



RATE CONTROLLED TORQUE WRENCH TESTER

OPERATOR'S HANDBOOK (PART NO. 34078)
ISSUE 8

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THIS OPERATORS MANUAL COVERS THE FOLLOWING RATE CONTROLLED TORQUE WRENCH TESTER MODEL NUMBERS

MODEL NO.	CAPACITY	VOLTAGE
60119	1000 lbf.ft RATE CONTROLLER FOR	240v ac OPERATION.
60133	1000 lbf.ft RATE CONTROLLER FOR	120v ac OPERATION.
60146	2000 lbf.ft RATE CONTROLLER FOR	240v ac OPERATION.
60147	2000 lbf.ft RATE CONTROLLER FOR	120v ac OPERATION.

Each of the above models includes the following 3 parts _____

1. Rate Controller Instrument (Part 60116).
(Including lead to ETS and Hand Controller).
2. Rate Controller Motor Driver (Part 60117 for 240v or 60132 for 120v)
(Including a lead to the rate controller instrument and a mains lead).
3. Motorised ISO Unit (ISO 1000 Part 60093 for 240v or 60131 for 120v or
ISO 2000 Part 20503 for 240v or 20504 for 120v)
(Including a range of transducer adapters, reaction arm and manual handle).

Mains Plug Fitting :- _____

Due to the wide variance of mains socket types around the world, the motor driver does not have a mains plug fitted as standard. Prior to use a mains plug needs to be fitted by a competent person.

Fit in accordance with the plugs own instructions, though 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 Motor Driver and mains supply. If no earth is available (2 wire mains supply) it is recommended that a separate earth is connected between the Motor Driver case (the bottom right hand fixing screw in the corner of the back panel is ideal) and a suitable earth.

If the plug has an internal fuse, a 5 amp value is recommended.

INTRODUCTION

The Norbar Rate Controlled Torque Wrench Tester is a powered version of the ISO 1000 or ISO 2000 Torque Wrench Loader. The tester can automatically test all torque wrenches that operate on the 'click action' or 'cam action' principle, as well as manually testing dial type wrenches. The automatic loading is accomplished at a constant rate of torque application, not at constant motor speed, so leading to more consistent results.

The ISO loading rig is fully adjustable to accept any torque wrench within its operating range, with both clockwise and anti-clockwise tests being performed in either motorised or manual mode.

The system incorporates a settable dual reference ramp with variable changeover point. Torque feedback is utilised to obtain an accurate application of torque at the specified rates.

A DC electric motor is used to drive the torque wrench via a multi-stage gearbox. Manual operation using a hand wheel is possible should it be required.

Several safety features are built in to safeguard the machine and the wrench under test.

Additional Items Required To Create a Working System _____

1. A suitable Torque Transducer and Matching Amplifier.
2. A modified ETS, (one of the following) :
 - 40306 - ETS.
 - 40307 - ETS with LIMIT DETECTOR
 - 40310 - ETS with BATTERY PACK

The ETS comes with a mains lead, transducer lead and link out plug. Note that the link out plug is to be fitted in the ancillaries socket of the ETS if required to operate without the Rate Controller.

For more information on these 2 items please refer to their own handbooks.

Calibration And Repair :- _____

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

Recalibration, and repair where necessary, 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 rate controller to the specified accuracy can be found in the rate controller service manual Part No. 34079.

SYSTEM SPECIFICATION

RANGE OF OPERATION	ISO 1000 - 1 to 1000 lbf.ft (1 to 1350 N.m). ISO 2000 - 10 to 2000 lbf.ft (10 to 2500 N.m).
SETTABLE RATE VALUES	0.1% to 6% of transducer full scale in units (N.m) per second.
NUMBER OF SETTABLE RATES	2 per test (Approach rate 1 and final rate 2).
RATE CHANGEOVER POINT	Settable from 50% to 100% of wrench setting.
WRENCH SETTING VALUE	10% TO 100% of transducer value.
CALIBRATION DIRECTION	Clockwise or anti-clockwise.
AUTOMATIC OVERLOAD PROTECTION	+10% of wrench setting as set on instrument.
AUTOMATIC SYSTEM STOP TIME	20 seconds if no torque is detected (safety feature)
OPERATIONAL MODES	Automatic, Manual or Hand wheel.
AUTOMATIC OPERATION	Fast approach to take up slack prior to test Controlled torque application at set rate 1 (fast) Controlled torque application at set rate 2 (slow) Fast release of torque after test.
MANUAL OPERATION	Forward and reverse operation for positioning of wrench. Also useful for testing dial type wrenches.
HAND WHEEL OPERATION	For use as a standard (non rate controlled) ISO tester.
POWER REQUIREMENTS	120 Volts AC (99-132 V AC) or 240 Volts AC (198-264 V AC) dependent upon model.
POWER CONSUMPTION	250 W for the motor driver.
OPERATING TEMPERATURE RANGE	-10°C to +50°C
MAXIMUM OPERATING HUMIDITY	85% Relative Humidity @ 30°C

CABLE LENGTHS :

MAINS CABLE	2.0 meters (6 ft 6 ins) long.
ETS TO INSTRUMENT	0.5 meters (1 ft 7 ins) long.
INSTRUMENT TO MOTOR DRIVER	1.25 meters (4 ft 1 ins) long.
MOTOR DRIVER TO MOTOR	0.7 meters (2 ft 3 ins) long (approx.).

