



# OPERATION AND MAINTENANCE MANUAL FOR MODEL ETW-A() EXPERT TORQUE AUDIT WRENCH

## NOTICE

The Expert Torque Audit Wrench can be used to measure residual torque in a threaded fastener, by means of a proprietary dynamic torque algorithm. It can also be utilized as an electronic torque wrench.

## ⚠ WARNING

IMPORTANT SAFETY INFORMATION ENCLOSED - SAVE THESE INSTRUCTIONS

READ AND UNDERSTAND THIS MANUAL BEFORE OPERATING THIS PRODUCT

IT IS YOUR RESPONSIBILITY TO MAKE THIS SAFETY INFORMATION  
AVAILABLE TO OTHERS THAT WILL OPERATE THIS PRODUCT

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY



### PLACING TOOL IN SERVICE

- Always operate, inspect and maintain this unit in accordance with all regulations (local, state, federal and country) that may apply.
- Keep work area clean, uncluttered, ventilated and illuminated.
- Do not remove any labels. Replace any damaged label.

### USING THE TOOL

- Always use Personal Protective Equipment appropriate to the tool used and material worked. This may include dust mask or other breathing apparatus, safety glasses, ear plugs, gloves, apron, safety shoes, hard hat and other equipment.
- Keep others at a safe distance from your work area, or ensure they use appropriate Personal Protective Equipment.
- This tool is not insulated against electric shock.
- This unit is for indoor use only.
- Keep body stance balanced and firm. Do not overreach when operating this tool. Anticipate and be alert for sudden changes in motion, reaction torque, or forces during and operation.
- Ensure work pieces are secure. Use clamps or vises to hold work piece whenever possible.
- Never use a damaged or malfunctioning tool or accessory.
- Maintain unit with care. Keep unit clean for better and safer performance. Follow instructions for changing accessories.
- Do not operate this product in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust.
- Do not modify this product, safety devices, or accessories.
- Do not use this product for purposes other than those recommended.
- Use accessories recommended by Ingersoll-Rand for your model.

Refer all communications to the nearest Ingersoll-Rand Office or Distributor.

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### Using the Tool (Continued)

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- Stay alert, watch what you are doing and use common sense when operating this product. Do not use this product while tired or under the influence of drugs, alcohol, or medication.
- Replace battery with the same or equivalent type recommended by the battery manufacturer. Observe correct polarity when installing battery. Dispose of used batteries according to battery manufacturer's instructions.

#### CAUTION

- The unit should be checked periodically to ensure that the torque readings are accurate.
- DO NOT store the unit in relative humidity above 85%.
- Have the unit calibrated at least once a year.
- Keep the exterior of the unit clean and dry.
- Do not drop or abuse the unit.
- Do not allow chemicals such as acetone, benzene, thinner, ketone, trichloroethylene to come in contact with the housing, as damage will result.
- The instrument should not be subjected to vibration or shock.

For calibration or repair, return to:

**Ingersoll-Rand Company**  
ECOIE  
1725 US Highway 1 North  
Southern Pines, NC 28387  
USA  
Tel: (910) 692-8700  
Fax: (910) 692-7822

**Ingersoll-Rand IDC**  
**ETA Department**  
Swan Lane,  
Hindley Green  
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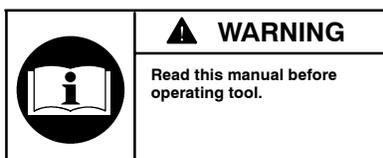
The use of other than genuine Ingersoll-Rand replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.

Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll-Rand Authorized Servicenter.

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### WARNING SYMBOL IDENTIFICATION

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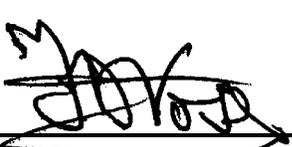


#### NOTICE

**SAVE THESE INSTRUCTIONS. DO NOT DESTROY.**

When the life of the tool has expired, it is recommended that the tool be disassembled, degreased and parts be separated by material so that they can be recycled.

# DECLARATION OF CONFORMITY

(F) CERTIFICAT DE CONFORMITÉ (E) DECLARACIÓN DE CONFORMIDAD (I) DICHIARAZIONE DI CONFORMITÀ	(D) KONFORMITÄTSERKLÄRUNG (P) DECLARAÇÃO DE CONFORMIDADE
<b>Supplier's Name:</b> <b>Ingersoll-Rand</b>	<b>Address:</b> <b>Swan Lane, Hindley Green, Wigan WN2 4EZ</b>
(F) nom du fournisseur (E) nombre del proveedor (I) nome del fornitore (D) Name des Herstellers (P) nome do fornecedor	(F) adresse (E) domicilio (I) indirizzo (D) Adresse (P) endereço
Declare under our sole responsibility that the product: <b>Expert Torque Audit Wrench (ETW-A) Series</b>	
(F) Déclarons sous notre seule responsabilité que le produit: <b>Expert Torque Audit Wrench (ETW-A) Serie</b> (E) Declaramos que, bajo nuestra responsabilidad exclusiva, el producto: <b>Expert Torque Audit Wrench (ETW-A) Serie</b> (I) Dichiariamo sotto la nostra unica responsabilità che il prodotto: <b>Expert Torque Audit Wrench (ETW-A) Serie</b> (D) Erklären hiermit, gemäß unserer alleinigen Verantwortung, daß die Geräte: <b>Expert Torque Audit Wrench (ETW-A) Serien</b> (P) Declaramos sob a nossa exclusiva responsabilidade que o produto: <b>Expert Torque Audit Wrench (ETW-A) Série</b>	
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(F) Modele      (E) Modelo      (I) Modello      (D) Modell      (P) Modelo	
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(F) No. Serie: (E) Gama de No. de Serie: (I) Numeri di Serie: (D) Serien-Nr.-Bereich: (P) Gama de Nos de Série:	(F) Date: Octobre, 2002 (E) Fecha: Octubre, 2002 (I) Data: Ottobre, 2002 (D) Datum: Oktober, 2002 (P) Data: Outubro, 2002
<b>Approved By:</b>	
(F) Approuvé par: (E) Aprobado por: (I) Approvato da: (D) Genehmigt von: (P) Aprovado por:	
 _____ D. Vose	 _____ John Linehan

