An illuminated green LED next to the battery symbol indicates that the internal battery is being charged by an external power source.
9	Power Indicator	An illuminated red LED next to the on/off symbol indicates that the unit is switched on and receiving power from either the internal battery or an external power source.
10	Display	The area where all the information regarding the current mode of operation of the TEMPEST 100 is displayed.
11	Keypad	Allows the operator to control the unit and access the TEMPEST 100 functions using simple keystrokes. The positions of the principal keys are shown in Figure 2 and a tabulated brief description of their functions is given in Table 1 : Quick Key Reference (centre page).

3.3 Right : Printer and Communications

This section describes the physical layout of the integral printer (if fitted as an option), the charger input socket and the various communications ports used to send emissions data to external devices (Refer to Figure 3 Right : Printer and Communications Ports).

No.	Name	Description/Function
12	Printer Cover	Protects the printer unit from damage while allowing easy access for replacement and insertion of the printer roll and ribbon
13	Paper Slot	The printer paper roll should be fed through the paper slot which also acts as a sharp cutting edge to tear the paper.
14	Printer Cover Catch	Click-tight catch that holds the printer cover in place.
15	RS232 Port	The RS232 communications port allows the TEMPEST 100 to send emissions data to a suitable terminal or data logging hardware.
16	Charger Socket	Receiving socket for either the mains charger or the 12V DC charger.
17	Parallel Port	Performs no function for the TEMPEST 100 . An additional communications port for higher specification units.

4. QUICK START

This reference section will enable the user to operate the **TEMPEST 100** quickly. However, it is advisable to consult the relevant sections to familiarise yourself with the layout of the **TEMPEST 100** (Section 3 - **Tempest 100** Grand Tour). For a more detailed explanation of the set up conditions see Section 5 and for key operations see Section 6.

4.1 Before Starting

Check that the contents supplied (Section 2) are in good condition. Always use the **TEMPEST 100** in the upright position.

4.2 Switching 'On'

Press the on and off keys   together.

4.3 Operation Mode

When switched on the display will read:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*	*	*		T	E	L	E	G	A	N			*	*	*
*	*		T	E	M	P	E	S	T		1	0	0	*	*
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

unless specially configured for you

The display will then countdown a stabilising or calibrating sequence from 30 to 0 as the unit stabilises before returning to the initial display as illustrated above.

Listen to check that the pump is running.

Check the current battery charge level by pressing key  'O'

and reading the percentage battery charge remaining (Battery (%)):

- If the level is below 40% then it is advisable to charge the battery
- If the level is below 10% then the low battery warning will be displayed and the battery must be charged.
- The **TEMPEST 100** can be used normally with the battery charger connected.

Check that the fuel setting is correct. This is shown below the Battery (%) status on the display. To select a different fuel press the menu key once (refer to the Quick Key Reference) then select option 2 and scroll through the list of standard fuels using the up and down cursor keys (keys 1 and 5). Select the desired fuel when displayed (refer to 2 in Section 6.2).

4.4 Probe Position

Select the sampling probe and fit the sample tubing to the sample port of the **TEMPEST 100** unit (1 in Fig 1) and the thermocouple plug to the stack thermocouple socket (4 in Fig 1). Position the probe in the flue to take the required sample.

4.5 Taking an Emissions Reading



Press key '8' to obtain the emissions data i.e. the carbon monoxide concentration plus the nitric oxide and calculated NO_x (when fitted as an option).



Press key '9' to obtain the efficiency data, which includes the carbon monoxide and oxygen concentrations, the excess air, calculated carbon dioxide concentration, ratio and efficiency for the selected fuel. This has two display pages and pressing key 9 toggles between the two.

4.6 Printing (if option available)



To obtain a print-out press key '1'.

4.7 Switching 'Off'

Remove the fitted probe and allow the pump to empty the **TEMPEST 100** of flue gas for about 60 seconds. Switch off by pressing both ON / OFF buttons together as in 4.2. In transport ensure that the filter bowl is empty of water (refer to 5.4.3).

