



TORQUE WRENCH ANALYSER

TWA

OPERATOR'S HANDBOOK (PART No 34211)
ISSUE 9



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MODEL NUMBERS :-

This operators handbook covers the following TWA display instruments.

<u>TWA TYPE</u>	<u>MODEL No</u>
TWA 10	43150
TWA 10 + Internal Battery Pack	43151
TWA 10 Special	43169
TWA 100	43152
TWA 100 + Internal Battery Pack	43153
TWA 1000	43154
TWA 1000	43154.BET
TWA 1000 + Internal Battery Pack	43155
TWA 1000 Special	43170
TWA 2800	43156
TWA 2800 + Internal Battery Pack	43157

NOTE :- *All TWA models are fitted with an RS-232-C interface as standard.*

See appendix for any model numbers not listed.

Due to continuous improvement all specifications are subject to change without prior notice.

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OPTIONAL EXTRAS :-

	<u>MODEL NO.</u>
Internal Battery Pack Sub-Assembly	44013
Data Printer (RS-232-C)	60164
Carrying Case	38272
TWA Service Manual	34214
Print Inhibit Controller (Remote, Hand Held)	60167

TWA CALIBRATION AND REPAIR :- _____

To maintain the specified accuracy it is recommended that the TWA be recalibrated at least once per year.

Recalibration and repair should be carried out at Norbar or by a Norbar approved agent, where all the facilities to ensure the instrument is functioning at maximum accuracy are available.

Alternatively, procedures for calibrating the TWA to the specified accuracy can be found in the TWA service manual Part No. 34214.

MAINS PLUG FITTING :- _____

If a mains plug is not fitted, follow the plug's own instructions. The following may be useful :

BROWN-LIVE BLUE-NEUTRAL GREEN / YELLOW-EARTH

WARNING! IT IS IMPORTANT THAT LIVE, NEUTRAL AND EARTH ARE ALL CONNECTED BETWEEN THE TWA AND MAINS SUPPLY. IF NO EARTH IS AVAILABLE (2 WIRE MAINS SUPPLY) IT IS RECOMMENDED THAT A SEPARATE EARTH IS CONNECTED BETWEEN THE INSTRUMENT CASE (THE BOTTOM RIGHT HAND FIXING SCREW IN THE CORNER OF THE BACK PANEL IS IDEAL) AND A SUITABLE EARTH. ALTERNATIVELY THE INSTRUMENT COULD BE POWERED BY BATTERY.

If the plug has an internal fuse, a 1 amp value is recommended.

CLEANING :- _____

Do not use abrasives or solvent based cleaners. We recommend a propriety brand of foam based fabric / vinyl cleaner. Use a soft cloth to avoid scratches.

TWA INTRODUCTION

NORBAR TORQUE WRENCH AND POWER TOOL ANALYSER :- _____

The Torque Wrench Analyser (TWA) has been designed as an accurate, cost effective and easy to operate instrument for checking and calibrating all types of torque wrenches, torque limiting screw drivers and power tools to torque tool standards ISO 6789, BS 6703 and ANSI/ASME B 107.14M. The TWA also conforms to current EC Directives and safety standards.

The TWA features a functionally colour coded front panel and switch selection guide to facilitate quick and easy selection of the operating mode most suitable for the tool to be tested; i.e. track, first peak memory with auto reset, or peak memory.

A signal filter is incorporated for power tool testing in line with ISO standard 5393 - 1994.

A custom liquid crystal display provides a clear, easily read, digital readout in engineering units.

Up to nine units of measurement are available for torque measurement. The units selected are clearly shown on the display.

An analogue trend bar tracks the measured value in steps of 4% of full scale.

All transducers are precision machined in stainless steel and mounted in robust housings.

With the addition of the optional rundown nose assemblies, which simulate various types of fastener joints, the TWA provides an ideal method of checking and setting the torque output from power tools such as air / electric screwdrivers and nut-runners. All TWA rundown nose assemblies conform to Standards BS 6268 1982, ISO 6544 and ISO 5393 1981 for testing hand held pneumatic assembly tools.

RS-232-C output is standard with an internally selectable control word.

Other options include:- Internal Battery Power, Print Inhibit Controller, Data Printer and a protective carrying case.

SPECIFICATIONS

TWA SPECIFICATION :-

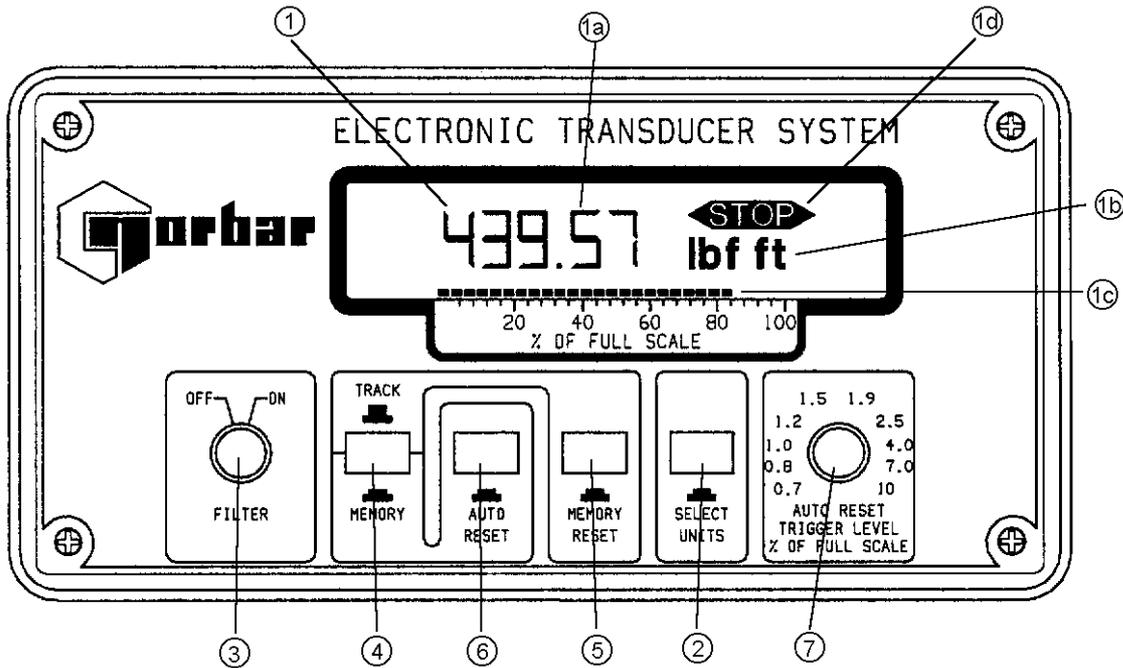
RANGE OF OPERATION		0 to 100% of full scale of transducer	
	TWA 10	0 to 10 N.m.	
	TWA 100	0 to 100 N.m.	
	TWA 1000	0 to 1000 N.m.	
	TWA 2800	0 to 3000 N.m.	
CALIBRATION RANGE	TWA 10	10% to 100% of full scale.	1 to 10 N.m.
	TWA 100	10% to 100% of full scale.	10 to 100 N.m.
	TWA 1000	2% to 100% of full scale.	20 to 1000 N.m.
	TWA 2800	5% to 100% of full scale.	150 to 3000 N.m.
TRANSDUCER OVERLOAD CAPACITY		To 150% of TWA range.	
ACCURACY		See calibration certificate supplied with TWA.	
READOUT		Custom LCD display giving 5+½ digits (with 4+½ digit option). Includes direct readout of engineering units, a stop loading indicator and 25 segment analogue trend bar.	
ANALOGUE TREND BAR		25 segments, resolution 4% of full scale.	
DISPLAY UPDATE RATE		3 per second (3Hz).	
RESOLUTION (5+½ digit mode)		1 Digit in 100,000 for TWA 10, 100 and 1000. 1 Digit in 30,000 for TWA 2800.	
RESOLUTION (4+½ digit mode)		1 Digit in 10,000 for TWA 10, 100 and 1000. 1 Digit in 3,000 for TWA 2800.	
ZERO SUPPRESSION	TRACK	5+½ DIGIT MODE. First 4 counts either side of zero. 4+½ DIGIT MODE. No suppression.	
	MEMORY	Suppressed from 0 to approximately 0.5% of transducer full scale	
UNITS OF MEASUREMENT		N.m, dN.m, cN.m, lbf.ft, lbf.in, ozf.in, kgf.m, kgf.cm, gf.cm. (Selectable).	
MEMORY AUTO-RESET TRIGGER		0.7% to 10% of full scale (settable).	
MEMORY AUTO RESET HOLD TIMES		1, 2, 3 or 4 seconds (selectable).	
MEMORY FREQUENCY RESPONSE		Filter OFF, Flat response to 1KHz. As BS 6268 1982 / ISO 6544 - 1981. Filter ON, -3dB @ 500 Hz as ISO 5393 - 1994.	