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## 1.01 How to Use this Manual

This manual is split into sections describing the steps to be taken to configure the Expert Audit Wrench for use in measuring and recording torque values.

Section 1 is an introduction to the Expert Audit Wrench.

Section 2 contains quick setup instructions.

Section 3 describes how to use and configure the Expert Audit Wrench.

The following conventions are adopted throughout this manual:

Keys to be pressed will be shown as the key legend – *for example*  Information displayed on the LCD screen will be shown in italics contained within quotation marks i.e. “*LAST CAL*” or displayed as an actual screenshot.

Refer to the table of contents to find action to be performed.

Follow instructions for key presses required to carry out required action.

## 1.02 Packing List

### Expert Audit Wrenches:

<u>Model</u>	<u>Capacity</u>	<u>Square Drive (included)</u>
ETW-A25	25 N•m	1/4”
ETW-A75	75 N•m	3/8”
ETW-A180	180 N•m	1/2”

The following items are supplied with each Expert Audit Wrench unit:

- One (1) Audit Wrench (*with batteries*)
- One (1) Operator’s Manual
- One (1) Square Drive Adapter
- Two (2) ‘C’ cell batteries
- One (1) ‘Certificate of Calibration’
- One (1) Case

### Accessories and Parts:

<u>Part Number</u>	<u>Description</u>
80097736	Battery Cover
80097744	1/4” Square Drive non-Ratchet Head
80097751	3/8” Square Drive non-Ratchet Head
80097769	1/2” Square Drive non-Ratchet Head
80097777	Printer Cable
80097793	PC Cable
80097801	Lithium Battery 3.6V (2 required)

## 1.03 Care & Storage

This unit is designed for indoor use only

Operating temperature range                    5-40 degrees C

Storage temperature range                        0-50 degrees C

The membrane keypad may be wiped clean with a soft damp cloth. The unit is not waterproofed and spillages should be avoided.

## 1.04 Batteries

Expert Audit Wrench takes either two 1.5v Alkaline Manganese type ‘C’ cells (battery life – 3 months normal usage) or two 3.6v Lithium Chloride ‘C’ cells (battery life – 6 months normal usage).

## 1.05 Overview



**Figure 1**

### The Expert Audit Wrench Features:

1. A digital torque audit wrench using bending beam technology along with a proprietary torque algorithm.
2. Torque Audit Mode → *Instant method (Measuring residual torque)*.

This method measures the residual torque dynamically in the fastening direction by capturing torque as the fastener is rotated through a small, pre-set angle, usually 2° to 4°. The proprietary dynamic torque algorithm enables the ETW Series Audit Wrench to ignore the initial peak torque required to overcome static friction as the fastener begins to turn. At the same time it effectively removes operator influence from the audit process. Friction and operator influences are two key sources of measurement variation.

No rotation occurs during the initial application of torque. After '*peak static*' torque is achieved, breakaway occurs. Upon rotation of the fastener the '*measured torque*' will sometimes drop.

1.05 Overview (Continued)

**NOTICE**

No rotation occurs during the initial application of torque. After peak static torque is achieved, breakaway occurs. When the fastener begins to rotate the measured torque sometimes drops. (See Figure 2)

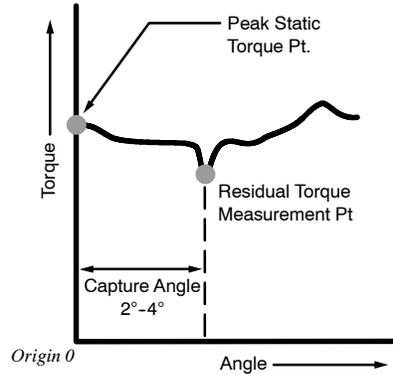


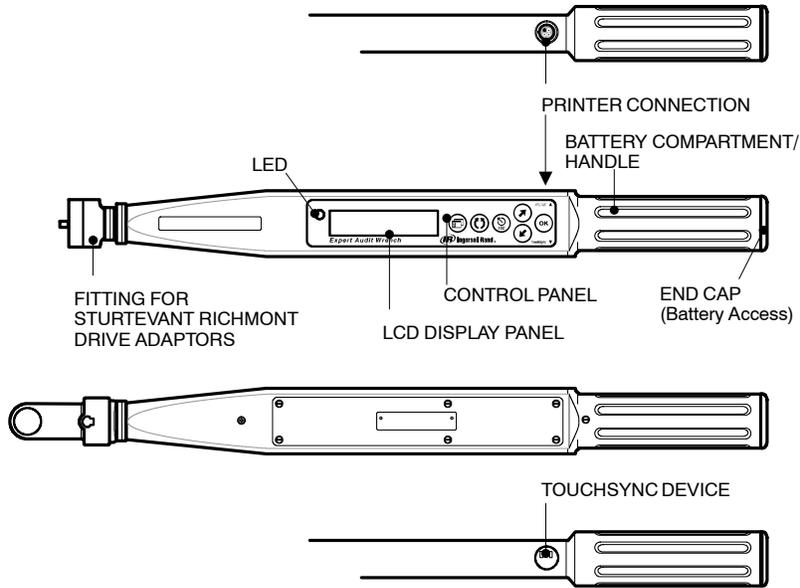
Figure 2

3. Measure Mode (Normal)

The ETW Series Expert Audit Wrench functions as an electronic torque wrench while in the Normal Measure Mode.

