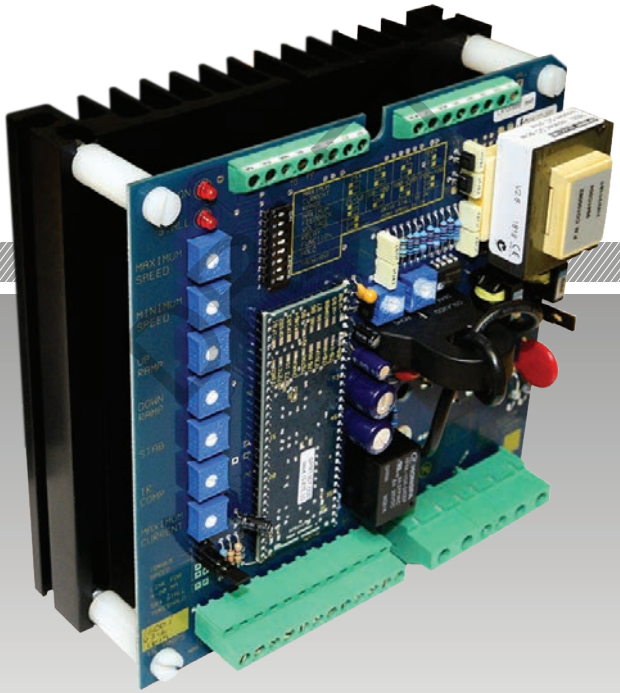
World Class Design | World Class Function | 30 Years Expertise in Industrial Motor Control

DC MOTOR DRIVE

1600i



Bardac drives

Product Manual

HG105411EN02 Issue 1 (11/2023)

Please read this information before installing or using the product.

Install, use and maintain this product following the procedures provided.
The manual(s) cannot provide all details, variations and contingencies required for your installation, operation and maintenance of this product or the apparatus with this product installed. For further help or information, refer to your local Supplier sales office.

Application area

The equipment described is intended for industrial (non-consumer) motor speed control.

Intended users

To safely enable the user to obtain maximum benefit from the equipment:

- Ensure this information is available to all persons required to install, configure or service the described equipment or any other associated operation.
- Always store the manual in a conveniently accessible area for quick reference.
- Make it available for the next user/owner of the product.

This product is of the restricted sales distribution class according to IEC 61800-3 and has a "professional equipment" designation as defined in EN 61000-3-2.

Safety

Ensure all users and operators understand the included WARNINGS, CAUTIONS and NOTES, which alert the user to safety issues. COMPLY WITH WARNINGS AND CAUTIONS AT ALL TIMES. Each of these carries a special meaning and should be read carefully:

WARNING!

A WARNING is given when non-compliance with the warning may result in personal injury and/or equipment damage.

CAUTION!

A CAUTION is given when non-compliance with the caution may result in permanent equipment damage.

NOTE A note provides specific information to make important instructions clear.

Symbols

 **Attention**	 **Electrostatic Discharge (ESD)**	 **Electric Shock Hazard**
See the instructions for use. Specific warnings not found on the label.	This equipment contains ESD sensitive parts. Observe static control precautions when handling, installing and servicing this product.	Disconnect the mains supply before working on the unit. **Do not touch presets, switches and jumpers!** Always use the correct insulated adjustment tools.

WARNING!

Only qualified personnel must install, operate and maintain this equipment.
A qualified person is someone technically competent and familiar with all safety information, established safety practices, installation, operation, maintenance and the hazards involved with this equipment and any associated machinery.

Hazards

This equipment can endanger life through rotating machinery and high voltages.

WARNING!

PERSONAL INJURY AND/OR ELECTRICAL SHOCK HAZARD

- Always isolate all power supplies from the equipment before starting any work.
- Never perform high voltage resistance checks on the wiring without first disconnecting the product from the circuit under test.
- Use guarding and additional safety systems to prevent injury and electric shock.
- Metal parts may reach 90°C during operation.

CAUTION!

EQUIPMENT DAMAGE HAZARD

- We thoroughly test our products. However, before installation and start-up, inspect all equipment for transit damage, loose parts, packing materials, etc.
- Installation must observe the required environmental conditions for safe and reliable operation.
- In a domestic environment, this product may cause radio interference, requiring adequate measures to be taken. Obtain the permission of the supply authority before connecting to the low voltage supply.

General risks

Installation

- Ensure mechanically secure mountings are in use as recommended.
- Ensure cooling airfl ow around the product is as recommended.
- Ensure cables/wire terminations are as recommended and are torqued correctly.
- Ensure the product rating is correct - do not exceed the rating.

Application risk

Electromechanical safety is the responsibility of the user. The integration of this product into other apparatus or systems is not the manufacturer's or distributor of the product's responsibility. It is the user's responsibility to ensure the compliance of the installation with any regulations in force.