TWA SPECIFICATION (Continued):-

POWER REQUIREMENTS	Selectable 110/120 Volts AC +/- 10 % or 220/240 Volts AC +/- 10% at 50-60 Hz. Also available is an internal battery pack.
MAINS POWER FUSE	T160 mA anti-surge (2 off)
POWER CONSUMPTION	6.0 W - maximum.
TRANSDUCER TEMPERATURE EFFECTS	ZERO : +/- 0.01% of full scale / °C SPAN : +/- 0.03 % of full scale / °C
OPERATING TEMP RANGE	-10°C to +50°C.
MAXIMUM OPERATING HUMIDITY	85% Relative Humidity @30°C.
MAINS POWER CABLE	2.5 meters (8 ft 2 ins) long.
TRANSDUCER CABLE	2 meters (6 ft 6 Ins) long.
WEIGHT (Display Instrument Only)	2.8 kg (6.2 lb) as standard. 4.2 kg (9.3 lb) for battery pack option.
WEIGHT (Transducer Only)	TWA 10 - 1.25 kg (2.76 lb). TWA 100 - 1.25 kg (2.76 lb). TWA 1000 - 3.6 kg (7.94 lb). TWA 2800 - 3.6 kg (7.94 lb).
DIMENSIONS (Display Instrument)	108 mm high x 197 mm wide x 282 mm long.
CASE MATERIALS / FINISH	Case engineered in aluminium extrusions and castings. Finished in tough texture paint.
DIMENSIONS (Transducer) Height x Width x Depth (mm)	TWA 10 - 80 x 93.5 x 93.5. TWA 100 - 80 x 93.5 x 93.5. TWA 1000 - 76.2 x 110 x 129. TWA 2800 - 76.2 x 110 x 129.
SQUARE DRIVES - TWA 10 TWA 100 TWA 1000 TWA 2800	¼ inch (6.4 mm). ¼ + ½ inch (6.4 + 12.7 mm). ½ + ¾ inch (12.7 + 19.1 mm). ¾ + 1 inch (19.1 +25.4 mm).
ENVIRONMENT	Indoor use within a light industrial environment.
ELECTROMAGNETIC COMPATIBILITY (EMC) DIRECTIVE	In conformance with EN 50081-1 : 1992 & EN 50082-1 : 1992.
LOW VOLTAGE DIRECTIVE	In conformance with EN 61010-1 : 1993. To environmental conditions Pollution Degree 2 & Installation Category (Overvoltage Category) II.
TIME/DATE COMPLIANCE	This equipment does not utilise time or date functions and thus will not be affected by the issues of date compliance in the future.

Note : *If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.*

TWA FUNCTIONS - FRONT PANEL

**(1) DISPLAY :-** _____

- 1a MEASUREMENT VALUE - Shown to 5+½ digit resolution.
- 1b UNITS OF MEASUREMENT - 9 torque units available.
- 1c TREND BAR - Shown along the base of the display as a percentage of transducer full scale in N.m. This feature tracks the signal from the transducer in 4% steps and is NOT memorised. Any value over 100% is shown as 100%.
- 1d STOP - This legend will be displayed to indicate 'stop loading' when a peak has been detected in Memory Auto Reset mode. A bleeper will sound when the legend is on.
- 1e TWA MODEL DESIGNATION.

(2) SELECT UNITS SWITCH (GREEN) :- _____

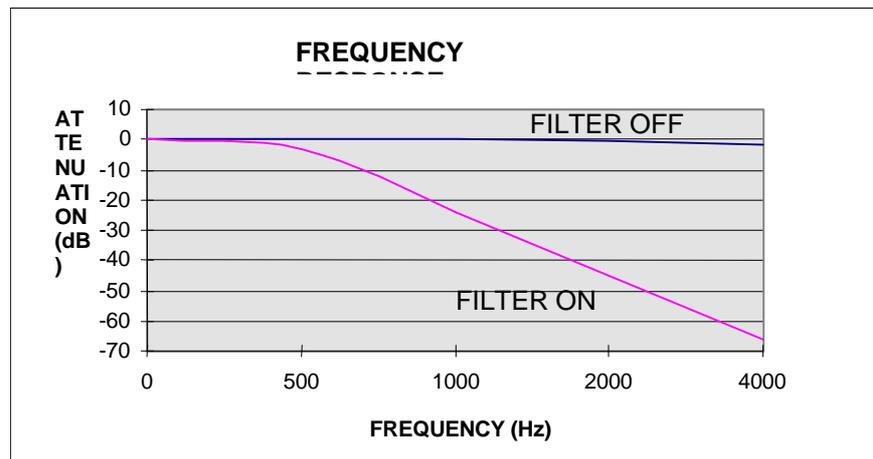
When pressed, the units of measurement will step onto the next available unit. Repeated pressing will step through all available units of measurement, then loop round to the start of the list. Changing the units of measurement whilst a signal is stored in the memory will give the correct readout in the reselected units.

NOTE:- Any of the units of measurement in the specification on page 4 can be enabled or disabled by internal switches. Please refer to internal user settings on page 21.

(3) FILTER (BLUE) :- _____

In the 'FILTER OFF' position, the instrument's frequency response is flat to above 1KHz.

With the 'FILTER ON', the frequency response is -3dB @ 500Hz. This specification corresponds to ISO standard 5393 - 1994 'Rotary tools for threaded fasteners - Performance test method'.

**(4) 'TRACK / MEMORY' SWITCH (PARCHMENT & ORANGE) :-** _____

In 'TRACK' the display follows the transducer's output signal. This is generally used for calibration.

Selecting the 'MEMORY' mode causes the display to retain the peak value experienced by the transducer. This mode is useful for testing dial type wrenches and power tools.

The TWA features an analogue memory to ensure fast capture of the peak value, together with digital hold to give infinite storage.

(5) 'MEMORY RESET' SWITCH (PARCHMENT) :- _____

Press to reset the memory when in the 'MEMORY' mode. On reset the memorised value is output via the RS-232-C connector.

(6) 'MEMORY AND AUTO RESET' SWITCHES (ORANGE) :- _____

Pressing 'MEMORY' and 'AUTO RESET' switches simultaneously selects memory auto reset mode.

In this mode the TWA holds and displays the first peak of torque. When a peak is detected all following peaks are ignored until the memory resets. The 'STOP' legend will flash and bleep tone sound to give a visual and audible indication to the operator to stop loading. Reset is automatic after a set hold time, this is settable to 1,2,3 or 4 seconds, see internal settings on page 21.

During the cycle the memorised value is output via the RS-232-C connector.

The memory auto reset mode is used primarily intended for testing preset (click) torque wrenches and torque screwdrivers.

This mode is used in conjunction with the 'AUTO RESET TRIGGER LEVEL % OF FULL SCALE' knob (7), see following description for it's function.