5. **HARDWARE SET-UP**

5.1 **Power Requirements**

The **TEMPEST 100** unit can be powered in three ways:

1. Internal rechargeable battery
2. Mains charger and connector
3. 12 V DC charger for use in a vehicle

5.1.1 **Battery Operation** - the **TEMPEST 100** is designed for battery operation enabling 4-6 hrs continuous use. Fully recharging the cell can take less than 2 hrs. The approximate percentage battery charge remaining can be identified by pressing the STATUS key (Refer to 0 in 6.1) when the unit is switched on. During operation a low battery warning will indicate when recharging is necessary. The internal battery will recharge automatically when the unit is connected to either the mains (Section 5.1.2) or a 12 V DC power source (Section 5.1.3) and the green power indicator next to the battery symbol (9 in Fig 2) will illuminate to indicate that the unit is charging whether the unit is operating or not.

5.1.2 **Mains Adapter** - the **TEMPEST 100** unit can be run continuously from a mains socket using the standard mains charger supplied. This adapter should be inserted into the charger socket (16 in Fig 3). To quick-charge (in 2 hours) the unit must be switched on, otherwise the charging time will be greater than 5 hours.

5.1.3 **12 V DC Adapter** - the **TEMPEST 100** unit can also be run continuously or charged from a normal car battery via the cigarette lighter socket using an optional 12 V DC adapter. The power connector leading from the adapter should be inserted into the charger socket (16 in Fig 3).

5.2 **Sample Probe Attachment**

The sample tubing should be connected to the sample port (1 in Fig 1) or pressure port (3 in Fig 1) depending on which measurement is being performed (emissions or draught measurement, respectively).

The yellow thermocouple plug should be correctly inserted (thinner pin marked + to the left) into the stack thermocouple socket (4 in Figure 1) for stack temperature measurement.

The user must ensure that the sample tubing is not bent, blocked or kinked in such a way that the gas cannot be drawn through the unit.

When the sample line is blocked the pump and motor unit will begin to labour generating increased noise.

5.3 **Printer Roll Insertion**

The printer cover (12 in Fig 3) can be flicked up by unfastening the printer cover catch (14 in Fig 3). The paper roll should be placed in the compartment so that the free end is drawn from below the roll and feeds towards the front of the unit. A short length of the paper roll (4-8cm) should be unwound and fed through the printer mechanism by press Key 2 - Paper Feed until the paper is visible. The paper should be fed through the paper slot (13 in Fig 3) in the printer cover and the cover should then be shut. Excess paper should be torn off by pulling against the sharp edge of the paper slot. The printer should now be fully operational.

5.4 **Filter Unit**

The internal structure of the filter unit (Fig 4) consists of two separate filter elements (e and f) that are attached at one end to the **TEMPEST 100** unit (g) and separated at the bottom by the filter inner disc (d) which allows water to pass through the assembly to the receiving filter bowl (b). A gasket (c) is fitted to the filter inner disc to form a seal between the filter inner disc and the filter bowl.

5.4.1 Assembly - to assemble the filter unit for the initial set up or to replace damaged filter elements the **TEMPEST 100** unit should be turned upside down after ensuring that the filter bowl has been drained completely (Section 5.4.3). The filter bowl (b) should be unscrewed clockwise and removed from the unit. The coalescing and particulate filter elements (e & f respectively) should be aligned and pushed down onto the **TEMPEST 100** unit (g). The gasket (c) should be pushed onto the filter inner disc (d) which should subsequently be pushed down onto the 2 filter elements (e & f). Ensuring that the 'O' ring (h) is present in the base of the **TEMPEST 100** (g) align the filter elements and fittings with the filter bowl (b) and press against the 'O' ring and gasket / filter inner disc. Screw anti-clockwise until the bowl locks into place and is held securely.

This action simultaneously exerts a compressive force upon the gasket, pushing the filter inner disc upwards and producing a tight fit between the filter elements, the inner disc and the filter bowl.

Before sampling can commence, ensure that the filter drain plug (a) is inserted into the base of the filter bowl (b).

5.4.2 Filter Replacement - it is advisable to replace the filter elements (e & f in Fig 4) when they appear dirty (see re-ordering information on back page) to prevent filter inefficiency due to blockage from particulate contamination or water saturation. Following removal of the filter bowl (as described in 5.4.1) the filter elements stick due to compression of the filter material and they can be removed gently by pulling the filter inner disc (d) and gasket (c) from the filter assembly. The filter elements should be discarded, if damaged or irretrievably contaminated (see above), or reclaimed by drying if water saturated. The filter unit should then be reassembled as described previously (5.4.1).