Health and safety at work

Electrical devices can constitute a safety hazard. Thorough personnel training is an aid to SAFETY and productivity. SAFETY awareness not only reduces the risk of accidents and injuries in your plant but also has a direct impact on improving product quality and costs. If you have any doubts about the SAFETY of your system or process, consult an expert immediately. Do not proceed without doing so. If in doubt, refer to the Supplier.

Weight

Consideration should be given to the weight of our heavier products when handling.

Risk assessment

Under fault conditions or conditions not intended: the motor speed may be incorrect; the motor speed may be excessive; the direction of rotation may be incorrect; the motor may be energised.

In all situations, the user should provide sufficient guarding and/or additional redundant monitoring and safety systems to prevent risk of injury.

NOTE: During a power loss event, the product will commence a sequenced shut-down procedure. Therefore, the system designer must provide suitable protection for this case.

Maintenance

Only qualified personnel should maintain and effect repair using only the recommended spares, alternatively return the equipment to the factory for repair. The use of unapproved parts may create a hazard and risk of injury.

WARNING!

PERSONAL INJURY AND/OR EQUIPMENT DAMAGE HAZARD

When replacing a product, all user-defined parameters that define the product's operation must be installed correctly before returning to use. Failure to do so may create a hazard and risk of injury.

The packaging is inflammable and incorrect disposal may lead to the generation of lethal toxic fumes.

Repairs

Repair reports can only be given if the user makes sufficient and accurate defect reporting. Remember that the product without the required precautions can represent an electrical hazard and risk of injury, and that rotating machinery is a mechanical hazard.

Protective insulation

Isolated product

WARNING!

The drive and motor must be connected to an appropriate safety ground. Failure to do so presents an electrical shock hazard. Exposed metal work in this equipment is protected by basic insulation and bonding to a safety ground.

This product is classified as a component and must be used in a suitable enclosure.

1. This is achieved through basic insulation and protective grounding, or double-insulation to provide SELV Control Circuits.
2. This protection allows a safe connection to other low voltage equipment.
3. **Ground bonding is the responsibility of the installer.**

Contents

1 Introduction

APPLICATION AREA: Industrial (non-consumer) "Motor speed control utilising DC Motors".

DRIVE MODEL	AC SUPPLY VOLTAGE	NOMINAL OUTPUT VOLTAGE	MAXIMUM CURRENT	PRODUCT DISSIPATION at full current	ISOLATION
1600iLV60	60/30	48/24	16 A	50 W	isolated
1600i	240/110	180/90	16 A	50 W	isolated

The 1600i is designed for operation Line-to-Neutral (240 Vac nominal or 110 Vac 50/60 Hz with optional 60 Vac/30 Vac).

- Models are of open-chassis construction for use in a suitable electrical enclosure.
- The drive has isolated control electronics.
- Closed loop control of both armature current and voltage for precise control of motor torque and speed.
- Motor and drive are protected by a stall timer to automatically remove power after 30 seconds if the required speed cannot be achieved.
- Up to 150% of the preset maximum current for up to 30 seconds allowing for high, short-term torques during acceleration etc.
- Independent control of either the current or speed loops by external inputs allow for torque or speed control applications with overspeed or overcurrent protection.
- Speed demand signal can be derived from a customer provided external potentiometer, 0-10 V signal or 4-20 mA loop.
- Speed feed back signal selection: ARMATURE VOLTAGE, or shaft-mounted DC Tachometer.

Input and outputs	+aux input	speed output	+24 V unregulated output
	-aux input	current output	+12 V regulated output
	current input	ramp output	+10 V precision reference
	4-20 mA input	demand output	-12 V regulated output
	0 to 10 V input	zero/stall relay	-24 V unregulated output
Adjustable parameters	Max speed	Up ramp	Max current
	Min speed	Down ramp	IR comp
			Stability
Switched functions	Max current range	Max feedback	Tach feedback
	Relay function	Power up hold	AV feedback
Jumper functions	Torque mode	Dual supply voltage	Phase angle limit
	Zero reference interlock	4-20 mA input	50% stall threshold
Performance features	Dual loop control	Precision tach rectifier	System inputs/ outputs
	Relay driver outputs	Compact design	

2 Installation

WARNING!

ELECTRIC SHOCK HAZARD

Disconnect the mains supply before working on the unit. DO NOT TOUCH PRESETS, SWITCHES AND JUMPERS! Always use the correct insulated adjustment tools.

2.1 Motor installation

- Ensure accurate alignment of the motor shaft and couplings.
- Do not hammer pulleys or couplings onto the motor shaft.
- Protect the motor from ingress of foreign matter during installation and operation.

