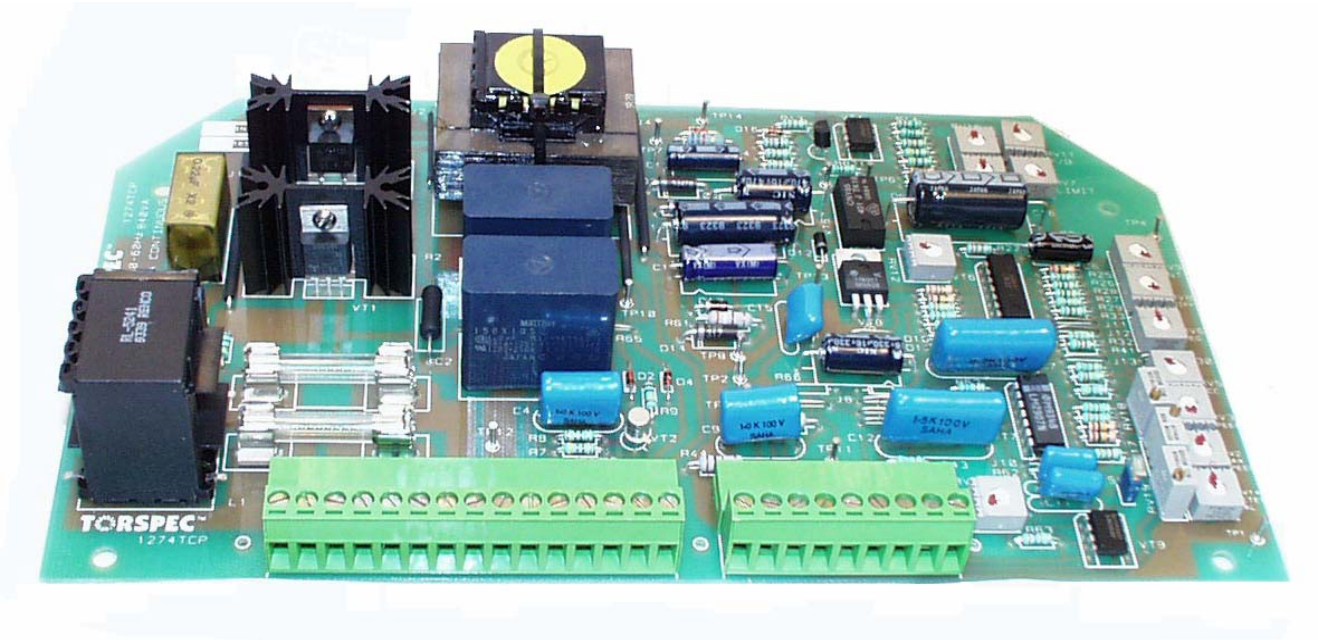
TORSPEC™



INSTALLATION AND CONFIGURATION MANUAL

1274TCP SPEED CONTROLLER

WARNING

Disconnect all incoming power before working on this equipment.
Follow power lockout procedures.
Use extreme caution around electrical equipment.
Do not touch the circuit board while power is applied.

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Manufacturers & Suppliers of World Class Quality Variable Speed Drives & Controls