ALLOWABLE TORQUE WRENCH LENGTH :

ISO 1000 (Standard)	MINIMUM 200 mm MAXIMUM 1360 mm
ISO 1000 (Small reaction plate option)	MINIMUM 95 mm MAXIMUM 185 mm
ISO 2000 (Standard)	MINIMUM 220 mm MAXIMUM 1100 mm (2200 mm with extension tube)
ISO 2000 (Small reaction plate option)	MINIMUM 125 mm. MAXIMUM 210 mm.

CASE DIMENSIONS
(INSTRUMENT & MOTOR DRIVER)

108 mm high x 197 mm wide x 282 mm long.

Engineered in aluminium extrusions and castings with tough paint finish in blue and grey.

DIMENSIONS ISO 1000 LOADER	590 mm high x 415 mm wide x 1130 mm long (maximum).
DIMENSIONS ISO 2000 LOADER	730 mm high x 460 mm wide x 2533 mm long (maximum).
GEARBOX RATIO	10,800 : 1
TRANSDUCER ADAPTERS ISO 1000	1/4", 3/8", 1/2", 3/4", 1"
TRANSDUCER ADAPTERS ISO 2000	1/2", 3/4", 1", 1 1/2"

WEIGHT :

INSTRUMENT	2.5 Kg (5.4 lbs).
HAND CONTROLLER	0.2 Kg (0.4 lbs).
MOTOR DRIVER	3.7 Kg (8.2 lbs).
ISO 1000	42 Kg (92 lbs) - With all adapters.
ISO 2000	88 Kg (194 lbs) - With all adapters and extension tube.

ADDITIONAL OPTIONS AVAILABLE

20576	Reaction post for tensiometer testing.
20502.38	7mm test cable for tensiometer testing.
20502.39	6mm test cable for tensiometer testing.
20502.40	5.3mm test cable for tensiometer testing.
20502.41	5mm test cable for tensiometer testing.
20502.43	4mm test cable for tensiometer testing.
20502.43	3mm test cable for tensiometer testing.
20502.44	2.5mm test cable for tensiometer testing.
20502.45	1.6mm test cable for tensiometer testing.
20552.1	9/32" test cable for tensiometer testing.
20553.1	1/4" test cable for tensiometer testing.
20554.1	7/32" test cable for tensiometer testing.
20555.1	3/16" test cable for tensiometer testing.
20556.1	5/32" test cable for tensiometer testing.
20557.1	1/8" test cable for tensiometer testing.
20558.1	3/32" test cable for tensiometer testing.
20559.1	1/16" test cable for tensiometer testing.
20580	6" quadrant for tensiometer testing (2.5 - 1.6 cable) (1/16" - 3/32")
20581	9" quadrant for tensiometer testing (3 - 7mm cable) 1/16" - 9/32")
20588	Small Reaction Plate for calibrating tools upto 20 N.m (i.e. SL0)

NOTE *20588 can only be used on rigs ordered after 1 September 1995, without additional holes being drilled into box section.*

TROUBLE SHOOTING - ELECTRICAL NOISE

This page is to cover the fitting of a mains filter for use on the rate controller motor driver and the use of the signal filter function on the ETS / DTS.

IMPORTANT: REMOVE ALL POWER TO ALL PARTS OF THE RATE CONTROLLER SYSTEM.

Fitting of the motor driver mains filter (if supplied) _____

Some versions of the Rate Controller Motor Driver (Part 60117 for 240v or 60132 for 120v) are supplied with an additional mains filter, labelled 'MAINS FILTER FOR RATE CONTROLLED MOTOR DRIVER'. This filter is housed in a metal box, and is to be inserted in the motor driver mains lead. With the system fully set up as in the operating instructions on page 12, fit the mains filter as follows:

1. Remove the mains lead from the back panel of the motor driver.
2. Place the mains filter into the back panel of the motor driver.
3. Insert the mains lead into the mains filter just fitted.

It is intended for the mains filter to be situated close to the motor driver back panel.

Signal filter use of the ETS / DTS _____

The ETS / DTS that is being used with the rate controller system may have a signal filter setting on the front panel. This function, labelled 'FILTER', should be placed in the 'ON' position when connected to the rate controller.

The setting of the filter will make no difference to the measured torque value, but will help to remove unwanted noise from the system.

Location of transducer lead and mains leads _____

Once the rate controller system is fully connected it is advisable to keep the transducer lead away from the mains leads. Ensure the mains leads pass directly away from the system and that the transducer lead remains close to the transducer and ETS / DTS.