Grounding: Connect the motor to the system enclosure ground.

2.2 Drive Installation

Requirements during installation and operation:

- Optimize the heatsink airflow.
- Avoid vibration.
- Protect the drive from pollutants.
- Ambient operating temperature must be within 14ºF and 104ºF (-10ºC and +40ºC). To comply with UL requirements, the temperature of the surrounding air must not exceed 122ºF (50ºC).

POWER CABLING: Use correctly rated cable: minimum 600 Vac, 2 x armature current.

CONTROL SIGNALS: The 1600i has isolated control terminals and as such may be connected to other systems. Avoid running signal cables close to power cables.

SUPPLY: Please ensure that the supply selection jumper on the drive matches the incoming supply. Failure to do this may result in permanent damage to the drive unit and will invalidate any warranty.

FUSING: The drive MUST BE FUSED EXTERNALLY with semiconductor fuses that MUST be rated at 1.75 x armature current, and have an A^2s rating lower than the I^2t value shown. **Any warranty will be invalid if this fusing is incorrect.**

Recommended Fuse Kit		
Current	Clearing I^2t	Fuse Kit Model # Includes 2x30A Fuse + Fuse Holder
30 A	350 A^2s	F2-30

SUPPRESSION: The drives have excellent noise immunity. However, installations involving electrical welding or RF induction heating may require further filters on the line and armature terminals. Contactor coils and sparking contacts may also require suppression. A 100 Ω resistor in series with a 0.1 µF capacitor is usually adequate in these situations. Refer to page 5 for EMC guidelines.

CAUTION!

EQUIPMENT DAMAGE HAZARD

Reversing systems: do not transpose the armature connections until the motor has stopped, otherwise damage will occur.

CAUTION!

EQUIPMENT DAMAGE HAZARD

For frequent stopping or jogging, it is not good practice to rely on switching the supply off and on to stop and start with the run contact permanently closed. This may result in an uncontrolled current pulse for one half mains cycle under certain conditions, e.g. main contact bounce. This could lead to undesired motor movement or device damage.

In rapid start-stop systems, use a spare normally-open contact on the main supply contactor in series with T7 (RUN) and any other applicable contacts.

2.3.1 Terminal tightening torques

Terminal	Tightening torque	Maximum cable cross-section
T1-12	0.5 Nm (4.5 lbf.in)	12 AWG solid, 14 AWG stranded
T13-18	0.8 Nm (7 lbf.in)	16 AWG solid, 12 AWG stranded
T51-58, 61-68	0.5 Nm (4.5 lbf.in)	16 AWG solid, 17 AWG stranded
Ground screw	3.9 Nm (35 lbf.in)	Same cross-section as incomer

2.3 Mechanical dimensions

The unit must have a substantial ground in compliance with local standards and codes. Connect the ground to the heatsink ground screw provided using a star washer to obtain optimum ground continuity.

Recommended mounting bolts:

M5 x 35 mm

(approximately 10/32 X 1.5")

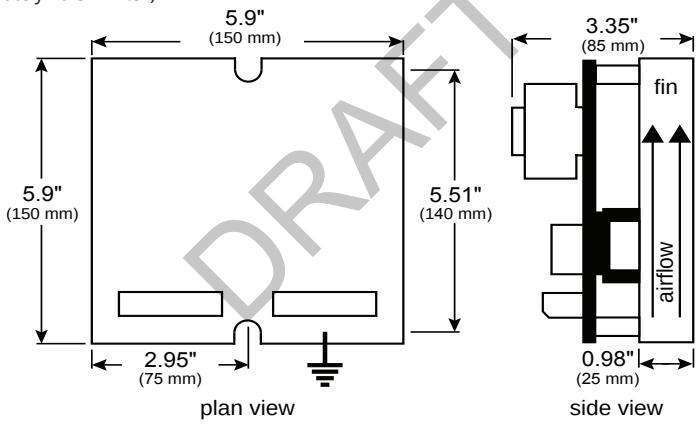


Figure 1 Mechanical dimensions

2.4 Guide for systems used in the EU

Special consideration must be given to installations in member states of the European Union regarding noise suppression and immunity. According to IEC 1800-3 (EN61800-3) the drive units are classified as complex components only for professional assemblers, with no CE marking for EMC.

The drive manufacturer is responsible for the provision of installation guidelines. The resulting EMC behavior is the responsibility of the manufacturer of the system or installation. The units are subject to the LOW VOLTAGE DIRECTIVE 73/23/EEC and are CE marked accordingly.

Following the procedures outlined below will normally be required for the drive system to comply with the European regulations, some systems may require different measures. Installers must have a level of technical competence to correctly install. Although the drive unit itself is not subject to the EMC directive, considerable development work has been undertaken to ensure that the noise emissions and immunity are optimized.