5.4.3 Water Removal - the water level in the transparent filter bowl (b) can be observed during operation from the side of the unit and the filter bowl should be drained of water at any convenient time, such as before sampling, or before the water level reaches the base of the filter inner disc (d) and gasket (c). When draining the filter bowl the sampling pump of the **TEMPEST 100** unit should be switched off (refer to Section 6.3, 6 - Pump (On / Off)) and no emissions data (8 in Section 6.1) should be collected during this short period of time. The filter bowl drain plug (a) should be removed from the filter bowl (b) and water allowed to drain away completely. It should be noted that removing the filter bowl drain plug will allow the ambient atmosphere to dilute the sample gas stream in the unit and no emissions data should be collected until this residual air has been thoroughly flushed through the sampling system. After reactivating the pump (see 6.3, 6 Pump (On / Off)) allow 60 seconds to thoroughly flush the sampling system.

5.5 Exhaust Removal

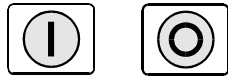
If the instrument is to be used in a confined space, the exhaust gases that exit the **TEMPEST 100** unit following analysis can be vented away from the user. Attach a suitable connector or flexible tube with the required minimum internal diameter (15mm) to the exhaust spigot located on the base of the unit.

Care must be taken to ensure that this vent is not blocked in any way that would prevent the transport of exhaust gas along the tubing.

6. OPERATION

The **TEMPEST 100** unit is operated using the membrane keypad located on the top of the unit (11 in Fig 2) and a brief description of the specific key functions is given in Table 1 (Quick Key Reference). A comprehensive guide to the operation of the unit using the Principal Key Operations (Section 6.1) and menu operations (Sections 6.2 & 6.3) follows:

6.1 Principal Keys



ON / OFF

The **TEMPEST 100** unit can be switched on / off by simultaneously pressing the two keys shown above.

A red light (9 in Figure 2) will indicate that the unit is on and a characteristic beep will be heard before the start up screen is displayed:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
*	*	*		T	E	L	E	G	A	N		*	*	*	
*	*		T	E	M	P	E	S	T		1	0	0	*	*
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

(Note: This may be configured slightly differently in some cases.)

A green light (8 in Fig 2) will indicate that the unit is connected to a charger unit. The characteristic noise of the pump will be heard unless the charger unit is connected, the oxygen concentration is > 20% and either the flue probe is not connected or the stack temperature is < 50°C≡112°F. The unit will immediately begin a stabilising routine and the following numeric countdown will be displayed, where [X] = 30 to 1:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		S	T	A	B	I	L	I	S	I	N	G		
						[	X]						
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The start up screen is displayed once again (see above) indicating that the unit is now ready to perform emissions monitoring functions.

1 Print (Optional)



Pressing the print function key will print the emissions data in the following format (see below).

The data will be output in the following manner:

```

* * *   T E L E G A N   * * *
* *   T E M P E S T   1 0 0 * *
DATE           0 9 - 1 9 - 0 2
TIME           1 5 : 1 1 : 0 6
   NATURAL GAS
AMBIENT C           2 3
INTAKE C           2 5
STACK C           1 8 7
NETT C           1 6 2
CAL .  0 2   - -   2 0 . 9 3
XAIR
CO %   . . . . . 0 . 3 5
CO2    %   . . . . . 3 . 5
NO     p p m   . . . . . 1 5
NOx    p p m   . . . . . 1 8
EFF    %   ( N )   8 5 . 5
Pr s .   m B a r   - 2 8 . 1 5
- - - - -

```

4 Backlight



Pressing the backlight function key will turn the backlight on and off.

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		D	I	S	P	L	A	Y		L	I	G	H	T
						O	N							
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The backlight display allows the user to operate **TEMPEST 100** in areas of poor illumination.

5 Hold



When the hold function key is pressed the display will show:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#		D	I	S	P	L	A	Y		H	O	L	D	#
						O	N							
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

before reverting back to the displayed data.

When this message is displayed the **TEMPEST 100** unit will not perform any subsequent emissions measurements, update the time or allow any other parameters to be changed. This enables the user to hold data or print-out several copies of a set of readings. Pressing again will turn the 'DISPLAY HOLD' off.