1.06 Specifications:

<b>Power:</b>	Two type 'C' cells (Lithium Chloride 3.6 volt) or two type 'C' cells (Alkaline Manganese 1.5v)
<b>Torque Range:</b>	10% to 100% of Full Scale.
<b>Torque Accuracy:</b>	±0.5% of rated maximum wrench capacity.
<b>Overload Capacity:</b>	125% of rated maximum wrench capacity.
<b>Zero Drift:</b>	<0.1% of rated maximum wrench capacity.
<b>Operating Temperature Range:</b>	+5 to +40 degrees Celsius
<b>Temperature Stability:</b>	±0.1% per degree Celsius.
<b>Sealing:</b>	IP40.
<b>Humidity:</b>	5% to 75% non condensing.
<b>Calibration:</b>	Issued with calibration certificate traceable to national and international standards. Twelve months typical recalibration interval.
<b>Warranty:</b>	Twelve months parts and labor.
<b>Servicing:</b>	Ingersoll-Rand offers a repair facility and calibration to NAMAS and international standards.
<b>Weight:</b>	1 Kg
<b>Length:</b>	468mm, (w/o Sturtevant Richmond® fitting)
<b>Handle Ø:</b>	38mm



### 1.1.1 Removing and Attaching Drive Adaptors

To remove a drive adaptor, insert a small screwdriver into the access hole as shown, in Figure 3, depress the pin towards the body of the wrench and slide the adaptor to the side - see below.

To attach a drive adaptor, depress the locking pin and slide the adaptor into place until it locates with a click.

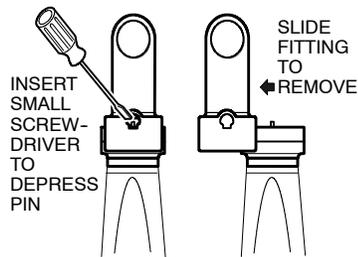


Figure 3

### 1.1.2 Control Panel

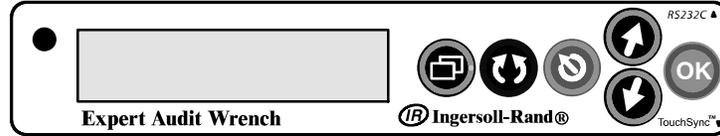


Figure 4

### 1.1.3 Keys

Press any key to switch on the Expert Wrench

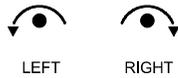
Press  to access the main menus.

Use  and  keys to select menu items, then press .

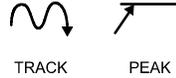
Press  to return to previous level.

### 1.1.4 Symbols

*DIRECTION OF ROTATION*



*TYPE OF MEASUREMENT*



Other symbols in the display are in the form of text:

**Torque; N•m; etc.**

## 2.01 Torque Audit Mode

- Press any key to activate the Expert Torque Wrench.
- Press this  key to access the main menus.
- Press this  key to access “OPTIONS”, then press .
- To accept “SET MODE” press .
- Press this  key to access “INSTANT”, then press .
- Press this  key to move back to the main menus.
- Press this  key to access “SETUP”, then press .
- To accept “ANGLE” press .
- Press this  key to set capture angles in degrees, then press .
- Press this  key to select “CLEAR”, then press .
- Press this  key to select “AUTOSAVE”, then press .
- Press this  key to toggle between “AUTOSAVE On/Off”, then press .
- Press this  key to select “MAX”, then press .
- Press this  key to change the value of the digits.
- Pressing the  key will toggle to the next digit.
- When all digits are correct, press  to accept value. Note, other numeric values, including “MIN” and “THR” are also edited in this manner.
- Press this  key to select “MIN”, then press .
- Set the ‘Minimum Torque Limit’ using said method described above.
- Press this  key to select “THR”, then press .
- Set the ‘Threshold Torque’ using said method described above.
- Press this  key to select “UNITS”, then press .
- To toggle between available units use , then press .
- Press this  key twice to exit the menu structure.
- Press this  key to set direction of rotation.

### 3.01 Installing and Replacing Batteries

#### NOTICE

Before removing the batteries, return the Expert Audit Wrench to the Measure Mode (by pressing the  key).

#### Removing

Unscrew the end cap (counterclockwise) as shown in Figure 5a, and remove batteries. (You may need to use a coin or a large screwdriver in the large central slot to turn the cap if it is tight.) Tilt the wrench slightly to allow the batteries to slide out.

#### Replacing

Place 2 new ‘C’ type batteries into the Expert Audit Wrench as shown, in Figure 5b, making sure the Positive (+) ends of the batteries are both facing into the device and the Negative (-) ends are toward the cap.

Replace the cap by carefully screwing it clockwise against the spring pressure, taking care to keep it at a right angle to the wrench body to avoid cross-threading.