SYSTEM FUNCTIONS

(i) Rate Controller Instrument

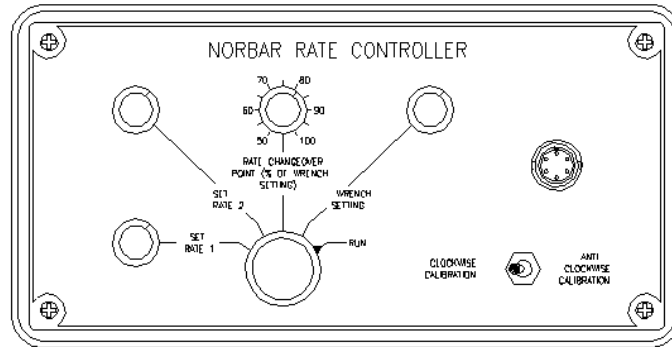


Fig 1 Rate Controller Instrument Front Panel

1. Main selection knob for selection of 5 settings.
 - (a) **SET RATE 1** - Setting of initial rate of torque loading. The value is displayed on the ETS.
 - (b) **SET RATE 2** - Setting of final rate of torque loading. The value is displayed on the ETS.
 - (c) **RATE CHANGEOVER POINT (% OF WRENCH SETTING)** - The setting of the changeover point between rate 1 and rate 2. A changeover value of between 50% and 100% of the wrench setting is possible.
 - (d) **WRENCH SETTING** - This is the target torque value. The value is displayed on the ETS.
 - (e) **RUN** - In this position the ETS displays the measured torque value.
2. **HAND CONTROLLER.** Socket to plug hand controller into.

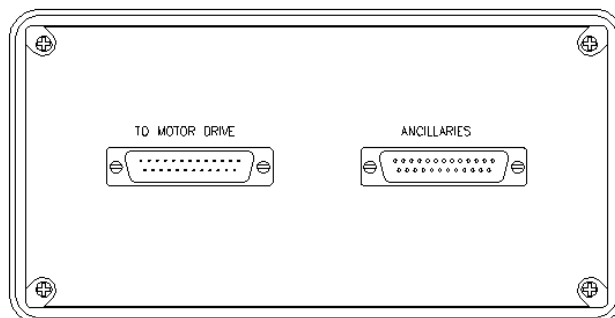


Fig 2 Rate Controller Instrument Back Panel

3. **CLOCKWISE / ANTI-CLOCKWISE CALIBRATION.** Switch to allow reverse operation. This switch will only take affect with no torque on the transducer and the motor stationary.
4. **ANCILLARIES.** 25 way D socket connector to ETS.
5. **TO MOTOR DRIVER.** 25 way D plug connector to motor driver.

(ii) Rate Controller Hand Controller

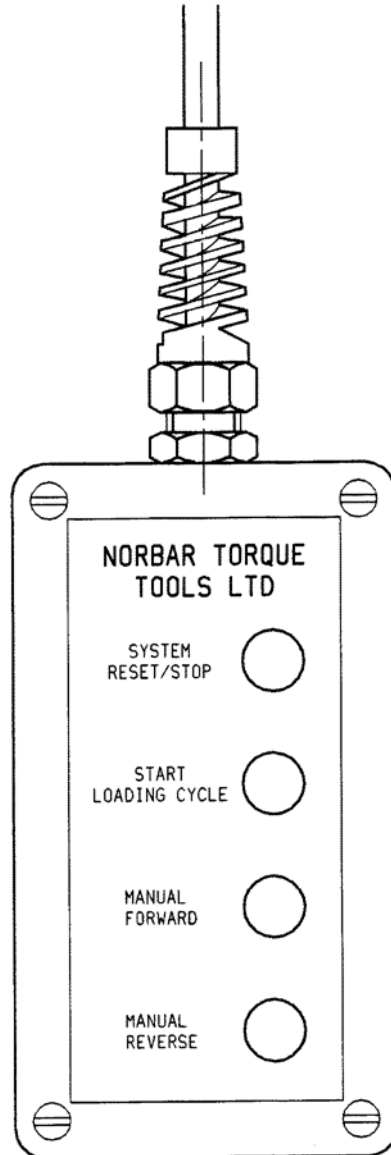


Fig 3 Hand Controller

- | | | |
|----|----------------------------|--|
| 1. | SYSTEM RESET / STOP | - Press to stop system. |
| 2. | START LOADING CYCLE | - Press to start cycle. |
| 3. | MANUAL FORWARD | - Keep depressed for manual forward operation. |
| 4. | MANUAL REVERSE | - Keep depressed for manual reverse operation. |