6 Scale



When the scale function key is pressed the following measured parameters will be displayed:

O	2		S	T	A	T	U	S				H	I	G	H
P	r	s	.		m	B	a	r		.	.		9	9	0

O2 STATUS HIGH indicates that the oxygen sensor is producing sufficient output when placed in air. If the status reads LOW then the oxygen sensor may require replacement (see back page). The other line of data is the draught measurement, when the pressure sensor is fitted as an option.

7 Temperature



When the temperature function key is pressed the following temperature data will be displayed in the following format using the selected temperature units, i.e. °C or °F:

I	N	T	A					C					1	8
S	T	A	C					C					1	9
A	M	B	I	E	N	T		C					2	3
N	E	T	T					C					1	7

- INTA(KE) The temperature of the air entering the combustion chamber if an auxiliary probe is fitted.
- STAC(K) The temperature measured by the flue gas probe.
- AMBIENT The temperature measured by a sensor in the **TEMPEST 100**
- NETT The difference between the intake (or ambient if no intake

temperature) and the stack temperatures.

8 Emissions



When the emissions function key is pressed, any emissions data will be displayed in the following format:

N	O			p	p	m														4	6			
N	O	x		p	p	m															5	2		
C	O			p	p	m	1	0	2	
O	2			%	1	0	.	8

9. Efficiency



When the efficiency function key is pressed the following parameters (measured and calculated) will be displayed in the following format:

E	F	F			%																		7	3				
X	A	I	R					O	2		>														2	0	%	
O	2				%
C	O				p	p	m	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

When the efficiency key is pressed again the screen will display the following parameters (measured and calculated) in the revised format using the chosen units:

R	A	T	I	O	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
C	O	2			%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
O	2				%	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
C	O				p	p	m	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

RATIO The ratio of CO (measured) / CO₂ (calculated)

CO₂ The calculated CO₂ concentration obtained from the measured oxygen concentration O₂% and the maximum theoretical CO₂% concentration value (constant) for the specified fuel.

O Status

When the status function key is pressed the following page of information will be displayed:

D	A	T	E					1	7	-	1	0	-	9	5
T	I	M	E					0	9	:	0	6	:	1	7
B	A	T	T	E	R	Y	(	%	)					8	6
			N	A	T	U	R	A	L		G	A	S		

- DATE** The date can be displayed in either d-m-y or m-d-y format (Refer to 0 in Section 6.2 to alter format).
- TIME** The time is displayed in a 24 hour clock format hours: minutes:seconds.
- BATTERY (%)** The battery life remaining.
- FUEL** The fuel type indicates the currently selected fuel (Refer to 0 in Section 6.2 to alter fuel selection) used to calculate parameters such as efficiency, calculated CO₂, etc.


6.2 First Menu Page

The menu keys enable a further range of **TEMPEST 100** functions and parameters to be accessed. When prompted for a parameter, either a number can be input using the numeric keys (0-9) or a selection can be made by scrolling through a list of options. When the desired number or option is highlighted it can be selected by pressing the return key:



MENU



When the menu function key  is pressed the following menu of options will be displayed:

1	-	P	R	I	N	T		2	-	F	U	E	L		3	-	L	O	G
4	-	V	I	E	W		5	-							6	-	C	/	F
7	-	T	E	M	P		8	-	E	F	F		9	-	C	A	L	O	2
0	-	D	A	T	E		<	>	-	N	E	X	T		P	A	G	E	

The specific options can be chosen by pressing the appropriate numeric key (0-9) and each choice will now be described in detail:

The choice of standard fuels can be chosen by scrolling through the table using the up and down cursor keys:

PROPANE

NATURAL GAS

HEAVY OIL

LIGHT OIL

COKE

COAL

BUTANE

When the desired fuel has been highlighted the return key should be pressed to choose this parameter.

3 - Data Logging

1. Data Output

In this mode the full set of parameters is output on the RS232 port each time the SAVE key or PRINT key is pressed. Data is also output each time a timed printout occurs. No data is saved to memory. The data is in ASCII text format for compatibility with word processors and spreadsheets.