#### NOTICE

If the Expert Audit Wrench does not switch on and the LED is showing a constant amber light, the wrench will have to be reset. Press the  and   keys simultaneously and hold for a few seconds to perform a Hardware Reset.



Figure 5a

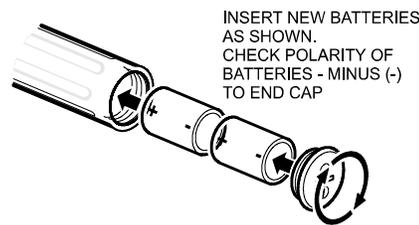


Figure 5b

### 3.02 Powering On

To switch on the Expert Audit Wrench, press any key.

### 3.03 Hardware Reset

To perform a Hardware Reset, press the  and   keys together. The wrench will start its hardware reset and the display will light up all the segments of the LCD screen followed by the following screen messages:

“WARM RST” - “ANGLE” - “WRENCH” - *The version number.*

#### NOTICE

Performing a Hardware Reset resets the Expert Audit Wrench but does not erase any settings or batch information. Use it to reset the software after changing the batteries.

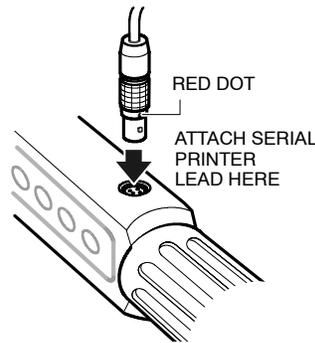
### 3.04 Auto Power Off Function

As an energy saving feature, the Expert Audit Wrench is programmed to power down automatically if it has received no user input for a predefined period (1-10 mins). Pressing any key will restore the unit to the last display prior to powering off. This is to avoid the possibility of loss of data due to an interruption to the operator's activities while configuring the Expert Audit Wrench.

There is no direct shut down facility for the Expert Audit Wrench using key strokes.

### 3.05 Attaching a Printer or PC

A printer or PC may be connected to the wrench using optional printer cable #80097777, or optional PC cable #80097793. Attach the small 4 pin connector to the wrench as shown in Figure 6, making sure the red dot on the connector aligns with the red dot on the wrench. The other end of the cable connects to the serial port on printer such as the Epson LX-300 or to the port of a PC.



**Figure 6**

### 3.06 Measure Mode - Normal (*How to tighten to a specific torque*)

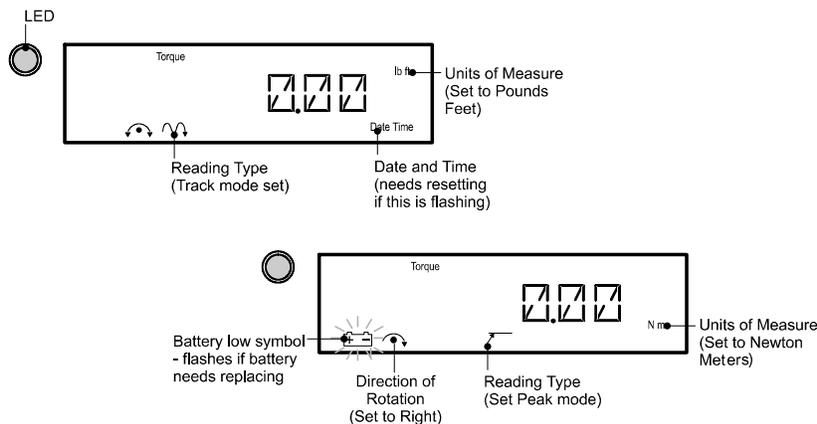
Power up wrench (*by pressing any key*)

Press  to reset the display to zero.

**NOTICE**

**Before taking torque readings with the Expert Audit Wrench, first set the Maximum, Threshold and Minimum Torque Values from within the 'SETUP' menu. (See page 19)**

The display shows the readout, the type of measurement (*Peak or Track*) and the direction of rotation (*if in Peak Mode*). If Track Mode is selected, the symbol shows rotation in both directions. The diagram below shows (2) two typical examples of the Measure Mode screen.



With a suitable drive adaptor and socket in place, connect to the required fastener and apply torque. (See Figure 7) For information on fitting drive adaptors, see page 8.

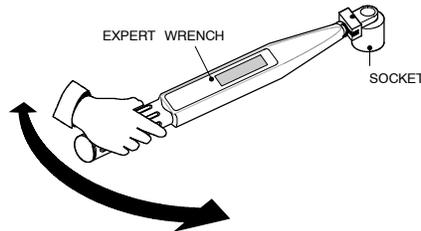


Figure 7

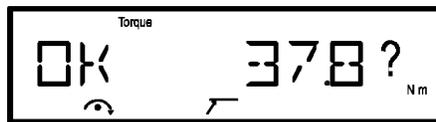
### 3.07 Peak Mode Selected

Check readout. As the reading is taken, the LED will light to show the following:

**AMBER** - Measurement is below the minimum torque setting. Display will show “LO”.

**GREEN** - Measurement is within the specified torque range. Display will show “OK”.

**RED** - Measurement is above the preset maximum torque setting. Display will show “HI”.



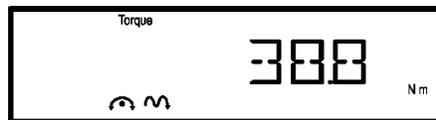
TYPICAL SCREEN FOR PEAK MEASUREMENT

#### NOTICE

All LED indicators are based on the Maximum and Minimum Torque values assigned in the SETUP Menu.

### 3.08 Track Mode Selected

If TRACK Mode is selected, turning the wrench in either direction will cause the amount of torque being applied to be continuously displayed.