(iii) Rate Controller Motor Driver

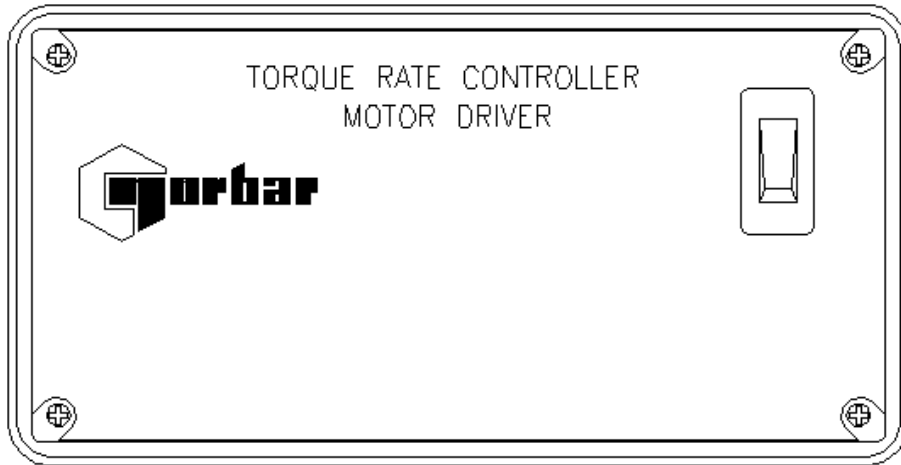


Fig 4 Rate Controller Motor Driver Front Panel

1. **ON / OFF** switch situated on front panel.

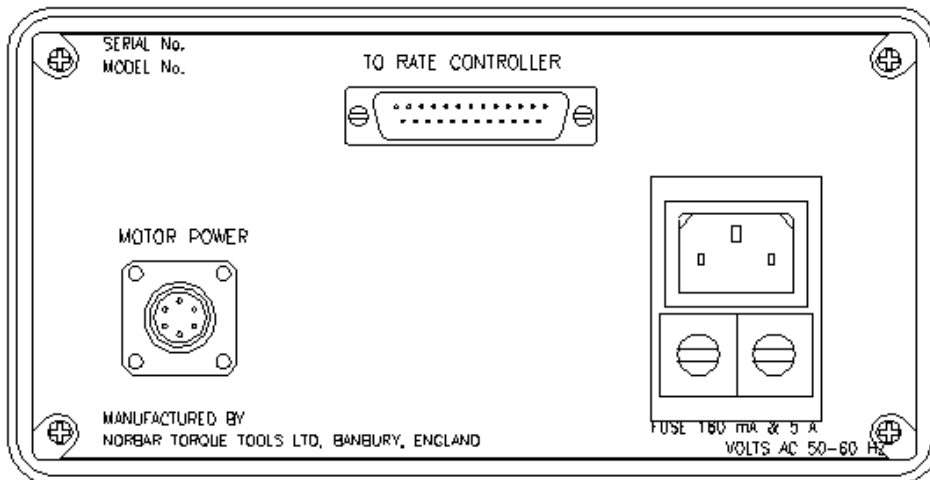


Fig 5 Rate Controller Motor Driver Back Panel

2. **MAINS INLET.** Mains power inlet.
 (Note : Motor Driver 60117 requires 240 Volts and Motor Driver 60132 requires 110 Volts)
3. **FUSES** - 160 mA for power supply. REPLACE WITH FUSE OF SAME TYPE AND VALUE.
 - 5A for Motor Driver.
4. **TO RATE CONTROLLER.** 25 way D plug connector on back panel to instrument.
5. **MOTOR POWER.** 6 way connector to feed motor.

NOTE: Power for the magnetic field of the motor is supplied by the motor driver. To prevent the motor getting too warm during periods of non use, turn off motor driver when not required.

(iii) Motorised ISO Test Rig

1. Custom Multi-stage gearbox.
2. Optional manual operation using hand wheel.
3. Universal transducer mounting fixture with range of transducer adapters.
4. Reaction post and arm assembly.