(7) 'AUTO RESET TRIGGER LEVEL % OF FULL SCALE' (ORANGE) :- _____

The trigger level setting is used to adjust the sensitivity of the memory auto reset mode that was discussed in (6) on the previous page. It dictates the amount (as a % of TWA full scale) by which the torque must fall below the peak torque for the peak torque to be held and the auto reset to operate.

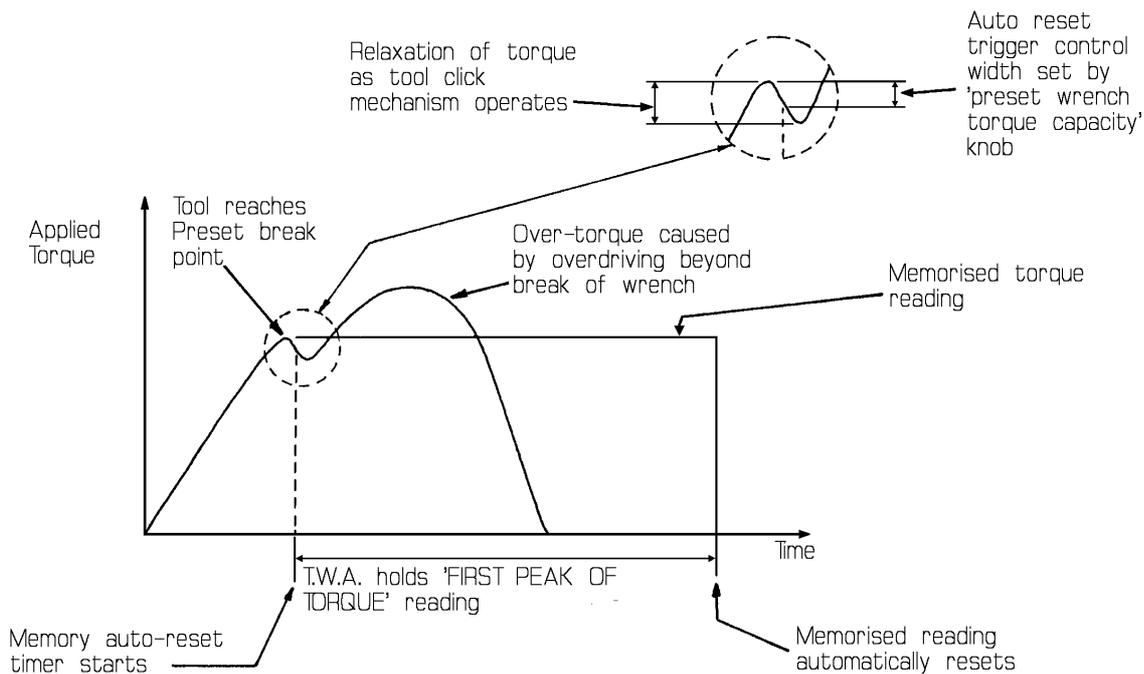
By setting it is possible to ignore small ranging torque peaks in the transducer's signal in preference to the required larger peak.

When the trigger level is set to a low value (e.g. 0.7%) the auto reset will trigger on a small torque peak.

When set to a higher value (e.g. 10%) the auto reset will trigger on a larger peak, ignoring smaller peaks.

The setting is analogue, so allowing for infinite setting resolution within the allowable range.

As an example of the trigger level setting, the operation of a torque wrench is explained in the graph below and guide on the opposite page.



GRAPH showing capture of FIRST PEAK OF TORQUE in memory, when a preset (click) type torque wrench is being tested with the TWA in the 'memory auto reset mode'.

TRIGGER LEVEL SETTING :- _____

The trigger level only needs to be set when using the auto-reset mode. The following is a guide to it's setting.

General rule for setting trigger level for testing preset (click type) torque wrenches : -

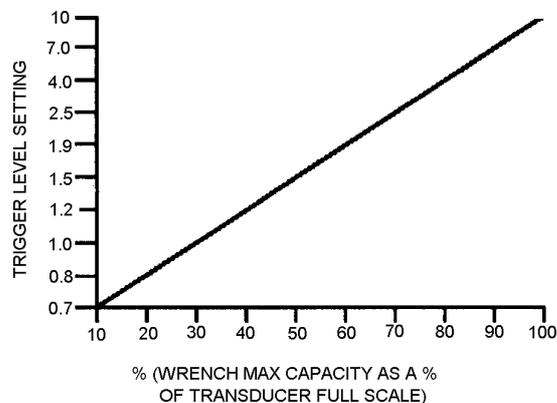
1. Note the torque **WRENCH MAX CAPACITY** .
2. Note the **TRANSDUCER FULL SCALE VALUE**.

E.g : for a	TWA 10	TRANSDUCER FULL SCALE = 10
	TWA 100	TRANSDUCER FULL SCALE = 100
	TWA 1000	TRANSDUCER FULL SCALE = 1000
	TWA 2800	TRANSDUCER FULL SCALE = 3000

3. Calculate the **WRENCH MAX CAPACITY** as a percentage (%) of the **TRANSDUCER FULL SCALE**.

$$\% = \frac{\text{WRENCH MAX CAPACITY}}{\text{TRANSDUCER FULL SCALE}} \times 100\%$$

4. Having found the percentage (%) use the following graph to set the trigger level.



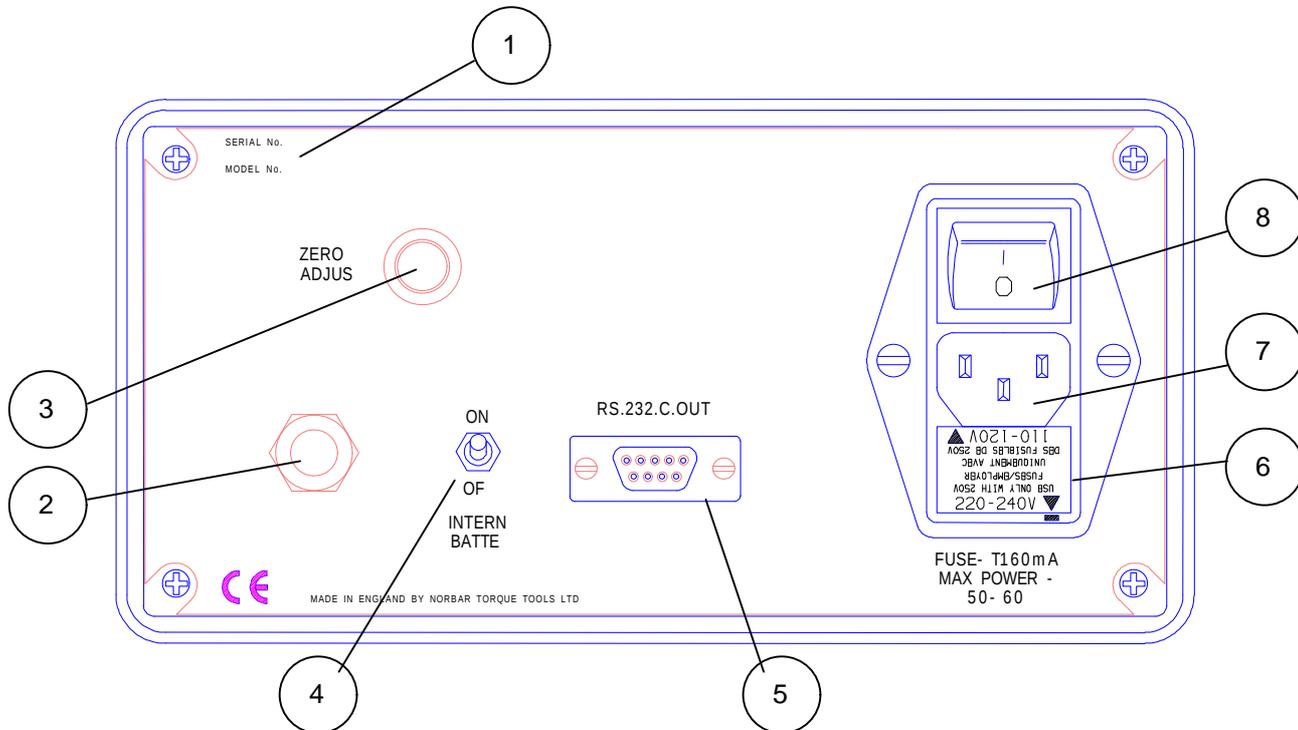
The above is only a guide and because different wrenches have different operating characteristics, it may be necessary to try alternative trigger level settings to obtain consistent results. This will be particularly true for very large and very small torque wrenches, and torque screwdrivers.