* EN61800-3 specifies two alternative operating environments. These are the Domestic (1st environment) and Industrial (2nd environment). There are no limits specified for conducted or radiated emissions in the industrial environment, hence it is usual for the AC supply filter to be omitted in Industrial systems.

  Definition of an industrial environment: all establishments, other than those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes.

2.5 Multiple drives

The arrangement shown below is for multiple drives with one filter, showing the star point grounding method.

The filter should be rated for the worst case total armature current load. The drive units are designed to function normally on unfiltered AC supplies shared with other thyristor DC drives. **(Not AC drives)**.

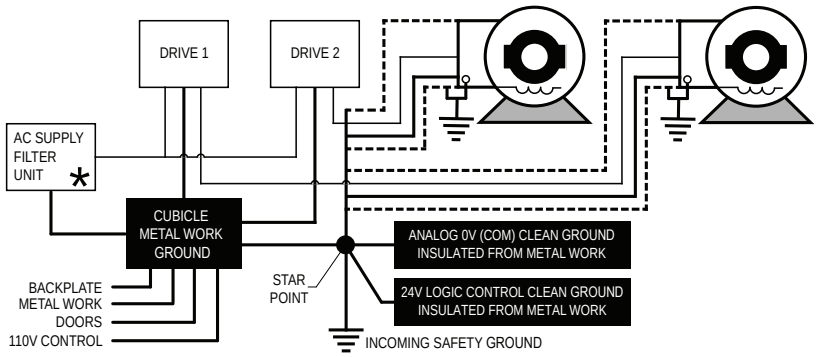


Figure 2 Star point connections for multiple drives

2.6 Requirements for EMC compliance

- Keep parallel runs of power and control cables at least 1 foot apart. Cross-overs must be at right angles.
- Keep sensitive components at least 1 foot from the drive and power supply cables.
- The AC connections from the filter to the drive must be less than 1 foot or, if longer, correctly screened.
- Do not run filtered and unfiltered AC supply cables together.
- Control signals must be filtered or suppressed, e.g. control relay coils and current carrying contacts. The drive module has built-in filters on signal outputs.
- The AC supply filter must have a good ground connection to the enclosure back plane. Take care with painted metal to ensure good conductivity.
- The AC input filter has ground leakage currents. Ground RCD devices may need to be set at 5% of rated current.
- The metal enclosure will be RF ground. The AC filter, drive ground and motor cable screen should connect directly to the metal cabinet for best performance.
- Linear control signal cables must be screened, with the screen grounded at the drive end only. Minimize the length of screen stripped back and connect it to an analog ground point.
- **(1)** The motor cable must be screened or armored with 360 degree screen terminations to ground at each end. The cable must have an internal ground cable and the screen must extend into the enclosure and motor terminal box to form a Faraday cage without gaps.
- **(2)** The internal ground cable must be grounded at each end. The incoming ground must be effective at RF. **WARNING! The ground safety must always take precedence.**

WARNING!
ELECTRIC SHOCK HAZARD

AC supply filters must not be used on supplies that are unbalanced or float with respect to ground.

The drive and AC filter must only be used with a permanent ground connection. No plugs/sockets are allowed in the AC supply.

The AC supply filter contains high voltage capacitors and should not be touched for a period of at least 20 seconds after the removal of the AC supply.