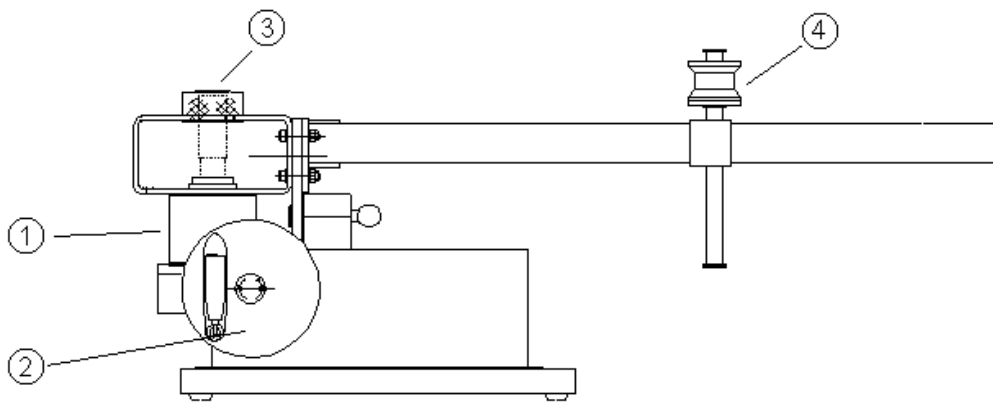


Fig 6 Side View Of ISO 1000 Test Rig

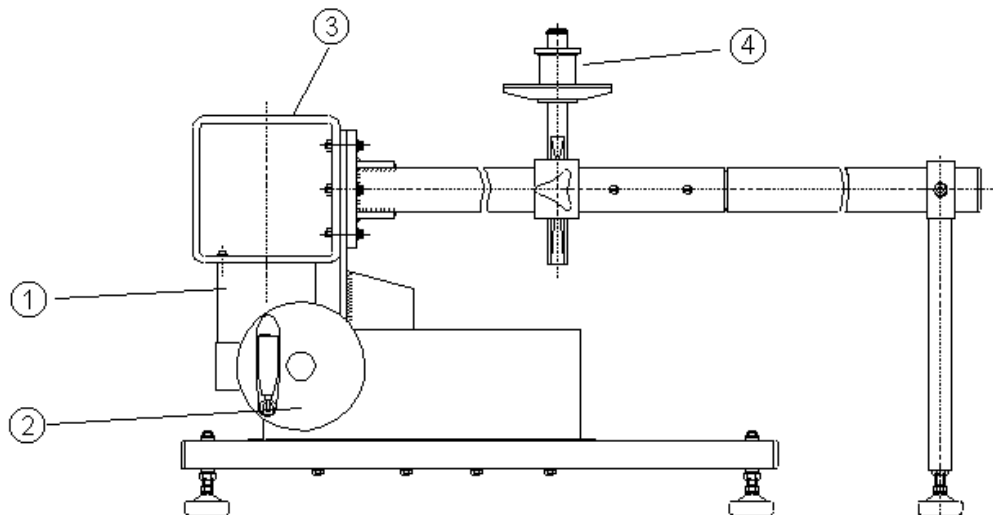


Fig 7 Side View Of ISO 2000 Test Rig

OPERATING INSTRUCTIONS

(A) Mounting The Transducer

1. Select the lowest capacity torque transducer to cover the range of the torque wrench to be tested.
2. Mount its male square into the gearbox output.
1" square drive transducers will fit directly into the gearbox, transducers with other drives should be connected using the converter provided. It may be necessary to install a transducer spacer (provided) in order to site shorter transducers towards the top of the transducer aperture.
3. The appropriate locating collar should be placed over the top of the transducer.
4. Connect the transducer to the ETS using a standard transducer lead. If using some of the larger diameter transducers, the transducer connector and cable may become trapped against the housing allowed for the transducer. Always ensure the transducer's connector is at the front of the test rig so that any possibility of becoming trapped can be monitored.

(B) Locating The Torque Wrench

5. The torque wrench to be tested is to be fitted into the female square of the transducer that has just been located. Several adapters are supplied to enable any wrench to be fitted.
6. The handle of the wrench is to run along the length of the test rig.
7. Adjust the position of the reaction post so it is against the handle of the wrench.
7. Adjust the height of the reaction arm so that the wrench is horizontal.

(C) Connecting to an ETS

1. Place the ETS on the left hand side of the ISO tester.
2. Connect the transducer to the ETS using the transducer lead provided.
3. Place the corresponding transducer amplifier in the rear of the ETS. Ensure both model and serial numbers match on the transducer and amplifier.

(D) Manual Operation With The Hand wheel _____

NOTE : ***This section deals with manual operation using the hand wheel provided to apply torque.***

If motorised or rate controlled operation is required please move to part (E), for manual operation continue with this section.

1. If the system has previously been used in motorised or rate controlled operation complete the following :
 - (i) Turn off the motor driver.
 - (ii) Remove the ETS to Rate Controller Instrument lead from the back of the ETS.
2. Fit the link out plug (a 25 way connector without a lead attached) into the ancillaries socket on the back of the ETS.

Power up the ETS and select units of measurement. With no load on the transducer zero the display in track mode, it is advisable to exercise (pre load) the transducer 3 times before setting the zero.

Select the required mode of operation, refer to ETS operators handbook.

3. Place the hand wheel into the hole in the belt guard, ensure the hexagonal drive is fully engaged.
4. Turn the handle to apply torque to the wrench under test.
 - (i) Applying clockwise torque to the wrench.

Turn the handle anti-clockwise, this will drive the gearbox output stage anti-clockwise so applying a clockwise reaction to the wrench.
 - (ii) Applying anti-clockwise torque to the wrench.

Turn the handle clockwise, this will drive the gearbox output stage clockwise so applying an anticlockwise reaction to the wrench.
5. Due to an extra stage within the gearbox, to allow accurate rate controlled operation, the hand wheel operation can be extremely slow. It is easier to use a motorised method of applying torque.