If obtaining incorrect readings, check wrench setting and operation.

If the auto reset triggers before expected value, set trigger level higher.

If the auto reset does not trigger at click of wrench, set trigger level lower.

TWA FUNCTIONS - BACK PANEL



(1) INSTRUMENT IDENTIFICATION :- _____

Each TWA has an individual serial number and a model number, which is the same as the Norbar order part number for the particular model. (NOTE : *If the serial number or model number is intentionally tampered with any warranty may be void.*)

(2) TRANSDUCER CABLE :- _____

Permanently connected (hard wired).

(3) ZERO ADJUST :- _____

Adjust 'ZERO ADJUST' knob to give zero on display for no torque applied to transducer.

NOTE:- *The TWA must be in the TRACK mode when adjusting for zero.*

(4) 'INTERNAL BATTERY ON / OFF' SWITCH :- _____

The switch is only fitted to instruments that have an optional internal battery pack. If an AC voltage is not connected to the instrument, or the mains switch (8) is 'OFF', this switch turns the instrument ON / OFF. When an AC voltage is connected and the mains switch (8) is 'ON', this switch is not functional.

(5) 'RS-232-C OUTPUT' SERIAL INTERFACE :- _____

The RS-232-C output connector is a 9 way 'D' type socket. See page 12 for specification.

(6) VOLTAGE SELECTION AND FUSE HOLDER DRAWER :- _____

Drawer orientation indicates 110/120 or 220/240 V AC mains input. Remove, turn through 180° and reinsert drawer to alter voltage selection. To remove the drawer, firstly remove the mains lead, then place a small screwdriver into the slot at the top of the drawer and gently lever open. The drawer contains two fuses, one for 110/120V and one for 220/240V operation. Both are 160mA anti-surge fuses.

The fuse for the selected voltage is located on the right hand side of the drawer as it is removed. Always replace fuses with the same value and type of fuses as originally fitted.

(7) POWER INPUT :- _____

Standard IEC type plug inlet with integral mains filter for use with mains cable supplied.

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(8) MAINS SWITCH :- _____

Turns TWA on / off.

RS-232-C SERIAL DATA OUTPUT INTERFACE

The RS-232-C output socket is a 9 way 'D' type mounted on the back panel of the TWA.

Output of both measured value and units of measurement (as shown on the display) are in a familiar serial data format for communication with computers, printers, etc.

Data is output on the RS-232-C interface when the 'request to send' (pin 7 on output socket) is taken HIGH, automatically when the memory auto-reset mode timer operates or when the 'MEMORY RESET' button is pressed. Output can be triggered by pressing 'MEMORY RESET' in track and memory modes.

RS-232-C INTERFACE SPECIFICATIONS :- _____

- Control Word - Parity odd, even or off.
- 7 or 8 data bits.
- 1 or 2 stop bits.

Data rate fixed at 1200 baud.

Maximum of 5 data stream outputs per second.

Option for having a 'blank' or '+' character at start of data stream.

Units of measurement can be selected to be output or inhibited.

Maximum number of characters per line is 17.

Transmitted data voltage levels +9 volts to -9 volts.

Print signal, HIGH to print +3 volts to +20 volts DC.

NOTE :- *All options shown are internally selectable, refer to page 21.*

Options are initially factory set to 8 data bits, 2 stop bits, no parity and no leading '+' character.

RS-232-C OUTPUT PIN CONNECTIONS :- _____

PIN No	FUNCTION
1	Arm LED for print inhibit option.
2	No connection.
3	Transmitted data (from TWA).
4	Mode switch for print inhibit option.
5	Signal ground 0V.
6	Arm switch for print inhibit option.
7	Request to send (To TWA).
8	+ 5 volts (from TWA). WARNING: Not for powering external devices.
9	+ 10 volts (from TWA). WARNING: Not for powering external devices.

NOTE: *If Pin 9 is shorted to Pin 7 (via a momentary switch) data will be transmitted on Pin 3 each time the switch is made and released. Up to 5 outputs per second can be requested in this way.*

RS-232-C DATA OUTPUT EXAMPLES :-

Code : DP=Decimal Point. CR=Carriage Return. SP=SPace.

1. Using TWA 1000 set to the standard data string. Reading 864.45 Nm.

8	6	4	DP	4	5	SP	N	SP	m	SP	SP	SP	SP	SP	CR
---	---	---	----	---	---	----	---	----	---	----	----	----	----	----	----

2. Using TWA 2800 set to the standard data string. Reading 26505 lbf.in.

2	6	5	0	5	SP	l	b	f	SP	i	n	SP	SP	CR
---	---	---	---	---	----	---	---	---	----	---	---	----	----	----

3. Using TWA 100, with modified data string giving a '+' at the start and no units of measurement. Reading 34.227 N.m.

+	3	4	DP	2	2	7	CR
---	---	---	----	---	---	---	----

For RS-232-C trouble shooting see page 26.

MITUTOYO DATA PROCESSORS :-

The instrument can be configured to communicate to Mitutoyo DP3DX, DP7, QM1000 and QM5000 families of data processors. This is selected by internal switches, see page 21.

For DP3DX, DP7, QM1000 and QM5000 families, the units of measurement must be inhibited, (set switch 2-3 to ON).

For DP3DX and DP7 families, a '+' character must be added to the start of the data stream, (set switch 5-5 to ON). This is in addition to switch 2-3.

WIRING THE TWA TO A DP3DX or DP7 DATA PROCESSOR :-

TWA RS-232-C OUTPUT		MITUTOYO DP7 RS-232-C INPUT
CONNECTOR COVER	CABLE SCREEN	
PIN 3		PIN 3
PIN 5		PIN 7
		LINK PINS 1 AND 5
		LINK PINS 4 AND 8

WIRING THE TWA TO A QM1000 or QM5000 DATA PROCESSOR :-

TWA RS-232-C OUTPUT		MITUTOYO QM5000 RS-232-C INPUT
CONNECTOR COVER	CABLE SCREEN	
PIN 3		PIN 3
PIN 5		PIN 7
		LINK PINS 4 AND 5
		LINK PINS 6 AND 8

For more information please consult your Mitutoyo data processor manual.

TRANSDUCER, TRANSDUCER HOUSING AND MOUNTING INSTRUCTIONS

All TWA transducer shafts are robustly constructed from precision machined and heat-treated specialised stainless steel onto which strain gauges are bonded in the form of a Wheatstone Bridge. These strain gauges vary their electrical resistance in direct proportion to the strain produced in the steel shaft by the applied torque. This small change in resistance causes a change in voltage across the strain gauges, which is amplified within the TWA display unit.