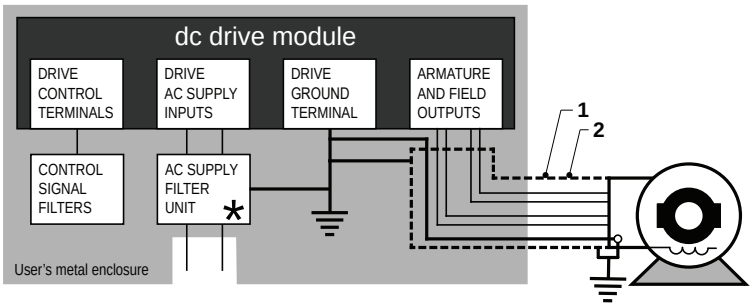


Figure 3 Connections for EMC compliance

2.7 Typical applications

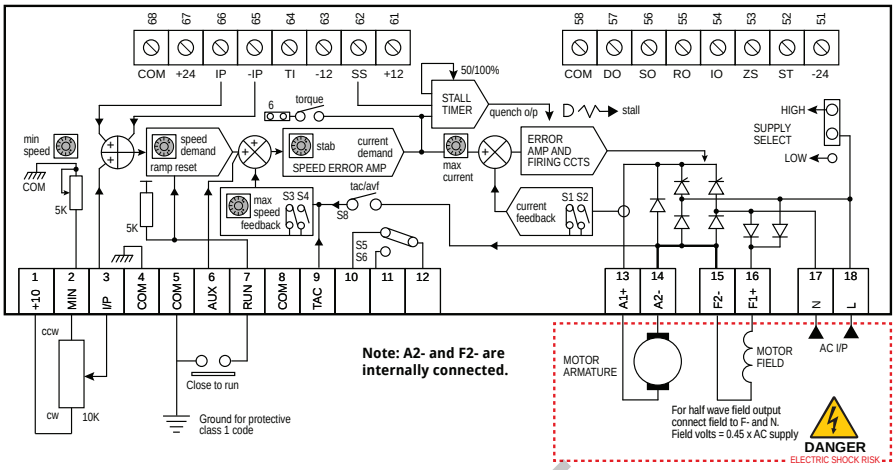


Figure 4 Basic connection

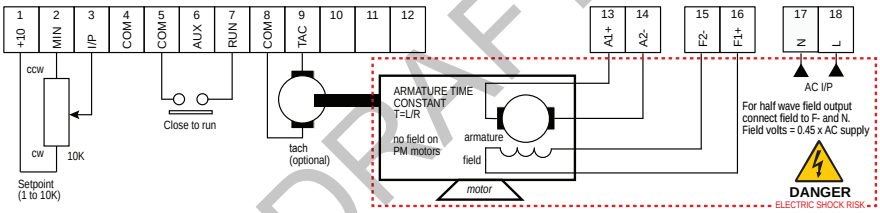


Figure 5 Basic connection with optional tach

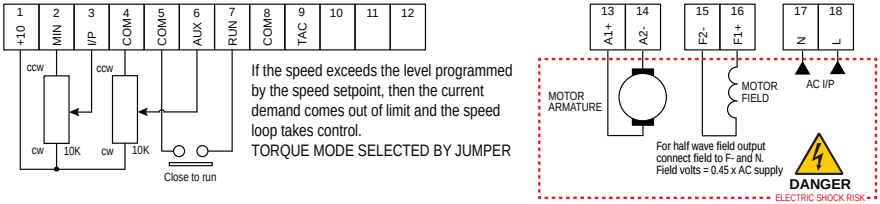


Figure 6 Torque control with overspeed limiting by separate setpoint

BARDAC CORPORATION does not accept any liability whatsoever for the installation, fitness for purpose or application of its products. It is the users responsibility to ensure that the unit is correctly used and installed.

Health and Safety at Work
Devices constitute a safety hazard. It is the responsibility of the user to ensure compliance with any Acts or By-Laws in force. **ONLY skilled persons should install this equipment.**