2. Data Logging

A full set of parameters is saved to memory as a page each time the SAVE key is pressed. Up to 100 pages can be stored after which the previous reports are overwritten - the MEMORY PAGE counter is reset to 1. In this case the most recent report overwrites the oldest report so that the most recent 100 reports are retained. The current page count can be displayed by pressing the STATUS key twice. The page count and logged data are stored when the instrument is switched off. If required, the MEMORY PAGE counter can be reset to 1 at any time - see MEMORY RESET. The contents of the logging memory can be output to the RS232 port as a complete list of 100 reports - see MEMORY OUTPUT. Note that pressing the print key or occurrence of a timed printout does not cause data to be stored to memory or output on the RS232 port in this mode.

3. **Timed Logging**

This mode should be selected if data storage at fixed time intervals is required. In this mode data is stored whenever a *timed printout* occurs, the PRINT key or the SAVE key are pressed. If timed logging is required without timed printouts then the USER PRINTOUT mode should be selected and set for zero lines - see section of USER PRINTOUT. Note that the TIMED LOGGING mode should be changed to DATA LOGGING mode if the logging memory contents are to be output on the RS232 port.

Associated Keys

SET LOGGING MODE KEY (Key 3 on first MENU page)

This allows the DATA OUTPUT/DATA LOGGING/TIMED LOGGING mode to be selected as required.

SAVE KEY (Key 3 pressed during normal viewing mode)

In DATA OUTPUT mode pressing the SAVE key causes the current set of parameters to be output on the RS232 port.

In DATA LOGGING or TIMED LOGGING mode pressing the SAVE key causes data to be stored to the logging memory at the current MEMORY PAGE and the MEMORY PAGE pointed to be incremented by 1. No data is sent to the RS232 port.

MEMORY OUTPUT KEY (Key 7 on the second MENU page)

In DATA LOGGING mode this causes entire 100 reports to be output on the RS232 port. It has no effect in DATA OUTPUT or TIMED LOGGING modes.

MEMORY RESET (Key 8 on second MENU page)

This resets the logging memory page pointed to 1 so that all subsequent logs are stored sequentially starting at page 1.

Connecting TEMPEST 100 to a Windows 3.1 PC

1. Connect the **TEMPEST 100** to SERIAL port 1 or 2 of the PC as required.
2. From windows programme manager select the **TERMINAL** programme.
3. From the Settings menu select Communications.
4. Set the Communications parameters as follows:

Baud rate: 9600
Data bits: 8
Stop bits: 1
Parity: None
Flow Control: None
Connector: COM1 or COM2
Parity Check - blank
Carrier Detect - blank

5. Then press the OK button.
6. From the Settings menu select Terminal Preferences.
7. Set the Terminal Preferences parameters as follows:

Terminal Modes:
Line Wrap - X
Local Echo blank
Sound - X

CR->CR/LF
Inbound - blank
Outbound - blank

Columns
132

Translations
None

8. Then press the OK button.

9. To save these settings for future use select the File menu and save as **TEMPEST 100.TRM**. When you next run TERMINAL open this file from the File menu.
10. When **TEMPEST 100** is switched on data should appear in the TERMINAL window of the PC when the SAVE key on the **TEMPEST 100** is pressed.
11. To store this data go to the Transfers menu and select Receive Text File. Enter the File name, *name.txt*, of the file in which you wish to store the data.
12. Press the Stop button when you wish to stop receiving data and save the file. You can view the file by selecting View File from the Transfers menu or use another application such as a word processor or spreadsheet.

Connecting TEMPEST 100 to a Windows 95 PC

1. Connect the **TEMPEST 100** to SERIAL COM port 1 or 2 of the PC as required.
2. From Windows 95 START menu select Programmes then Accessories then Hyper Terminal.
3. If this is the first time you are making a connection from the PC to **TEMPEST 100** then select the Hypertrm Icon from the Hyperterminal panel. Otherwise select the **TEMPEST 100** icon and go to the section on *Transferring Data from Tempest 100*.
4. Choose a name for the new connection e.g. **TEMPEST 100** and then select an icon as promoted by Hyperterminal.
5. Select the COM port to which the **Tempest 100** connected as prompted by Hyperterminal. (Country Code, Area Code and phone number are faded out and should be ignored).

5 This key is not used.

6-Celsius / Fahrenheit

	T	E	M	P	E	R	A	T	U	R	E		S	C	A	L	E	?		
					C	e	l	s	i	u	s									

Pressing any of the numeric (0-9) will toggle the unit of temperature measurement between degrees Celsius (°C) and degrees Fahrenheit (°F). When the desired unit is displayed it should be selected by pressing the return key.