TYPICAL SCREEN FOR TRACK MEASUREMENT

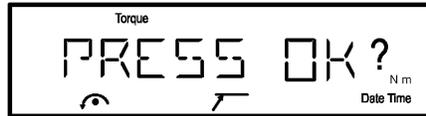
#### NOTICE

On both “PEAK” and “TRACK” readings, a minus sign in front of the figure indicates torque is being applied in the LEFT (counterclockwise) direction.

**3.09 Measure Mode - Instant** (How to measure residual torque)

The working characteristics of the Expert Audit Wrench, when used in INSTANT Mode, functions as illustrated in the graph shown below.

Power up wrench (by pressing any key). The display should now appear as shown below:



**NOTICE**

**Before taking torque readings, you should first set:**

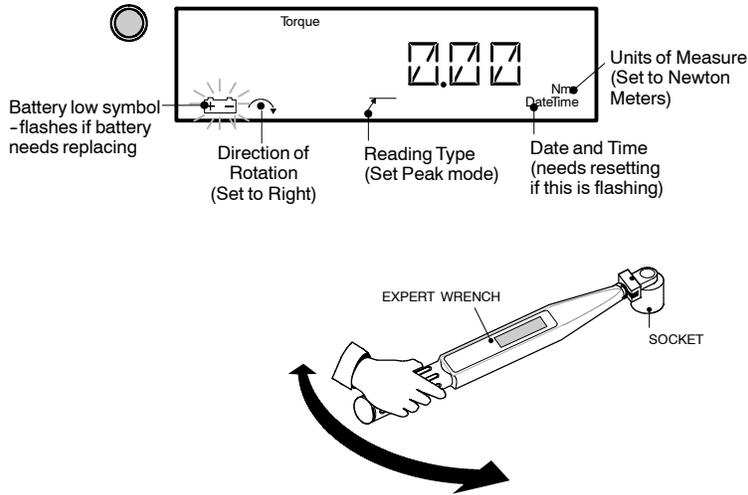
- a) **Maximum Torque Limit value**
- b) **Minimum Torque Limit value**
- c) **Threshold Torque Limit value** (normally 50% of extended measurement)
- d) **Capture Angle** (with range of 1-20 degrees)

Guideline values for Capture Angles (See chart, shown below):

Joint Type	Joint Grip Length (d = bolt Ø)			
	<2d	2d - 5d	5d - 10d	>10d
Hard/ Medium	2°	3°	4°	6°
Soft	2°	4°	6°	8°

With a suitable drive adaptor and socket in place, connect to the required fastener and apply torque. For information on fitting drive adaptors, see page 8.

When ready to apply the torque, press **OK** to reset the wrench. The “WAIT” message will be displayed on the screen and the LED will glow RED. Seconds later the LED should turn GREEN. When the LED goes out and the display shows zero (as depicted below), begin to apply the torque. The display shows the measurement, and the direction of rotation.



As the reading is taken, the display will show the torque value at the capture angle as defined in the SETUP menu ('n' degrees movement above threshold torque).



If the wrench does not achieve the required rotation, the LED will glow RED momentarily and the display will show “*ANGLE < N*”.

If the wrench has not been moved fast enough, the LED will glow RED momentarily and the display will show “*TOO SLOW*”.

To take a further reading, press **OK** to reset and wait for the WAIT message to disappear from the screen.

### 3.10 Changing the Type of Measurement/Direction of Rotation

To alter the type of measurement and/or the direction of rotation, press the  key.

With each key pressed, the display will cycle between the following options.



**Peak Mode - Right hand rotation.**

**Peak Mode - Left hand rotation.**

**Track Mode. (This applies to Normal Mode operation only)**

### 3.11 Changing the Units of Measurement

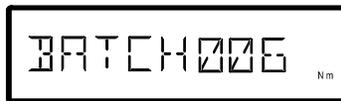
To change the **UNITS of measurement** (N•m, lb•ft etc.) you need to access the **SETUP Menu** (see page 17)

### 3.12 Adding to the Batch List Manually

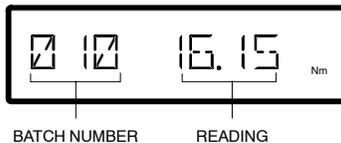
While in Measure Mode, readings taken can be added to the Batch list. If the Auto Save option has been set in the **SETUP Menu** (See page 17), all readings are automatically added to the end of the **BATCH** list. If this Auto Save has not been set, readings can be added manually from the Measure Mode. When the reading is taken, the “?” symbol will flash when the reading is displayed. If  is pressed, the reading is added to the end of the Batch list. Pressing  will cause the wrench to ignore this reading.

### 3.13 Viewing the Last Batch Number

While in Measure Mode, it is possible to view the number of the last reading stored in the Batch list. This will tell the operator how many readings are currently stored. Press  and the screen will display the latest batch number. The screen will look similar to this:



Press the  key to reveal the readings stored in the batch.



The first figure is the latest batch reading number and the second figure is the current reading.

Pressing the  or  keys will allow the user to scroll through the stored batch readings.

Each reading shows the batch number, a sign as above to denote the status and the torque reading.

Press  to return to the Measure Mode.

The Expert Audit Wrench can store up to 200 separate readings in the batch. When the batch is full, any subsequent readings will wrap around and will begin overwriting the existing readings, starting with reading 1. To clear the batch, use the **CLEAR** function in the **SETUP Menu** - see page 17.