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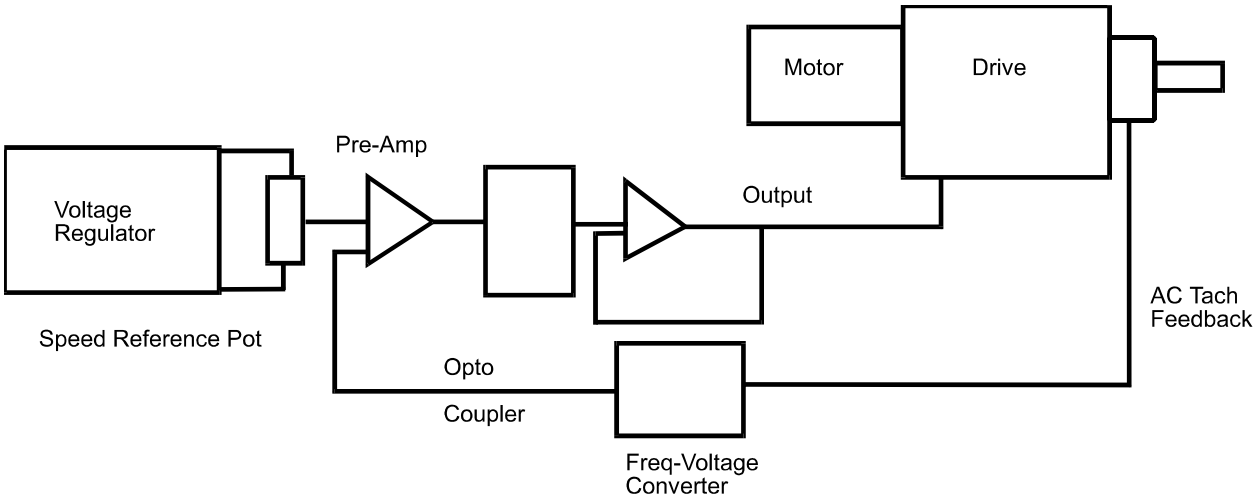
SYSTEM DESCRIPTION

The 1274TCP drive panel is a solid-state controller, which has been well proven in the industry and is used to control speed on the TORSPEC drive. The 16 pre-set controls have been factory adjusted to give a nominal performance so the system may operate satisfactory without adjustment. However, instructions are provided so that optimum performance may be obtained with further fine-tuning. The function of these controls will be described later.

SCHEMATIC SYSTEM DESCRIPTION



The TORSPEC drive coil is driven from a full wave thyristor output stage, which incorporates current feedback. This output state is driven from an error voltage via a pre-amplifier employing operational amplifiers, which has variable gain, integral and differential action. In addition, there is an optical coupler between the output stage and the control circuitry to provide isolation.

The error voltage is the difference between a reference voltage and feedback voltage, which is proportional to the TORSPEC drive's output shaft speed. Thus variable speed control is achieved by varying the reference voltage. To minimize errors the reference is derived from a voltage regulator, while the feedback voltage is produced from the frequency developed by a sinusoidal tacho generator and via a digital to analog converter.

CONSTRUCTION

All of the components are mounted on the front of a double-sided epoxy glass printed circuit card, each component identified by a component code. The board is a hybrid construction of through hole and surface mount components for high reliability and ease of service. Termination is through a quick connect terminal strip with captive screws and retractable wire pressure plates.

CONTROLLER PHYSICAL DETAILS

Size: 9.45" long x 5.31: high x 1.57" deep
Weight: 1 lb.

Permissible temperature is 0-160°F local ambient around the controller providing. The 160°F local ambient is equivalent to 122°F outside ambient when the controller is mounted in a small NEMA 12 enclosure.

SPECIFICATIONS

Inputs

Supply Voltage:	220 - 240 Volt ± 6%
Supply Frequency:	50 to 60 HZ
Tach Signal Frequency:	12 to 720 HZ
Tach Signal Voltage:	Proportional to tach frequency
	30 to 60V at 700 HZ
Torque Limit:	Controlled by RV7 on the board

Outputs

Maximum Nominal Output:	90 VDC
Maximum Current:	5 ADC
Reference Signal Load:	16 mADC (625 ohm)
Speed Output Signal:	0 to 1 VDC

Abbreviations

ADC = Amps direct current	AAC = Amps alternating current
HZ = Hertz	mADC = Milli-amps direct current
VAC = Volts alternating current	VDC = Volts direct current

PERFORMANCE

1. Speed control range is down to 20 RPM, or as dictated by the drive selected, see drive technical data sheet for speed range.

2. Response to supply variation is 1 % for 6 % fluctuation.

3. Regulation is defined as the ability of the system to maintain a set speed when the applied load is decreased or increased. The regulation accuracy is a function of the setting of regulation, integral, and differential control pots. These are set at the factory to give a good performance against most normal applications. With a factory setting of 90 Volt output to the coil, a change of 1 Volt would give a speed change of 0.085% at 3300 RPM. Where tighter regulation is required, the control can be further adjusted in the field against actual dynamic conditions.