7-Temperature

This function allows the intake temperature to be measured using the sampling probe and stored in the **TEMPEST 100** unit memory for nett temperature calibration.

	S	E	T		I	N	T	A	K	E		T	E	M	P					
					Y	E	S													

Pressing any of the numeric (0-9) will toggle the intake temperature setting between the on and off states. When the desired state is displayed it should be selected by pressing the return key. If the 'yes' option is selected then the following message is displayed and the sampling pump, if not already operating, will be activated:

		P	L	A	C	E		P	R	O	B	E		B	Y						
		B	U	R	N	E	R		A	I	R		I	N	T	A	K	E			
		S	T	A	C	K				C						2	6				

At this prompt you should insert the sampling probe into the air inlet for your burner and allow the displayed temperature reading to stabilise, at which point the return key should be pressed.

If no intake probe is fitted this reading is now used to calculate the net temperature and is displayed against the INTAKE heading on the display.

8-Efficiency

	E	F	F	I	C	I	E	N	C	Y		B	A	S	I	S				?
							G	R	O	S	S									

Pressing any of the numeric (0-9) will toggle the efficiency basis between gross and net efficiency i.e. the calculated efficiencies based on the gross and net calorific values for the selected fuel respectively. When the desired state is displayed it should be selected by pressing the return key.

9-Calibration Oxygen Level

The calibration oxygen level function is used to set the calibration oxygen level to the ambient atmospheric value (i.e. 20.9% v/v O₂). When this option is chosen the pump will automatically be switched on, if not already, and a clean air sample should then be drawn through the instrument. While the oxygen sensor reading is approaching the calibration value of 20.9% the following screen will be displayed with the cal. O₂ value gradually approaching the atmospheric value:

		D	A	T	E				0	9		1	0		9	5				
		T	I	M	E				1	5	:	0	3	:	2	8				
		C	A	L	.		O	2	-	-		2	0	.	9	7				

When the oxygen reading has reached a stable value and achieved its calibration state the bottom line of the display will change to:

	O	2		%										2	0	.	9			
--	---	---	--	---	--	--	--	--	--	--	--	--	--	---	---	---	---	--	--	--

0-Date

	D	a	y	-	M	o	n	t	h	-	Y	e	a	r						
			S	e	l	e	c	t	O	r	d	e	r							

Pressing any of the numeric (0-9) will toggle the date format between Day-Month-Year and Month-Day-Year.

When the desired state is displayed it should be selected by pressing the return key. The following screen will be displayed:

	D	A	T	E			<u>2</u>	1	-	0	8	-	9	5						
							S	E	T											

The cursor (underline) indicates which number is selected and either a different number can be input using the numeric keys (0 to 9 in Figure 2) or the displayed value can be selected by pressing the return key. In each case the cursor will move to the next number on the display, six in total, and each pair of numbers represents each field of the date format selected previously.

After the sixth number has been selected the display will switch to the following time selection screen:

	T	I	M	E			<u>1</u>	1	-	0	8	-	3	5						
							S	E	T											

Similarly the cursor (underline) indicates which number is selected and either a different number can be input using the numeric keys (0 to 9 in Figure 3) or the displayed value can be selected by pressing the return key. In each case the cursor will move to the next number on the display, six in total, and each pair of numbers represents each field of the time format i.e. hours-minutes-seconds.

Note: The clock in the Tempest does not store leap year data and, therefore, will need to be reset every 4 years e.g. the clock will need resetting on the 1st January 2000, 1st January 2004 etc.

6.3 Second Menu Page

MENU



When the menu function key is pressed a second time the following menu of options will be displayed if the optional pressure sensor is fitted:

1	-	P	R	E	S	S	U	R	E		Z	E	R	O					
2	-	P	R	E	S	S	U	R	E		m	B	a	r	/	i	n	W	G
4	-	P	R	E	S	S	U	R	E		H	O	L	D					
5	-	S	E	R	V	I	C	E						6	-	P	U	M	P

Else the following reduced menu of options will be displayed:

1	-																		
2	-																		
4	-																		
5	-	S	E	R	V	I	C	E						6	-	P	U	M	P

The specific options can be chosen by pressing the appropriate numeric key (0-6) and each choice will now be described in detail:

1-Pressure ZERO (Optional)

Pressing this key will calibrate the internal pressure sensor to standard atmospheric pressure.