### 3.14 Deleting the Last Batch Number

Pressing  when in Measure Mode will delete the latest reading to be stored in the batch list. The LED will glow **RED** to indicate deletion has taken place. No confirmation of this will be shown on the screen until the last batch number is displayed as detailed above.

**NOTICE**

**Only 1 reading may be deleted until another reading has been taken.**

### 3.15 Setup Menu

The following options are available in the SETUP Menu:

ANGLE (Applicable to Instant Mode only)  
PASSWORD  
CLEAR  
AUTOSAVE  
MAX  
MIN  
THR  
UNITS

To access the SETUP Menu - from the Measure Mode, press the  key.

Press the  or  arrow keys until "SETUP" appears in the display, then press .



To set the angle (Instant Mode) using the ANGLE function:

Select 'ANGLE' using  and  then press .

The readout will show the currently set angle in degrees. Use the  and  keys to select a number in the range from 1 to 20.

Press  to confirm.

To return to the SETUP Menu press .

**To set a password using the *PASSWORD* function:**

Select 'PASSWORD' using  and  then press .

The current status of the password protection will be displayed ("OFF" or "ON").

Use the  and  keys to select the required option and press .

If 'OFF' is selected, the display will return to the previous menu level. Press  twice to return to Measure Mode with no password selected.

If 'ON' is selected, the display will show 5 digits. The rightmost digit will be flashing. Use the  and  keys to select the rightmost digit in the display and press . The next digit to be entered will now be flashing. Repeat the process for the remaining digits. Press  to confirm the selection. Press  twice to return to Measure Mode.

Once a password has been set, the display will prompt for this number each time the SETUP, OPTIONS or DIAGNOSTICS menus are accessed. Key in the number using the  and  keys and pressing  for each digit.

**NOTICE**

**The password protection system is to prevent unauthorized access to the administrative functions of the wrench. Always be sure to memorize the number for future reference and apply it as soon as possible if required. If an unknown password has been entered into the wrench, please call Ingersoll-Rand for assistance.**

**To access the *CLEAR* function:**

Select 'CLEAR' using  and  then press .

Screen will show "DEL DATA?" Press  to delete all batch data or press  to return to SETUP Menu without deleting. If no readings have been stored, the screen will show: "NO BATCH".

To return to the SETUP Menu press .

**To access the *AUTOSAVE* function:**

Select 'AUTOSAVE' using  and  then press .

Use the  and  keys to toggle between AUTO ON and OFF.

Press  to select the required option. To return to the SETUP Menu press . When the auto save function is set to ON, all torque readings will be added to the batch as they are taken. If the auto save function is set to 'OFF', readings can be added manually to the batch list. See MEASURE MODE, page 14.

**NOTICE**

If the maximum or minimum torque setting is changed while there are existing readings saved in the BATCH store, the display will prompt “DEL DATA?” Press  to delete the existing data in the BATCH store. Press  to preserve the data saved with the old MAX settings.

**To set MAX torque setting:**

Select ‘MAX’ using  and .

Press  to display the maximum torque figure.

The first digit will be flashing. Use the  and  keys to alter the flashing digit.

Press  to move to the next digit.

Continue in this way until all the digits are correct. The new figure will be shown with no flashing digits. Press  to accept and return to MIN screen. Use  and  arrow keys to move on to the next option.

**To Set MIN torque setting:**

Select ‘MIN’ using  and .

Press  to display the minimum torque figure.

The first digit will be flashing. Use the  and  keys to alter the flashing digit.

Press  to move to the next digit.

Continue in this way until all the digits are correct. The new figure will be shown with no flashing digits. Press  to accept and return to MIN screen. Use  and  arrow keys to move on to the next option.

**To view the Threshold Torque Value:**

Select ‘THR’ using  and  then press .

**To set the UNITS of Measurement:**

Select 'UNITS' using  and  then press .

The currently selected Units Of Measurement will be displayed (e.g. N•m).

Use the  and  keys to select the units required, then press .

Units available (depending on the span of the wrench) are: **N•m**, **kg•m**, **kg•cm**, **lb•in**, or **lb•ft**.

To return to the SETUP Menu press .

**To exit from SETUP Menu:**

Pressing the escape  key will return the user to the Measure Mode.

**3.16 Printer Menu**

The following options are available in the PRINTER Menu:

**PRINT**  
**TEST PRN**  
**SET PRN**  
**AUTO PRN**

To access the PRINTER Menu - from the Measure Mode, press the  key.

Press the  and  arrow keys until "PRINTER" appears in the display, then press .



**To print from the Expert Audit Wrench:**

Make sure the wrench is connected to a suitable printer, or computer - see page 12.

**Note:** When attaching to a computer use a software program such as “Hyperterminal” to capture the data. Be sure communication protocol is set the same for both the wrench and the software.

Select ‘**PRINT**’ using  and  then press .

This will produce a printout of the information currently stored in Expert Audit Wrench.