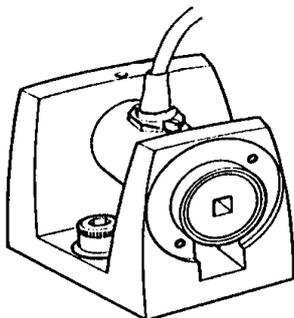
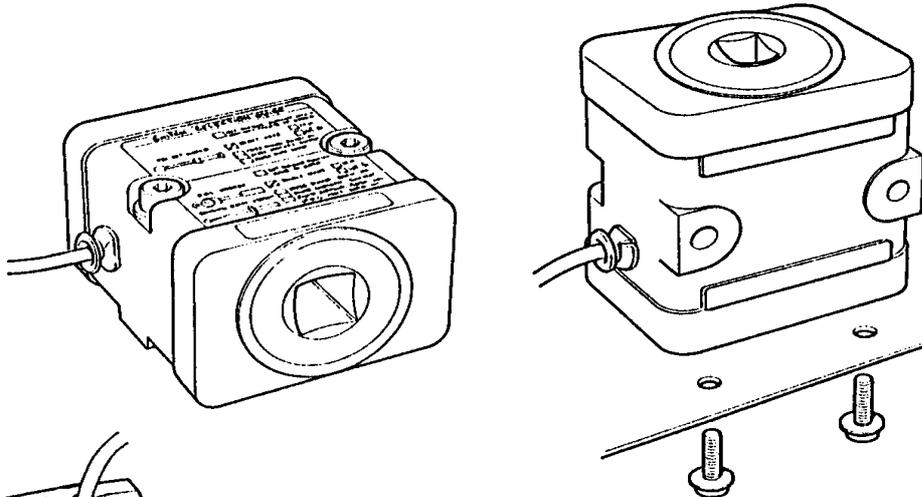
The gauges are bonded to the shaft in a configuration that ignores bending moments and other forces, and only responds to the true torque applied. The gauge configuration also helps in maintaining temperature stability.

The TWA display unit provides a highly stable constant current supply to the strain gauge bridge for accuracy.

TWA transducers are mounted in aluminium housings with steel reaction plates. The housings can be mounted in either a horizontal or vertical position.

TWA 10 and TWA 100 housings have two mounting holes of 8.4 mm diameter (21/64 inch). TWA 1000 and TWA 2800 housings have two 10.4 mm diameter (13/32 inch) holes for horizontal mounting and four M8 tapped holes in the reaction plate for vertical mounting.

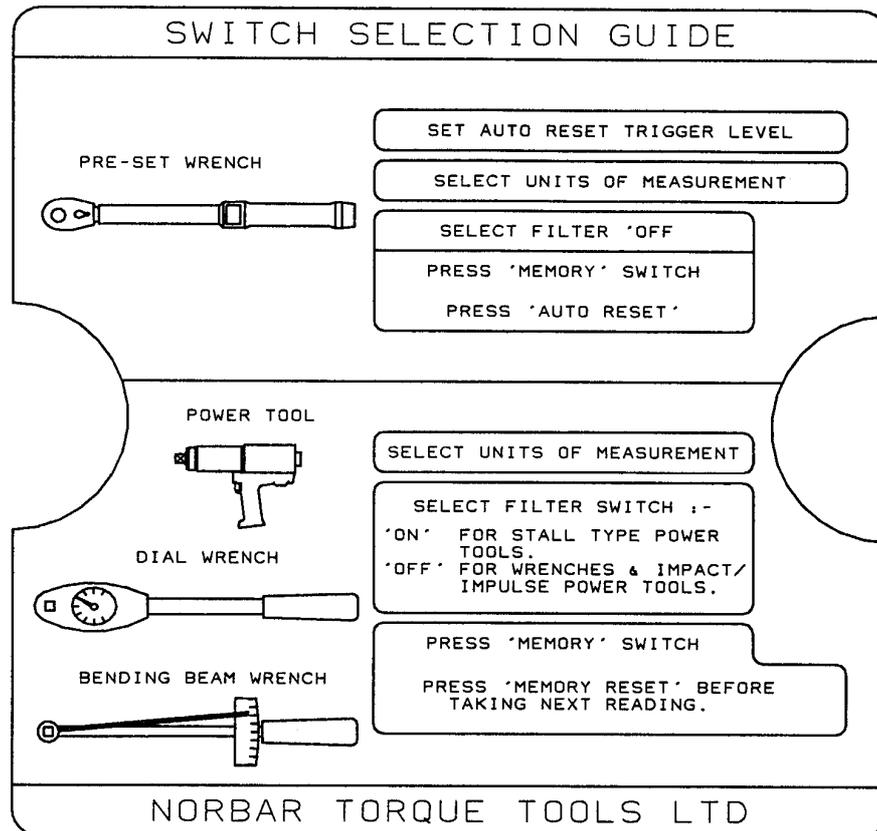
TWA 1000,
and 2800 Style
Transducer in
Housing



TWA 10 and 100
Transducer in Housing

TRANSDUCER HOUSING LABEL

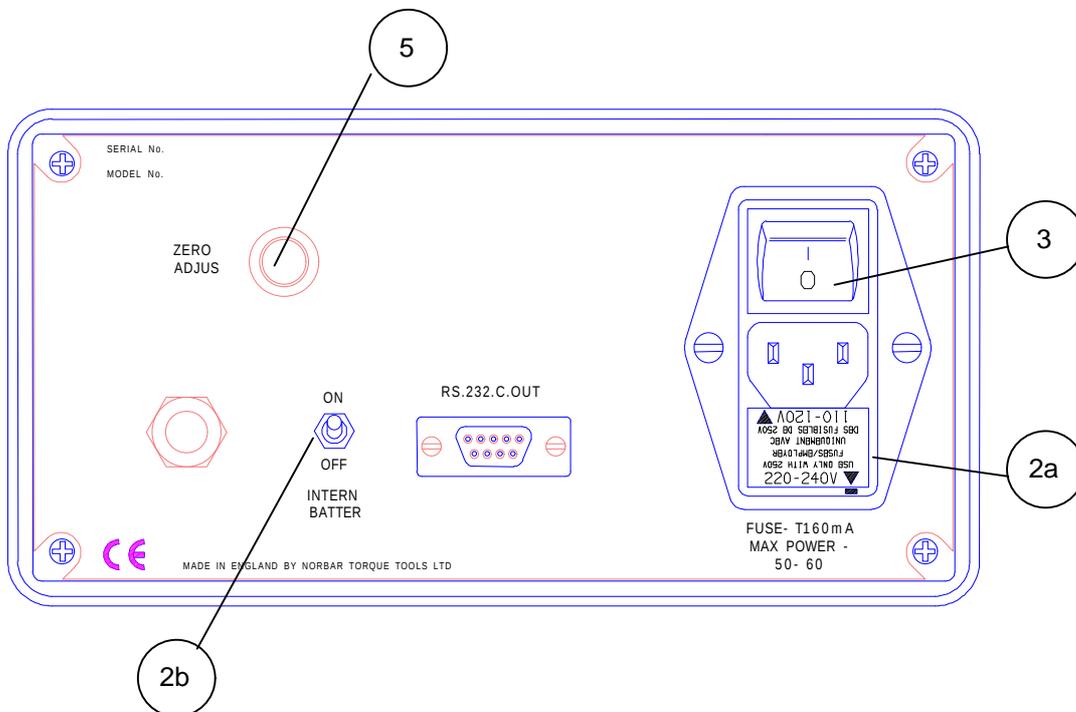
This shows the correct mode of operation for testing the specified types of torque wrenches and power tools shown. The colours of the instruction boxes are directly related to the colours associated with the front panel controls of the instrument.



TWA OPERATING INSTRUCTIONS

1. Securely mount the transducer.
2. There are two possible ways to power the TWA :-
 - a) 110/120 V or 220/240 V AC MAINS
Ensure voltage selector draw at the rear of the instrument is correctly positioned for your mains supply.
Connect AC mains lead and switch power 'ON' at rear.
 - b) INTERNAL BATTERY PACK OPTION
If fitted, the TWA can be used without an external connection. The TWA rear mains switch is not functional with this option, so a battery ON / OFF switch is fitted to the back panel.
3. Switch instrument 'ON', wait 2 seconds for initialisation.