2-Pressure Units (mBar or in WG) (Optional)

										S	E	T						
		P	r	S	.		m	B	a	r				0	.	0	0	

Pressing the up and down cursor keys (Keys 5 and 1)

4-Pressure HOLD (Optional)

Pressing this key will prevent the internal pressure sensor updating the pressure reading so that the information can be printed or analysed at leisure.

7. SPECIFICATIONS

Enclosure

Dimensions (mm)

Green, TRIAX, IP 345

280wx120dx112h mm

(=11"wx4³/₄"dx4¹/₂"h)

Weight (no case)

1.4 kg (= 3lbs)

Ambient operating temperature

0° to +40°C (=32° to +104°F)

Internal Power Cell

6v 850 mAh rechargeable NiCd cell

continuous duty 4-5 hours

Battery recharge to full

2 hours

Charger input voltage

115v or 230v, 50/60 Hz AC

Display

Liquid crystal display (backlight optional)

Format

4 line 20 character alphanumeric

Probe (standard) construction

Pistol-grip with stainless steel shaft

Insertion length

300mm (= 11³/₄"

Hose length

2500mm (=98"

Maximum probe temperature

800°C (=1472°F)

Integral Printer (optional)

Impact dot matrix printer

Format

16 characters/line 60 lines/minute

Ribbon

Black print life 7000 lines

Paper width

45mm (= 1³/₄"

Sensors

Measurement	Range	Resolution	Accuracy
Oxygen (O ₂)	0-25%	0.1%	±0.2%
Carbon Monoxide (CO)	0-10000 ppm	1 ppm	<100 ppm : ±5 ppm >100 ppm : ±5%
High (CO)	0-10.00%	0.01%	<0.10% : ±0.01% ±5% fsd > 0.10%
Nitric Oxide (NO)	0-1000 ppm	1 ppm	<100 ppm : ±5 ppm >100 ppm : ±5%
Probe Thermocouple	0-800°C (=32°-1472°F)	1°C	±0.3%, ±1°C (= ±0.3%, ±2°F)
Ambient Temperature	0-40°C (=32°-104°F)	1°C	±1°C
Pressure/Draught	±150 mb	0.01mb	±0.5%
Efficiency/Stack loss	0-99.9%	0.1%	
CO ₂	0-99.9%	0.1%	

The CO and NO sensors have replaceable filters which should be changed regularly if used in harsh environments. The expected life for these sensors is three years under normal operating conditions and for the oxygen sensor the expected life is two years.

TELEGAN SERVICE

Instruments for repair or calibration can be returned to our Abingdon factory which is equipped to provide an efficient after-sales service. Units may be returned direct or through our international distributor network.

CALIBRATION CERTIFICATE

Units repaired by Telegan or our Authorised Agents can on request be returned with a CALIBRATION CERTIFICATE. A nominal charge is made for this service.

TELEGAN GUARANTEE

Your Telegan instrument is guaranteed for twelve months from delivery against faulty design, workmanship or materials.

Issue No: 4
Date: 02 February 2005
Stock No: INS21001

TELEGAN INFORMATION

For further information on Telegan products contact:



TELEGAN GAS MONITORING LIMITED













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—A—
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GROUP
COMPANY

	No.	Key	Description / Function
	1	Print	Prints the current emissions data, time and date (when the printer is fitted as an option)
	2	Paper Feed	Advances the paper roll by one line (when the printer is fitted as an option)
	3	Data Output	Sends emissions data through the RS232 socket so that data may be accessed using a suitable terminal
	4	Backlight	Switches the backlight on and off
	5	Hold	Freezes the data collection and print functions. If the unit is frozen then asterisks (**) are printed on both sides of the display. Toggles on / off.
	6	Scale	Displays the life remaining of the oxygen sensor and the current pressure reading (when the pressure sensor is fitted as an option).
	7	Temperature	Displays the intake, stack, ambient and net (calculated) temperature values in the chosen units °C or °F
	8	Emissions	Displays combustion gas concentrations
	9	Efficiency	Displays the efficiency, excess air, ratio, CO ₂ (calculated), CO and O ₂ concentrations
	0	Status	Displays the date, time, remaining battery life and current selected fuel
		Menu	Displays menu screens to allow user to change settings
		Return	Used with the menu key