(E) Motorised And Rate Controlled Operation _____

1. The system should be set out as follows :

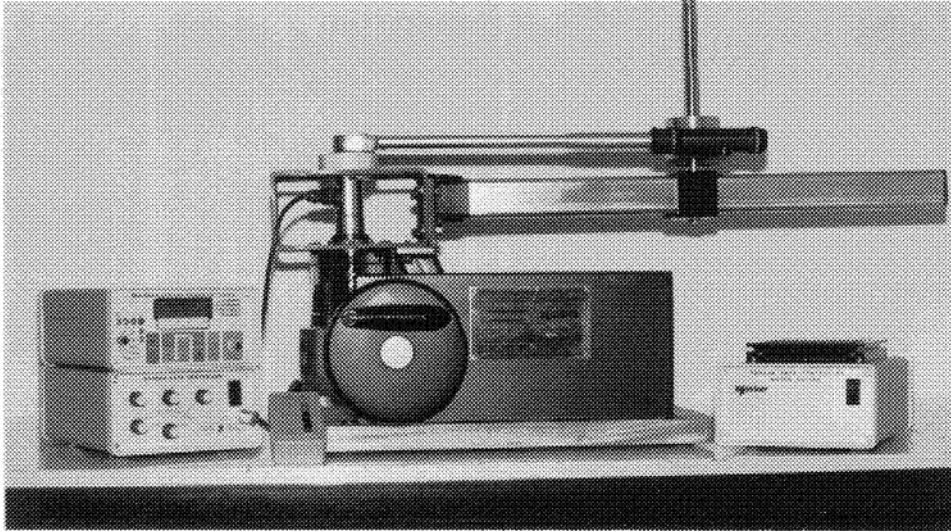


Fig 8 Suggested Layout For Rate Controller System (ISO 1000 shown)

ETS and Rate Controller Instrument on the left of the ISO rig and the motor driver on the right.

2. Connect the rate controller instrument to the ETS ancillaries using the short lead supplied. (The link out plug will need to be removed from the ETS ancillaries socket to allow this, keep the plug in a safe place.)
3. Connect the hand controller to the front of the rate controller instrument.
4. Connect the rate controller instrument to the motor driver using the long lead supplied.
5. Connect the motor lead to the motor driver.

WARNING : For any form of motorised operation the manual hand wheel **MUST** be removed. Keep the hand wheel away from the ISO rig so that it cannot be accidentally used.

6. Connect power supply leads. If being used for the first time, the mains lead will need to be wired with a plug. See page 2.
7. Power up the ETS, and select units of measurement.
8. Take the ETS out of memory mode by ensuring the memory button is out.
9. Set ETS auto reset trigger level to desired point. To achieve this please refer to the ETS operators handbook.
10. Power up motor driver and switch on.

(F) Setting The Rate Control Instrument _____

NOTE: *Appendix B has examples of settings for this instrument.*

1. Ensure the ETS is in 'TRACK' mode.
2. Select '**WRENCH SETTING**' mode using front panel rotary switch.
3. Adjust '**WRENCH SETTING**' knob to show the torque wrench setting in the display of the ETS.
4. Adjust '**RATE CHANGEOVER POINT**' control to required level. This is the point of changeover between rate 1 and rate 2 and will remain true for all values of wrench setting.
5. Select '**SET RATE 1**' position, and adjust '**SET RATE 1**' control until rate required (units/sec) is shown on ETS display.

Appendix A will help in choosing a suitable value.

NOTE : *Do not set the rate too slow (motor may stall) or too fast (system will be out of control). If in doubt consult Appendix A.*

6. Select '**SET RATE 2**' position, and adjust '**SET RATE 2**' control until rate required (units/sec) is shown on ETS display, again refer to Appendix A.
7. Select '**RUN**' position.
8. The ETS display reads the torque value. With no load on the transducer, zero the transducer amplifier that is situated at the rear of the ETS. It is advisable to exercise (pre load 3 times) the transducer in the direction of torque application before the transducer is zeroed. Obtaining an accurate zero value is critical in maintaining a fully working system, ensure it is checked regularly.
9. Place the ETS into memory auto reset mode by depressing the '**MEMORY**' and '**AUTO RESET**' buttons on the front of the ETS.
10. Set '**CLOCKWISE / ANTI-CLOCKWISE CALIBRATION**' switch to desired position.
11. The MANUAL FORWARD AND MANUAL REVERSE buttons can be used to position the wrench, or to apply torque if being used in the motorised (non rate controlled) mode. This mode is also designed for testing dial type wrenches, in which case the ETS should be in memory mode.
12. Press '**START LOADING CYCLE**' button.

This button needs to be kept down for a second and only starts the cycle upon its release. If no torque is detected within approximately 20 seconds the system will stop. This is a safety feature.

(G) Cycle Operation

- a) The system will run at fixed speed until torque is detected. At this point the system may pause for a second to allow rate 1 to catch up with the initial torque level, this is particularly true for a slow rate 1.
- b) The torque wrench will be tightened at rate 1 until the value of the changeover point is reached.
- c) At changeover rate 2 will be implemented.
- d) When the wrench operates, the ETS display is held and the torque is unloaded.
- e) When the wrench is free of torque the motor stops.
- f) The system has now finished its cycle.