4. Speed stability is ± 1 RPM over the speed range.

5. Linearity of speed against reference signal is less than 0.5% error of maximum speed.

6. Linearity of speed against speed control potentiometer rotation is dependent upon the type and make of potentiometer supplied. However, typical figures are:

a) Single turn pot

Sensitivity	2 Pole	9 RPM per degree rotation
	4 Pole	4.5 RPM per degree rotation
Resolution	2 Pole	5 RPM per degree rotation
	4 Pole	2.5 RPM per degree rotation
Linearity	± 4%	

b) 10 Turn Pot

Sensitivity	2 Pole	0.67 RPM per degree rotation
	4 Pole	0.33 RPM per degree rotation
Resolution	2 Pole	0.6 RPM per degree rotation
	4 Pole	0.3 RPM per degree rotation
Linearity	± 0.25%	

7. Repeatability is the ability of the system to return to the original set speed after this speed has been changed. The systems will revert to within ± 1 RPM providing load, temperature and supply voltage remains constant.

8. Long term drift due to tacho generator temperature change - since the feedback signal is digital, there is no drift.

9. Reference voltage at terminal A10 and A12 is 12 VDC ± 5% for a 12% supply change.

10. Supply transient protection is provided by an input filter and a surge suppressor.

11. Factory preset controls, the 16 internal board mounted pots have the following functions:

    RV2 - Is the Max Speed fine calibration pot with a range of +/- 90RPM at 2700 RPM.

    RV3 - Is the Min Speed fine calibration pot with a range of +/- 15 RPM.

    RV5 - Acceleration, factory set fully clockwise for fastest acceleration.

    RV6 - Gain, factory set mid-point, is used to reduce speed reduction as load increases.

    RV7 - Torque limit, set fully clockwise for maximum torque.

    RV8 - Differential, set 1/3 clockwise. Clockwise rotation improves stability and minimizes overshoots and undershoots. CCW increases speed change with load change, increases min/max speed settings.

    RV9 - Integral, set 1/3 clockwise. Clockwise rotation reduces system response and improves stability. Affects min/max speed settings.

    RV11 - Current feedback, set fully clockwise.

    RV12 - Factory preset, do not adjust.

    RV13 - 10V supply adjust at terminal A14, do not adjust.

    RV14 - 1V fine adjust pot proportional to drive speed. Adjustment range of +/- 20mv at 3000 RPM.

    RV15 - Regulation compensation, controls RPM compensation for load increases.

    RV16 - Regulation compensation rate, controls speed of regulation compensation.

    RV17 - Maximum speed coarse adjust, CCW to increase speed.

    RV18 - Minimum speed coarse adjust, CW to increase speed.

    RV19 - 1V coarse pot, factory set for 1V, represents 1800 RPM drive speed.

12. Input Signal

    0 to 10 VDC at terminals A11 and A12.

13. Output Signal

    0 to 1 VDC at terminals A12 (-) and A13 (+) proportional to speed:
    1V at 1500 RPM, 4 Pole Setting
    1V at 3000 RPM, 2 Pole Setting

WARNINGS

1. Provision must be made, at an external point, to isolate the supply voltage from the drive controller and motor.
2. Be sure the supply voltage, frequency and current are compatible.
3. The enclosure that the controller is to be fitted into must be grounded.
4. Power supply of 240 (220) Volt is to be connected at A1, A2.
5. ***The supply to the controller must be interlocked with the motor starter in such a way to prevent the control board from being powered up if the motor is not operating.***
6. Please contact our service department if you experience any difficulties that are not covered in this manual.

ADDITIONAL FACILITIES

(a) Transducer Inputs
    For 0 - 10 VDC, connect (-) to A12 and (+) to A11

    For 4 - 20 MADC, connect (-) to A12 and (+) to A16 (jumper to A11)

    The negative signal line maybe grounded.