A typical printout is illustrated below:

Page 1 of 2

Angle Wrench	90-1.00		
Span:	25.0 N•m	Date:	04/01/2002
Serial No:	22222	Time:	12:13:22
Next Calibration due:	05/23/2002		
Total Samples:	11		
Direction:	Right		
Max Torque set:	25.00 N•m		
Min Torque set:	2.50 N•m		
Threshold Torque:	3.75 N•m		
Xbar:	3.26 N•m		
Range:	0.58 N•m		
Sigma	0.15		
Max found:	3.26 N•m		
Min found:	3.02 N•m		
Readings above max:	0		
Readings below min:	0		
Percentage not OK:	0.00%		
Cp:	24.19		
Cpk:	1.63		

-----  
Page 2 of 2

Angle Wrench	90-1.00		
Span:	25.0 N•m	Date:	04/01/2002
Serial No:	22222	Time:	12:13:24
Next Calibration due:	11/23/2002		

Samples	Date	Time	Torque
1 -	04/01/2002	12:53	3.14 N•m
2 -	04/01/2002	12:53	3.30 N•m
3 -	04/01/2002	12:53	3.18 N•m
4 -	04/01/2002	12:53	3.43 N•m
5 -	04/01/2002	12:53	3.37 N•m
6 -	04/01/2002	12:53	3.36 N•m
7 -	04/01/2002	12:54	3.32 N•m
8 -	04/01/2002	12:54	3.53 N•m
9 -	04/01/2002	12:54	3.41 N•m
10 -	04/01/2002	12:01	3.30 N•m
11 -	04/01/2002	12:01	3.20 N•m

Press  to stop the print. Display will show “*ABORTED*” and printing will stop.

**To test the printer:**

Select 'TEST PRN' using  and  then press .

Display will now show "PRINTING" and the printer will begin continuously printing a string of test characters.

Press  to cancel printing. Display will show "ABORTED" and printing will stop.

**To change the PRINTER OUTPUT SETTINGS:**

Select 'SET PRN' using  and  then press .

Change the Baud Rate (*BD*) using the  and  then press .  
The default figure is 9600 - check with your printer.

Change the Data Bits (*DATA*) using the  and  then press .  
The default figure is 8 - check with your printer.

Change the Parity (*PRT*) using the  and  then press .  
The default figure is NONE - check with your printer.

Change the Stop Bits (*STOP*) using the  and  then press .  
The default figure is  - check with your printer.

**To set the AUTO PRINT function:**

Select 'AUTO PRN' using  and  then press .

Use the  and  keys to toggle between Autosave 'ON', Autosave 'OFF' and 'COMPUTER' and press .

When this option is set to ON, all data taken from readings is automatically sent to the printer.

When 'COMPUTER' is selected, all data taken from readings is automatically sent to the printer without the date and time. Readings and reading numbers only are printed - not units.

**To exit from Printer Menu:**

Pressing  will return the user to the Measure Mode.

### 3.17 Options Menu

The following options are available in the 'OPTIONS' Menu:

SET MODE  
POWEROFF  
SW RESET  
DATE FMT  
DATE  
TIME

To access the OPTIONS Menu - from the Measure Mode, press the  key.

Press the  and  arrow keys until "OPTIONS" appears in the display, then press .



#### To set the Operating Mode using the SET MODE function:

Select 'SET MODE' using  and  then press .

Use the  and  keys to select the operating mode required, then press . (The default is Instant)

The types of mode are:

- Instant** Move on operation with Angle function.
- Normal** Standard wrench operation.

#### To set the Power Off Delay:

Select 'POWEROFF' using  and  then press .

Display will show the currently set power off delay in minutes.

Use the  and  keys to select the time required (1 to 10 minutes), then press .

**To perform a Software Reset:**

Select 'SW RESET' using  and  then press .

Display will Show "CONFIRM".

To reset the software press . "NO BATCH" is shown - press . The unit will reset and return to the Diagnostic Menu.

If in Peak mode, and there are readings stored in the batch, the display will prompt:

"DEL DATA". Press  to clear the data and perform a Software Reset.

To return to the Diagnostic Menu without performing a reset press .

The default settings after a Software Reset are PEAK measure, RIGHT direction and N•m units.

**To set the Date Format:**

Select 'DATE FMT' using  and  then press .

The current date format will be displayed.

Use the  and  keys to select the required format and press .

Options are: **DD-MM-YY** or **MM-DD-YY**

**To set the Date:**

Select 'DATE' using  and  then press .

Display will show "YEAR=XX".

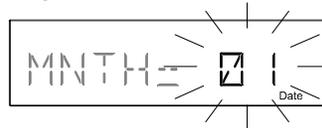
Currently selected year (XX) will be flashing:



Use the  and  keys to select the required year and then press .

Display will show "MNTH=XX".

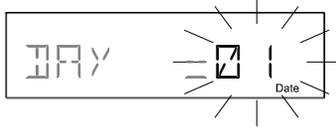
Currently selected month (XX) will be flashing:



Use the  and  keys to select the required setting and then press .

Display will show "DAY=XX".

Currently selected day (XX) will be flashing:



Use the  and  keys to select the required setting and then press .

**NOTICE**

**During date editing, the word 'DATE' will be flashing in the bottom right of the display.**

**To set the *Time*:**

Select 'TIME' using  and  then press .

The display will show hours, minutes and seconds.

The hours digits will be flashing - use the  and  to set to the correct hour and press .

The minutes digits will now be flashing.

Repeat the above process to set the minutes and seconds.

**To exit from *Options Menu*:**

Press  to return the user to Measure Mode.

### 3.18 Diagnostics Menu

This menu allows various diagnostics data to be viewed.  
Many of these options are used by Ingersoll-Rand for diagnostic purposes.

RELEASE  
SPAN  
NEXT CAL  
TEST LED  
TRACKADC  
ANGLE ADC  
ANGLE DAC  
MISC ADC  
DEMOTEXT

To access the DIAGNOSE Menu - from the Measure Mode, press the  key.

Press the  and  keys until 'SETUP' appears in the display, then press .



DIAGNOSE ?

To exit the DIAGNOSTICS MENU, press the escape  key.