NOTE : Regularly check that the transducer cable does not get wrapped round the transducer or get trapped in the housing (particularly applicable to large transducers).

13. If you wish to stop the cycle at any time, press the '**SYSTEM RESET / STOP**' button on the hand controller.
14. The rate controller has an overload of 10% above the wrench setting to ensure faulty wrenches do not cause a dangerous over-torque.

If over load is reached the motor stops. To release this torque take the ETS out of memory mode then simultaneously press both the '**SYSTEM RESET**' and '**MANUAL REVERSE**' buttons. Make sure that the torque is reducing.

(H) The Next Test

1. When the system has finished the cycle it is ready for the next test.
2. If the same test is to be repeated then press 'START LOADING CYCLE'.
3. If another wrench of the same value is to be tested, then exchange the wrench and press '**START LOADING CYCLE**'. The rate controller instrument settings remain unchanged.
4. If a different wrench setting is used then the rate controller instrument will need to be set up again.

The transducer and amplifier may also need to be changed to suit.

5. If the direction of applied torque is reversed, load transducer in reverse direction and re-zero display in track mode before taking any readings.

APPENDIX A - RATE SETTING CHART

This chart is designed to assist in the choosing of a suitable rate value.

The wrench setting (row) is used together with the required % of the wrench per second (column) to determine the rate setting.

	% PER SECOND						
	0.1	0.2	0.5	1.0	2.0	4.0	6.0
2 N.m	0.002	0.004	0.01	0.02	0.04	0.08	0.12
10 N.m	0.01	0.02	0.05	0.1	0.2	0.4	0.6
20 N.m	0.02	0.04	0.1	0.2	0.4	0.8	1.2
50 N.m	0.05	0.1	0.25	0.5	1.0	2.0	3.0
100 N.m	0.1	0.2	0.5	1.0	2.0	4.0	6.0
200 N.m	0.2	0.4	1.0	2.0	4.0	8.0	12.0
500 N.m	0.5	1.0	2.5	5.0	10.0	20.0	30.0
1000 N.m	1.0	2.0	5.0	10.0	20.0	40.0	60.0
2000 N.m	2.0	4.0	10.0	20.0	40.0	80.0	120.0
TIME FOR 100% OF WRENCH (SECONDS)	1000	500	200	100	50	25	16.6

In general:-

$$\text{Rate setting (N.m/Sec)} = \text{Wrench Setting (N.m)} \times \frac{\% \text{ Per Second}}{100}$$

The system is designed for rate settings between 0.1% and 6% per second of wrench setting.

NOTE : DO NOT USE RATE SETTINGS OUT SIDE THESE LIMITS.
 If set **too slowly** the motor may stop, so not giving a smooth application of torque.
 If set **too fast** the motor may not be able to keep up with the set ramp, the system is then out of control and hence unreliable.

See Appendix B for examples.

APPENDIX B - EXAMPLES OF RATE CONTROLLER SETTINGS

1. 50 N.m Wrench Setting.

Rate 1, "Fast Rate" at 6% of wrench setting per second using rate chart.

Rate 1 setting = 3.0 N.m/Sec

Rate 2, "Slow Rate" at 0.5% of wrench setting per second using rate chart.

Rate 2 setting = 0.25 N.m/Sec

Changeover at 80%

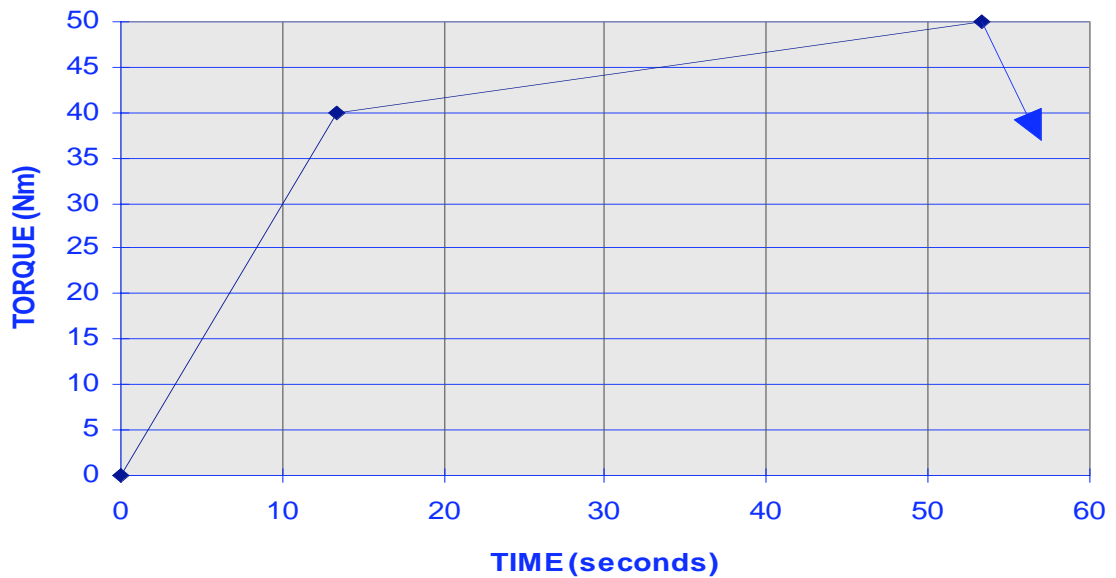


Fig 9 Wrench Setting Example 1.