2.8 Block diagram and terminal specifications

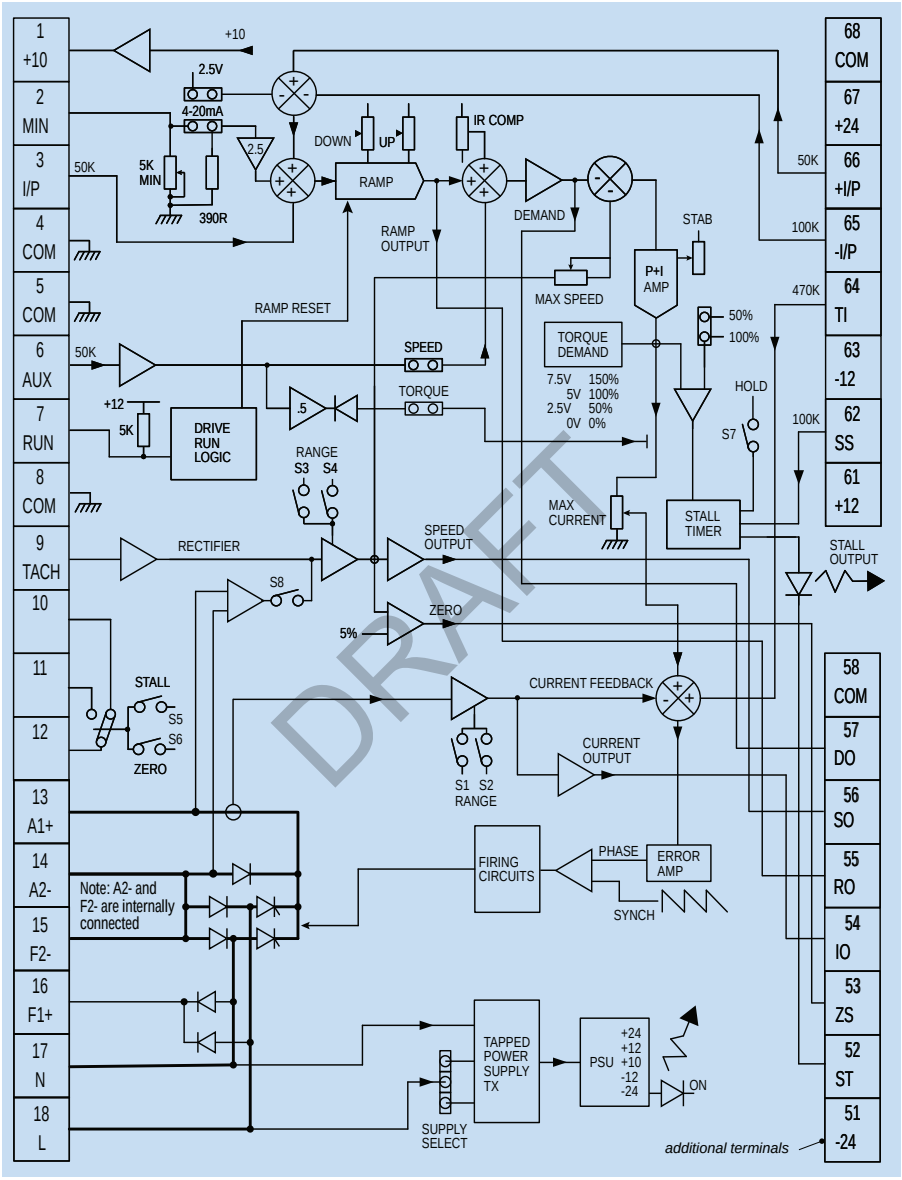


Figure 7 Block diagram

1	+10 V precision reference. 10 mA maximum. Short-circuit proof
2	Minimum end of setpoint potentiometer or 4-20 mA current loop I/P
3	Speed demand input, 0-+10 V for 0-100% speed
4	Common - 4-20 mA return
5	Common - connect to ground for protective Class 1
6	Auxiliary input - on-board jumper selects direct speed or torque mode (0-10 V for 0-100% control)
7	Connect to COMMON to run 60 ms ON / 20 ms OFF (WARNING: Run is an electronic inhibit function. The field remains energised and all power terminals remain "live". RUN must not be relied upon during hazardous operations)
8	Common - internally connected to T4, T5, T58, T68
9	Tach input 25-400 V full scale, + or - polarity
10	Relay contact, normally-closed
11	Relay contact, normally-open
12	Relay pole
13	(A1+) armature output
14	(A2-) armature output
15	(F2-) field output
16	(F1+) field output
17	(N) AC supply input according to supply select jumper
18	(L) AC supply input according to supply select jumper

Relay contact rating: 1 A, 240 Vac
RATINGS ACCORDING TO CSA:
voltage rating of relay terminals 10/11/12 must not exceed 30 Vac or 42.4 Vdc

Additional terminals

68	Drive common
67	+24 V output, 25 mA maximum - **do not short**
66	Auxiliary speed input, 0 to +10 V for 0-100% ramped speed
65	Auxiliary inverting speed input, 0 to -10 V for 0-100% ramped speed
64	Input to current loop, 0-5 V for 100% current
63	-12 V output 10 mA maximum - **do not short**
62	Stop/start input: close to -12 V to activate stall condition close to +12 V to release stall condition
61	+12 V output, 10 mA maximum - **do not short**
58	Drive common
57	Speed demand output 0 to -10 V represents 0-100% demand (output impedance 1 kΩ)
56	Speed output - typically 7.5 V full scale. Adjustment of maximum speed preset will alter the full scale reading from 4 V (counter-clockwise) to 9 V (clockwise)
55	Setpoint ramp output, 0-10 V, impedance 1 kΩ
54	Current output, 0-5 V for 0-100% of chosen range (S1, S2), 1 kΩ impedance
53	Zero speed relay driver output, maximum 100 mA, switches to -24 V
52	Stall relay driver output, maximum 100 mA, switches to -24 V
51	-24 V relay supply, 25 mA - **do not short**

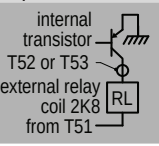


Figure 8 Terminal specifications

3 Commissioning

3.1 Initial settings - without power

The suggested Commissioning strategy is to start in the safest possible mode of operation and progressively exercise each element of the system until full functionality has been achieved.

For this reason, all drive units are shipped to run using:

- the highest supply option
- a nominal speed
- ARMATURE VOLTAGE feedback mode - **we recommend that initial commissioning is carried out in Armature Voltage feedback mode**
- the lowest current range.