(b) Terminal A15 is an input for external reference signal such as synchronization, it bypasses the acceleration circuit.

INSTALLATION

Each control has nine pots, which have been factory set to give a nominal performance, so in most cases the control may be installed and operated without further adjustment. However, optimum performance can be achieved with further calibration to match the control wit the dynamic characteristics of the load. See the setting up chart for more details.

If the reference signal and tach feedback wires are run in the same cableway as current-carrying conductors then shielded cable should be used. Please note that only one end of the shield wire is to be grounded; the other end should float.

Connect the system as per the attached sample drawings, ensuring the correct terminals are being used. It is important the connection of the drive tach and coil are correct or damage to the drive will result. A8 and A9 are for the tach, while A3 and A4 are for the coil. At the drive the smaller wires are from the tach, the larger wires are from the main coil.

The speed switch, *SWA should be in the corresponding position for the motor speed, 2 pole for 3600 RPM and 4 Pole for 1800 RPM motors.

*Some models may be equipped with a jumper for SWA, it should be off for the 2-pole position (3600 RPM motors) and on for the 4-pole position (for motors with 1800 RPM or less).

The current feedback must be set to match the drive's main coil amperage. This figure is stamped on the drive's nameplate or the factory can advise. Set the current feedback pot (Rv11) as follows:

- for 1 AMP or less, set fully counter-clockwise
- for 1 to 2 AMP, set midway
- for 2 to 5 AMP, set fully clockwise

Before engaging the drive, ensure the rotation is correct by starting only the AC motor and noting the direction of the fan's rotation. The output direction of the drive will be the same. The direction can be changed by changing phase polarity of any two of the three motor leads. **Ensure power is OFF before attempting this.**

Provision has been made for a remote 0-10VDC reference input on terminals A11 (+) and A12 (-). The 9V calibration is obtained by the pots RV2 and RV17, the 3V calibration is by the pots RV3 and RV18. Factory setting is 2700 and 900 respectively. Clockwise rotation increases the speed.

SETTING UP

All controls are factory preset and the system can be installed and operated with minor adjustments. Optimum performances can be achieved with further fine-tuning.

Apply power to the motor and verify rotation. Power up the control panel and adjust RV18 for zero speed. Turn main speed pot to maximum and set RV17 to match the drive's maximum rated speed. As RV18 and RV17 are inter-active, a repeat of the above may be necessary.

If adjustments of RV6, RV8, RV9, RV15, and RV16 are made, then RV17 and RV18 must be reset.

To calibrate the speed indicator, the drive should be set for maximum speed and RV19 trim pot adjusted to provide the desired reading on the meter scale for full speed.

With completion of these steps the drive is fully operational.

POT	PARAMETER	FACTORY SET	ADJUSTMENT	EFFECT
RV2	Max. speed fine	1/3 CW	CW to increase Speed	Affects min. speed settings
RV3	Min. speed fine	1/3 CW	CW to increase speed	Affects max. speed settings
RV5	Acceleration	Fully CW	CCW to Increase accel. time	
RV6	Gain	Mid-point	CW to decrease speed change with load	Affects RV2, RV3
RV7	Torque	CW	Set for max. torque.	
RV8	Differential	1/3 CW	CW to improve stability	Affects RV2, RV3
RV9	Integral	1/3 CW	CW to reduce response, increase stability	Affects RV2, RV3
RV11	Current feedback	CW	Set to match coil amperage	Affects RV2, RV3
RV14	0 - 1 Volt fine adj.		CW to increase voltage	
RV15	Regulation compensation	Mid-point	CW to increase speed gain with load increase	Affects RV2, RV3
RV17	Max speed coarse	Mid-point	CW to increase speed	Min. Speed
RV18	Min speed coarse	Mid-point	CCW to increase speed	Max. Speed
RV19	0 - 1 Volt coarse adj.	Set for 1V @ 1800 RPM	CW to increase voltage output	

CW = Clockwise Rotation *CCW = Counter-clockwise rotation*

BOARD TERMINAL IDENTIFICATION