Allow 5 minutes for the instrument to warm up and stabilise.
4. Select required units of measurement. Pressing the select units switch once will step onto the next available units of measurement.
5. If the display does not read zero, the zero control on the back panel will need to be adjusted.
Firstly, select 'TRACK' mode and exercise the transducer to full scale in direction of use to overcome hysteresis.
Then adjust the 'ZERO ADJUST' on the back panel until zero is displayed.



OPERATING INSTRUCTIONS :-

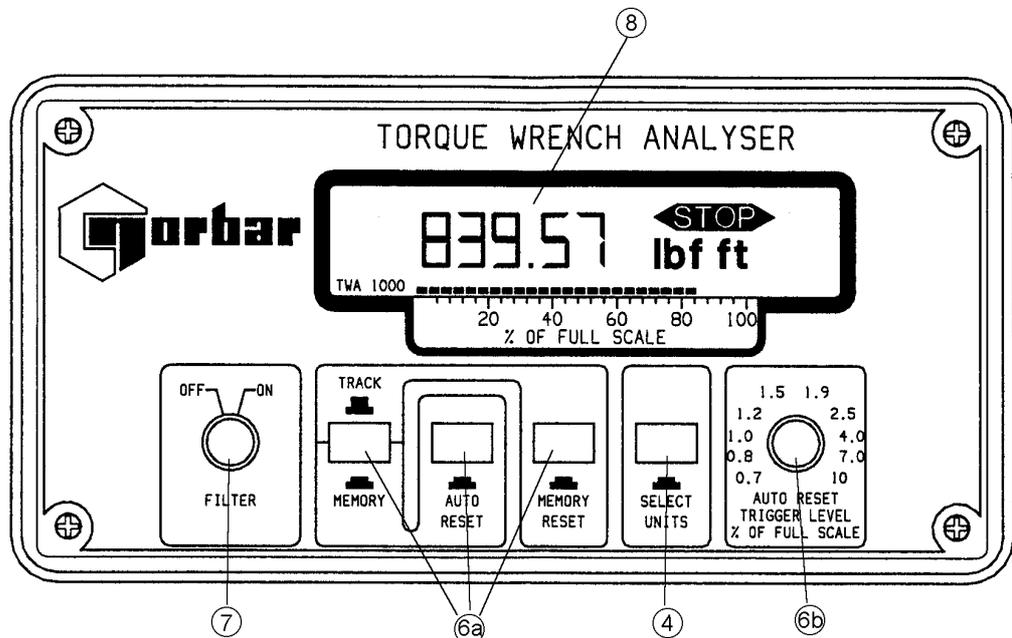
6. a) Select mode of measurement required, i.e. Track, Memory or Memory Auto Reset.
Track - 'TRACK / MEMORY' switch out..
Memory - 'TRACK / MEMORY' switch in.
Memory Auto Reset - 'TRACK / MEMORY' and 'AUTO RESET' switches both in.

NOTE:- *Ensure units are correctly selected for the capacity of the transducer.*

- b) If Memory Auto Reset is selected, set the 'AUTO RESET TRIGGER LEVEL % OF FULL SCALE' knob to the required level.
7. Select filter 'OFF' or 'ON' dependant on application.
See suggested applications on page 18.
8. The digital display will show the applied measurement with the analogue trend bar being a rapid reference to the torque applied.

The TWA is now ready for use. Please use the 'OPERATING GUIDE' label that is attached to the instrument for everyday operating instructions.

NOTE : *If direction of measurement application is reversed, torque the transducer to full scale in the reverse direction and re-zero the display before taking any readings.*



APPLICATIONS

The TWA has all the facilities to test and calibrate the numerous types of Torque Wrenches, Torque Screwdrivers and Power Tools in use today.

A more detailed description of the instrument's functions can be found on page 6 of this handbook , in addition there is an operating guide label attached to the instrument.

Colour coding of mode selection is used on the front panel and transducer housing instruction label to further ease operation.

Below is a summary of the main applications that the TWA has been designed for :-

PRESET (CLICK) WRENCHES :- _____

INSTRUMENT MODE :	First peak of torque memory.
FUNCTION BUTTONS :	'MEMORY' and 'AUTO RESET' both in.
SET TRIGGER LEVEL :	YES.
FILTER SETTING :	Recommended 'ON' for stahlwillie wrenches, 'OFF' for others.

This mode accurately captures the true operating point of the wrench.

If used in normal 'MEMORY' mode a possible over torque, caused by the operator loading the wrench past the 'click' point, would be displayed.

For a full description of how to use this mode, see pages 6 to 9.

BENDING BEAM AND DIAL WRENCHES :- _____

INSTRUMENT MODE :	Peak memory.
FUNCTION BUTTONS :	'MEMORY' in.
SET TRIGGER LEVEL :	NO.
FILTER SETTING :	Recommended 'OFF'.

This mode is used to give the operator time to monitor both the reading on the wrench and the value displayed on the TWA.

If the first peak of torque mode was used, then any operator hesitancy in reaching the desired torque value could lead to an incorrect reading.

For a full description of how to use this mode, see pages 6 and 7.

TORQUE SCREWDRIVERS :- _____

INSTRUMENT MODE :	First peak of torque memory.
FUNCTION BUTTONS :	'MEMORY' and 'AUTO RESET' both in.
SET TRIGGER LEVEL :	YES.
FILTER SETTING :	Recommended 'OFF'.

Inaccurate readings can be obtained when testing torque screwdrivers in the peak memory mode due to the operating action associated with this type of tool.

For a full description of how to use this mode, see pages 6 to 9.

POWER TOOLS :- _____

NOTE:- *A rundown nose assembly option should be used when testing power tools on TWA's.*

	Measuring torque output from all types of power tools.	Measuring the first (true) peak of torque from dog-clutch and ratcheting power tools.
INSTRUMENT MODE :	Peak memory.	First peak of torque.
FUNCTION BUTTONS :	'MEMORY' in.	'MEMORY' and 'AUTO RESET' both in.
SET TRIGGER LEVEL :	NO.	YES.

FILTER SETTING :	APPLICATION
Recommended 'ON'	For hydraulic, pneumatic and electric, stall type power tools in accordance with ISO 5393 - 1994 specifications.
Recommended 'OFF'	For testing other types of power tools, with frequency response of the memory complying to BS 6268:1982 / ISO 6544:1981.

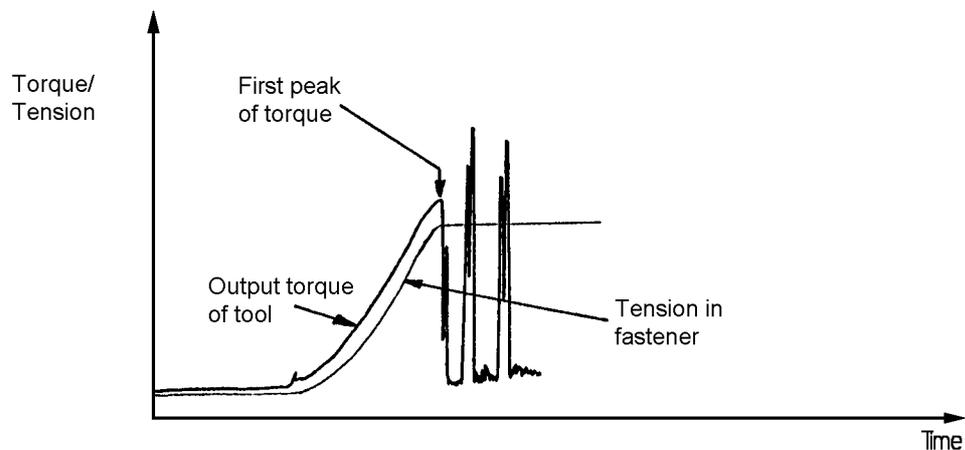
Shown below is a typical output for a clutch or ratchet type power tool.