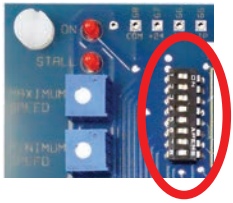
1. **To avoid damage, ensure the drive's supply selection jumper matches the incoming ac supply: 240 Vac or 110 Vac, (60 Vac or 30 Vac for LV60 models).**

Supply selection		
Drive model	HIGH position	LOW position
1600i	240 V	110 V
1600iLV60	60 V	30 V

2. Ensure switch S8 is set to ON, selecting AVF.

Refer also to "Figure 9 User adjustments" on page 11 for the following switch selections:

3. Use switches S1 and S2 to select a suitable current range.



1600i : current ranges			
S1	**S2**	**Min.**	**Max.**
OFF	OFF	0 A	4 A
ON	OFF	0 A	8 A
OFF	ON	0 A	12 A
ON	ON	0 A	16 A

4. Use switches S3 and S4 to select a range suitable for the armature voltage at full speed. For example, if the armature voltage is 180 V, then set S3:OFF and S4:ON for 100 to 200 V voltage feedback.

5. For an intial start, adjust the following presets:

MIN SPEED	Fully counter-clockwise
UP RAMP	Fully counter-clockwise
DOWN RAMP	Fully counter-clockwise
STABILITY	Mid-way
IR COMP	Fully counter-clockwise
MAX CURRENT	Set MAX CURRENT from your motor rating plate. Rotating clockwise gives 0-100% of the drive current rating as set by switches S1/S2, e.g. if S1/S2 are set to limit the current to 8 A, 50% rotation will give a 4 A current limit.

6. If a DC tachometer is fitted, disconnect the tach wire from terminal T9 and insulate.

3.2 Pre-operation motor check list

With no power applied, complete the following check list:

- Check for the correct insulation between all motor windings and ground (disconnect all drive cables before testing).
- Check inside the motor connection box for foreign objects, damaged terminals etc.
- Check that motor brushes are in good condition, correctly seated and free to move in brush boxes.
- Check for the correct action of brush springs.
- Check that motor vents are free of any obstruction or protective covers.

3.3 Operating the drive

1. Note the armature voltage rating given on the motor rating plate.
2. **Apply mains power to the unit.** The ON lamp will light.
3. Close the RUN contact.
4. Gradually increase the external setpoint to start the motor rotating. If the direction is wrong, TURN OFF THE POWER, WAIT FOR THE MOTOR TO STOP TURNING and swap over the cables connected to terminals A1+ (T13) and A2- (T14).
5. **MAX SPEED**: Increase the external setpoint further to ramp up to full speed. Fine adjust using the MAX SPEED preset to achieve the armature voltage stated on the motor rating plate.
6. Reduce the external setpoint to ramp the drive to zero. The motor will stop rotating.
7. **MIN SPEED**: Adjust MIN SPEED to provide a speed preset. (Not available if set for 4-20mA)
8. **RAMP UP/RAMP DOWN**: Run the motor up and down while adjusting the RAMP UP and RAMP DOWN potentiometers.
9. **STABILITY**: Adjust the STAB potentiometer to improve response. Clockwise rotation gives a faster response. (Excessive rotation in either direction may lead to instability, depending on load.)
10. **IR COMP**: Speed droop on heavy loads may occur where armature voltage feedback is used. Compensate for this by clockwise adjustment of the IR comp preset. Excessive rotation may lead to instability.

The drive is now commissioned for use in Armature Voltage feedback.

WARNING!

When power is applied to the drive,
ALWAYS use an insulated tool when adjusting the presets.