Operation:- 0 N.m to 40 N.m at 6% per second, taking 80% of 16.6 seconds = 13.3 seconds

40 N.m to 50 N.m at 0.5% per second, taking 20% of 200 seconds = 40 seconds

Torque up time = 53.3 seconds

2. 1000 N.m Wrench Setting

Rate 1, at 5% of wrench setting per second = 50 N.m/Sec

Rate 2, at 1% of wrench setting per second = 10.0 N.m/Sec

Changeover at 90%

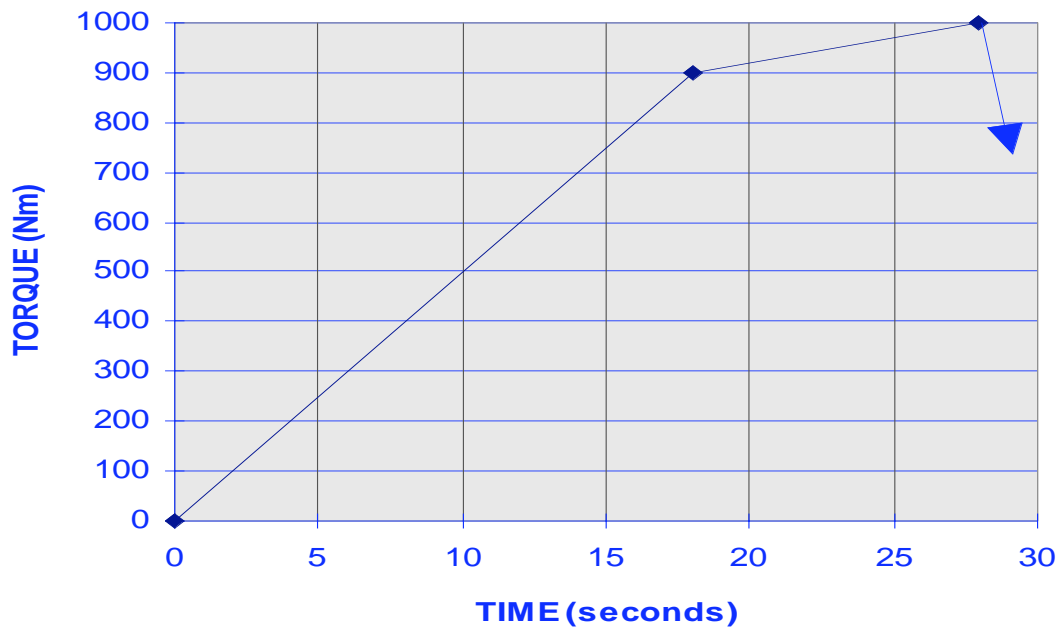


Fig 10 Wrench Setting Example 2.

Operation: 0 N.m to 900 N.m at 5% takes 90% of 20 seconds = 18 seconds

900 N.m to 1000 N.m at 1% takes 10% of 100 seconds = 10 seconds

Torque up time = 28 seconds

APPENDIX C - OPTIONAL EXTRAS

Rate Controller Programmable Cycle Tester (Model No. 60115) _____

This is an option on the existing rate controller, its main features are :-

1. Housed in matching case to rate controller.
2. Fully compatible with Norbar Rate Controller System.
3. Programmable digital cycle counter.
4. Cycle test from 2 to 999,999 times.
5. Circuitry to detect when no torque is seen, a fault situation.
6. Wrench break pass band function to detect faulty wrenches.
7. Batch totalizer for counting batches of cycles performed.

Small Reaction Plate (Part No. 20502.59) _____

This option, for the ISO 2000 range, allows wrenches as small as 125mm long to be tested.

APPENDIX D - TROUBLE SHOOTING

1. **System will not start.**
Check all fuses, ensure all necessary switches are on and the correct supply voltage is used.
2. **Start button inoperative.**
Torque may be present on the system. Remove torque and re-zero ETS exactly.
3. **System stops before torque is detected.**
This happens after approximately 20 seconds and is a safety feature.
4. **System continues to reverse off at end of cycle.**
Zero shift may have taken place on the transducer. Re zero ETS.
5. **System goes into overload and stops.**
 - a) Ensure rate controller instrument is in run mode.
 - b) Ensure ETS is in auto reset mode.
 - c) Wrench click has not been detected, this could be due to a faulty wrench, the auto reset trigger level set incorrectly or the rate of torque application is too fast, slow rate down.
6. **Recalibration of system.**
If there is any doubt concerning the functionality or accuracy of the Rate Controller System, it should be returned to Norbar or an appointed agent for repair/recalibration.