These tools produce a high value fast torque spike after the first peak of torque has been reached.

This torque spike may be of a considerably higher torque than the first peak, but because it is high frequency, low energy, narrow pulse, it will not significantly increase the tension in the fastener being tightened.

Thus the TWA should be used in the 'MEMORY AUTO RESET' mode to capture the important first peak of torque.

For full description of how to use this mode, see pages 6 to 9.



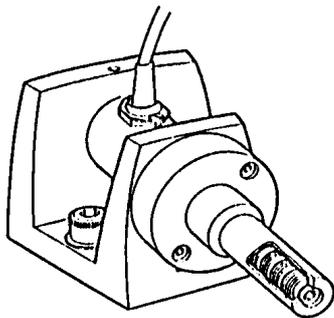
RUNDOWN NOSE ASSEMBLIES FOR POWER TOOL TESTING

The Norbar rundown nose assemblies used in conjunction with the Norbar Torque Wrench Analysers (TWA) are designed to measure the torque output of power tools. This they do by simulating the working conditions of screwed or bolted joints, to BS 6268 - 1982, ISO 6544 - 1981 and ISO 5393 - 1981 standards.

Washers can be arranged in various serial / parallel combinations to represent the working conditions as seen by the tool, i.e. joints of varying stiffness ('soft' or 'hard' pull up) and for a range of maximum torque outputs.

Stacks of washers with a long bolt are supplied to simulate soft pull-up joints over the range of the TWA. A short bolt is used to simulate hard pull-up joints. By re-arranging the stacks of washers intermediate pull-up conditions can be simulated.

Refer to individual rundown nose assembly data sheets for details of washer make-ups and graphs. These data sheets and graphs are supplied when a particular size of rundown assembly is purchased.



TWA 10 Nose Assembly attached to Transducer

RUNDOWN NOSE ASSEMBLY SPECIFICATIONS :-

NOSE ASSEMBLY PART No.	50185	50160	50186	50195	50163	51071
FOR USE WITH TWA	TWA 10	TWA 100	TWA 100	TWA 1000	TWA 1000	TWA 1000
RANGE	N.m 0.2-10 ozf.ins 1.8-90 lbf.ins 1.5-9.0 lbf.ft 2-100 kgf.cm	2-12 20-100 7.4-74 20-120	10-100 90-900 7.4-74 100-1000	10-100 7.4-74 100-1000	100-680 74-500 1000-6800	100-680 74-500 1000-6800
SOCKET CAP SCREW ACROSS FLATS	M6 SCREW mm 5.0 inches 0.197	M6 SCREW 5.0 0.197	M12 SCREW 10.0 0.394	M12 SCREW 10.0 0.394	M24 SCREW 10.0 0.394	M24 SCREW 19.0 0.748
WEIGHT	Kg 0.85 lbs 1.87	0.63 1.39	2.20 4.85	2.20 4.85	40.0 88.18	8.25 18.18

INTERNAL USER SETTINGS

Only open the instrument to make changes that are essential.

WARNING! SWITCH OFF AND DISCONNECT ALL POWER TO THE TWA.

- 1 To access the switches remove the 4 screws that retain the lid (2 at the top of front panel and 2 at the top of rear panel). It will be necessary to loosen the 2 bottom screws of the front panel by about one turn. The lid can be removed, along with the battery pack if fitted.

Due to human electrostatic discharge (ESD), do not touch components other than those required.

2. Select settings as required, please refer to layout drawing on page 23. There is also a switch setting diagram located on the mains inlet socket within the TWA.

SWITCH 1	FUNCTION	OFF	ON
1-1	Not for user selection, DO NOT CHANGE	FACTORY SET	
1-2.	Not for user selection, DO NOT CHANGE		FACTORY SET
1-3.	Not for user selection, DO NOT CHANGE		FACTORY SET
1-4.	Not for user selection, DO NOT CHANGE	FACTORY SET	

SWITCH 2	FUNCTION	OFF	ON
2-1.	RESOLUTION SELECTION (DIGITS)	Standard 5+1/2	Reduced 4+1/2
2-2.	Not for user selection, DO NOT CHANGE		FACTORY SET
2-3.	UNITS OF MEASUREMENT OUTPUT WITH RS- 232-C CHARACTER STREAM	Output units	Inhibit units
2-4.	N.m	Disabled	Enabled
2-5.	dN.m	Disabled	Enabled
2-6.	cN.m	Disabled	Enabled
2-7.	lbf.ft	Disabled	Enabled
2-8.	lbf.ins	Disabled	Enabled

INTERNAL USER SETTINGS :- _____

SWITCH 3	FUNCTION	OFF	ON
3-1	ozf.ins	Disabled	Enabled
3-2	kgf.m	Disabled	Enabled
3-3	kgf.cm	Disabled	Enabled
3-4	gf.cm	Disabled	Enabled

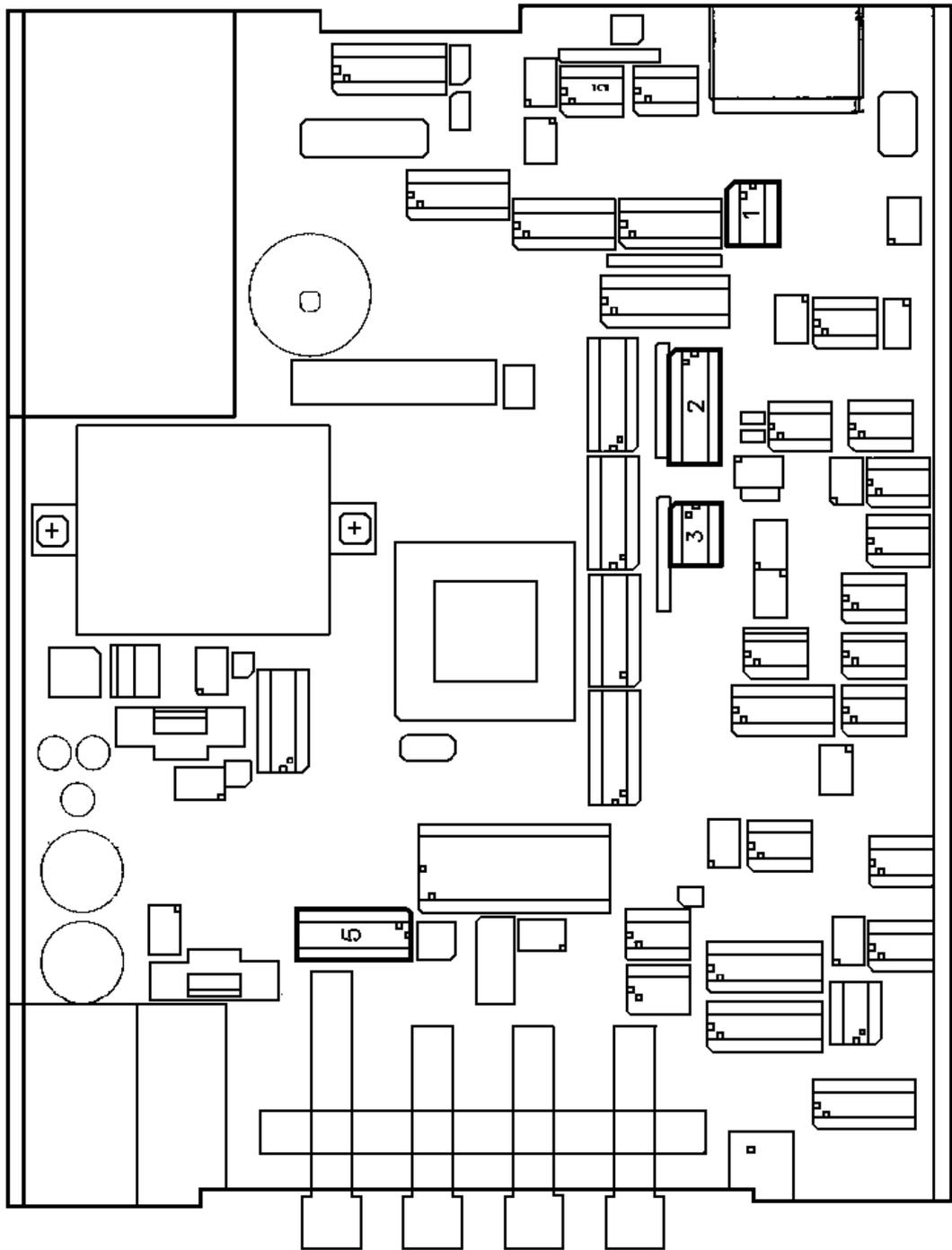
SWITCH 5	FUNCTION	OFF	ON
5-1	RS-232-C CONTROL WORD PARITY	EVEN	ODD
5-2	RS-232-C CONTROL WORD PARITY	NO PARITY	PARITY ON
5-3	RS-232-C CONTROL WORD CHARACTER LENGTH	8	7
5-4	RS-232-C CONTROL WORD STOP BITS	2	1
5-5	RS-232-C LEADING '+' CHARACTER	INHIBIT +	OUTPUT +
5-6	Not for user selection, DO NOT CHANGE	FACTORY SET	
5-7	AUTO RESET TIME (with 5-8), see below	STANDARD SET	
5-8	AUTO RESET TIME (with 5-7), see below	STANDARD SET	