#### To view the *Software Release Number*:

Select 'RELEASE' using  and  then press .

The software release number will be displayed.

To return to the Diagnostic Menu press .

**To view the SPAN:**

Select 'SPAN' using  and  then press .

Display will show the span of the wrench.

To return to the Diagnostic Menu press .

**NOTICE**

**The span of the wrench is displayed in N•m by default. If the user is working in different units of measurement, pressing  will display the converted figure.**

**To view the Next Calibration Date of this unit:**

Select 'NEXT CAL' using  and  then press .

Display will show the date the unit is next due for calibration by Ingersoll-Rand.

Press  to exit.

**To test operation of LEDs:**

Select 'TEST LED' using  and  then press .

The LED will cycle 3 times through its colours (RED, GREEN and AMBER) with a text confirmation.

The unit automatically returns to the Diagnostic Menu.

**To view Track A/D Converter Values:**

Select 'TRACKADC' using  and  then press .

The first 4 digits indicate an averaged value of the Analogue to Digital converter output.

The next 4 digits indicate the direct Analogue to Digital converter output.

Application of right hand torque will cause both values to increase.

Application of left hand torque will cause both values to decrease.

**NOTICE**

**With no torque applied the values displayed will be "2048 + 50".**

To return to the Diagnostic Menu press .

**To view Angle A/D Converter Values:**

Select 'ANGLEADC' using  and  then press .

Starts off with DAC o/p = 0. This is connected to the ADC input.

Displays DAC output and ADC Input as "0000:0000".

Use the  and  keys to increment or decrement the DAC o/p figure by 50 units.

Displays DAC output and ADC Input as "mmmm:nnnn", where 'mmmm' is an increment of 50, and 'nnnn' is a figure between the range 0000 to 4096.

On Down-arrow key, decrements DAC o/p by 50 units each time.

Press  to finish.

**To view Angle D/A Converter Values:**

Select 'ANGLEDAC' using  and  then press .

Display shows "DAC = 4096" units. User must check on scope the output is maximum, approx. 5 volts.

Press  or .

Display shows "DAC = 2048" units. User must check on scope the output is 1/2 maximum, approx. 2.5 volts.

Press  or .

Display shows "DAC = 0000" units. User must check on scope the output is minimum, approx. 0 volts.

Press  or .

Ramps angle continuously between 0 and 4096 units. Display shows "0 ---> 4096".

User must check on scope the ramping output.

Press  or .

**To view Miscellaneous A/D Converter Values:**

Select 'MISC ADC' using  and  then press .

The display will scroll through the remaining internal A/D converter numbers and display their current output value. The normal values for these outputs is given below.

A/D No	Value
7	65 (±6)
8	128 (±6)
9	255 (±5)
10	255 (±5)
11	60 (±10)

To return to the Diagnostic Menu press .

**To test *Demonstration Text*:**

Select 'DEMOTEXT' using  and  then press .

A scrolling message will be displayed.

To return to the *Diagnostic Menu* press .

**To exit from *Diagnostic Menu*:**

Pressing  will return the user to the Measure Mode.

### 3.19 Troubleshooting Guide

The following guide gives some of the possible problems which could be encountered with the Expert Audit Wrench, the possible causes, and the suggested remedial action.

#### Fault

LCD panel does not come on at power up.

#### Possible Cause

- A Batteries not fitted correctly or not secured.
- B Batteries discharged.

#### Action

- A Ensure the batteries are seated properly and the polarity is correct.  
Ensure the battery compartment cover is screwed down correctly.  
See page 11.
- B Change the batteries.

#### Expert Audit Wrench Error Messages

MESSAGE	Meaning
"ANGLE < N"	Wrench rotation has not exceeded capture angle. (Red LED will light momentarily).
"TOO SLOW"	Wrench has not been moved fast enough, after 5 seconds (Red LED will light momentarily).
"AZ ERROR"	Wrench works in A/D units (-2048 , 0 , 2048) and comes up with this error if autozero > 100 or < -100.

<b>Batch</b>	A group of readings taken. Expert Audit Wrench stores these readings by default.
<b>Configure</b>	The process of entering and storing the basic parameters which determine the resulting outputs of Expert Audit Wrench.
<b>Dynamic Torque</b>	The peak torque measured during the installation of a fastener using a power tool. It is the primary and preferred method for calibration.
<b>Peak</b>	A type of measurement which records the highest torque applied to a transducer during an operation.
<b>Residual Torque</b>	The torque value measured by rotating the fastener in the tightening direction. Used as an indication of how much torque is present on the fastener.
<b>Sample</b>	Individual torque reading.
<b>Span</b>	The Span is the effective operating range of the wrench. This is the range between zero and the maximum design limit of the transducer.
<b>Static Torque</b>	The maximum torque that may be applied to a fastener without inducing rotation.
<b>Threshold Torque</b>	The level of torque which a signal must rise above and then fall below to be considered a valid torque cycle. In the Expert Audit Wrench, this is set at approximately 50% of the estimated resident torque.
<b>Torque Cycle</b>	A complete application of torque to a joint starting from the torque rising above the preset threshold value and finishing at the preset cycle end time.
<b>Track</b>	A type of measurement which follows the changing torque values imposed on a transducer as torque is applied. The display will return to zero after the torque is removed.
<b>Units of Measure</b>	It is possible with Expert Audit Wrench to measure torque, and convert internally to display and store in any of the other torque measurement units as specified.

The diagram below shows the basic menu structure of the Expert Audit Wrench.