SWITCH 5-7	SWITCH 5-8	TIME
ON	ON	4 SECONDS
OFF	OFF	3 SECONDS
OFF	ON	2 SECONDS
ON	OFF	1 SECOND

3. Replace lid and screws before turning on.

INTERNAL USER SETTINGS :- _____

SWITCH LOCATIONS



FRONT OF TWA

INTERNAL BATTERY PACK OPTION

MODULE PART NUMBER 44032

The TWA internal battery pack is mounted in the lid of the instrument. Rechargeable nickel cadmium cells are used, these are not user replaceable.

The battery pack will power the instrument for a minimum of 8 hours continuous use. Recharge time is 16 hours.

To use the instrument on battery power, disconnect mains power and switch 'BATTERY ON / OFF' to 'ON' and select required operating mode, etc. When approximately half an hour battery power life is left in the batteries a 'LO BATT' message will flash on the digital display. When battery output goes below the voltage at which the instrument will not function correctly (out of calibration) the instrument switches OFF automatically. Once batteries are discharged, switch the 'BATTERY ON / OFF' switch to 'OFF'.

To recharge batteries connect the TWA to an AC mains supply (110/120 or 220/240 V AC) and switch 'Power On'. The TWA can be used as normal whilst batteries are charging. There is no maximum charge time for the battery pack, so the TWA can be continuously used on mains without causing damage to batteries.

Note :- If the TWA is charged for less than 16 hours or at a mains voltage of less than 110 VAC / 220 VAC then a reduced discharge duration may be expected.

To obtain maximum battery life and performance, It is highly recommended that battery packs are used in a cycle of :-

FULLY DISCHARGE - FULLY CHARGE (minimum 16 hours) - FULLY DISCHARGE

TROUBLE SHOOTING :- _____

If Battery Pack fails to power the TWA after recharging, check the two fuses protecting the batteries that are mounted on the Battery Pack P.C.B. This is achieved by following the procedure below :-

**WARNING! SWITCH OFF THE TWA AND REMOVE THE POWER LEAD.
SWITCH THE BATTERY ON / OFF SWITCH TO THE OFF POSITION.**

1. Remove the two upper most cross head screws on the instrument's front and back panels (four screws in all).
2. Loosen the two lower cross head screws on the front panel half a turn.
3. Lift off the instrument lid complete with the battery pack.

WARNING! UNPLUG THE BATTERIES FROM THE BATTERY PACK P.C.B. BEFORE ATTEMPTING TO REMOVE THE FUSES (500 MA ANTI-SURGE), AND RECONNECT ONCE THE FUSES HAVE BEEN REPLACED. IF PROBLEMS ARE STILL INCURRED, RETURN TO NORBAR OR A NORBAR APPOINTED AGENT, FOR EVALUATION.

PRINT INHIBIT CONTROLLER OPTION

PART NUMBER 60167

INTRODUCTION :-

The print inhibit controller is a remote, hand held device for controlling the RS-232-C output from the TWA. This option can be retro fitted to any TWA, model number 43150 - 43157.

This option can control unwanted RS-232-C data input to printers, calibration and data collection systems.

The function of this device is to either :

- (i) Allow RS-232-C data output as normal, so giving data on each request.
- (ii) Completely disable RS-232-C data output.
- (iii) Only to allow data RS-232-C output on the next request and inhibit all subsequent requests.

OPERATION :-

Position of ' PRINT NORMALLY/ PRINT WHEN ARMED' switch :-

SWITCH POSITION	STATE OF INDICATOR	ACTION
'PRINT NORMALLY'	UNARMED	The RS-232-C output acts as normal. Every time an output is requested it will be issued.
'PRINT WHEN ARMED'	UNARMED	The RS-232-C output is inhibited, so will not function.
'PRINT WHEN ARMED'	ARMED (Having pressed button on controller)	When the ' ARM ' button is pressed, the arm led will light so indicating that the next request to send data will be acted upon. Upon the next data output taking place, the arm led will turn off and the RS-232-C output will again be inhibited. To obtain further data output either press the 'ARM' button or switch to 'PRINT NORMALLY'.

TWA TROUBLE SHOOTING

1. Instrument does not power up.

- a) Check the Voltage Selector drawer is in the correct orientation for your mains supply.
- b) Check fuse in the voltage selector drawer (on the right hand side as draw is removed).
- c) Check fuse in mains plug.

2. Displayed user error messages.

These error messages will be displayed on the TWA front panel display if the following errors occur : -

- a) 'ERROR 27 - OVERANGE' : The transducer may have been taken into an overload state.
- b) 'ERROR 29 - TOO BIG' : Illegal units of measurement selected for transducer connected. Step to next conversion with select units switch.
- c) 'ERROR 30 - TOO SMALL' : Illegal units of measurement selected for transducer connected. Step to next conversion with select units switch.
- d) 'ERROR 33 - FIRMWARE' : Switch power to instrument 'OFF', then 'ON' again at the rear of the TWA. If message does not clear, return the TWA to Norbar for evaluation.

3. Required units of measurement are not selectable

- a) Conversion from transducer standard units to required units could not be displayed within available digits on display, thus conversion is not allowed.
- b) Units required have not been enabled. See page 21.

4. RS-232-C data output not communicating with other equipment

- a) Check that control word on the TWA and the equipment receiving data match. See page 21.
- b) Check that the baud rate is set to 1200 baud on the equipment receiving data.
- c) Check that the connecting lead is wired correctly at both ends, see page 12.
- d) Check if equipment receiving data requires the units of measurement inhibited or a leading character. This is applicable when interfacing to Mitutoyo equipment, see page 13.

5. Battery pack option

If the battery pack option fails to power the instrument after recharging, check the two fuses protecting the batteries, these are mounted on the battery pack board. To complete this task refer to the trouble shooting section of the integral battery pack option on page 24.

6. Display values changes when transducer cable is moved.

This could be caused by broken or loose wires in the transducer lead.

7. Display will not zero, with no torque applied to the transducer.

Check the relationship of the transducer input square drive to the output square drive, the sides must be parallel. If they are not the transducer has been overstrained and may require recalibration or replacement.

8. Recalibration of TWA

If there is any doubt concerning the functionality or accuracy of the instrument it should be returned to Norbar, or a Norbar appointed agent for repair and / or recalibration.

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