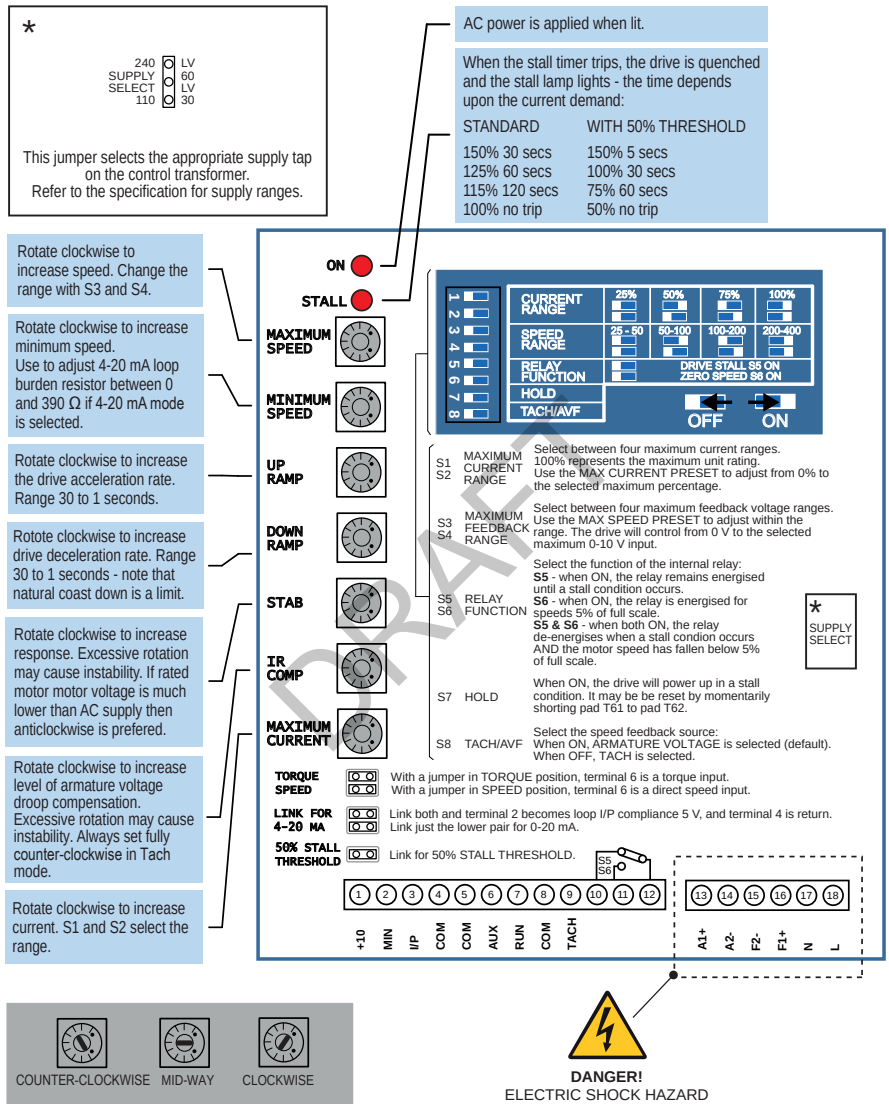


Figure 9 User adjustments

4 Options

Consider the following changes to tune/improve the performance of the drive/system.

- **SPEED FEEDBACK SELECTION** If the system is to use **Tach** feedback you can now adjust for the DC tachometer's output voltage, and hence the speed of the motor.

WARNING!
PERSONAL INJURY HAZARD
Terminals A1+, A2-, F1+, F2-, N & L are at high potential.
Do not touch the terminals or any connected conductor.

NOTE: IR COMP must NOT be used with Tach feedback - set the potentiometer fully counter-clockwise.

a. With the power off, connect the DC tachometer's output voltage to Terminal 9. Set the **Tach/AVF** switch S8 to OFF (left).

   Calculate the output voltage from the DC tachometer:

   For example, if quoted as "100 V per 1000 revs/min" then feedback voltage = (motor speed/1000) x 100 V

   Alternatively, it can be estimated as follows:

   1. Whilst still in AVF mode and running at 100% speed, measure the tach volts on the wire intended for connection to Terminal 9 - **WARNING: possible high voltage.** Note this voltage, **stop the motor and turn off the supply.**
   2. Set the **Tach/AVF** switch S8 to OFF (left) to disconnect AVF and then reconnect the tach wire to Terminal 9.

b. Reset switches S3 and S4 to a suitable range for the measured/calculated Tach voltage.

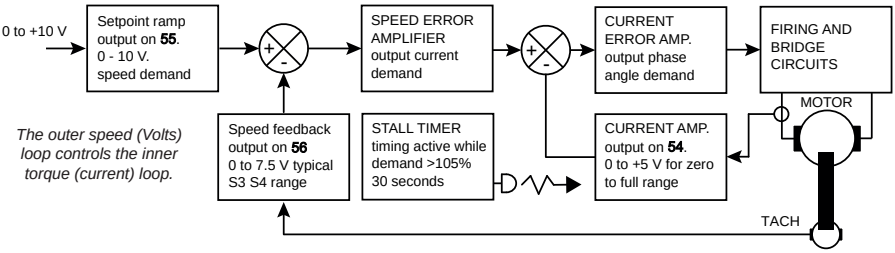
c. Run the drive using a low to middle speed setpoint.

d. Adjust the **MAX SPEED** preset to achieve the required shaft speed at maximum speed setpoint.

- **TORQUE CONTROL MODE**: Set the TORQUE/SPEED jumper to the TORQUE position, and Terminal 6 will provide a CURRENT/TORQUE LIMIT to the drive output, 0 to +10 V being 0 to 100% current. The current is only limited if the speed demand exceeds the speed feedback. The STALL timer is not affected as the torque demand cannot exceed 100%.
- **4 to 20 mA SETPOINT**: Use a 4 to 20 mA current source to provide a speed setpoint by fitting the two links described in "Figure 9 User adjustments" on page 11. Apply 20 mA to terminal 2 and adjust the MINIMUM SPEED potentiometer to achieve 5 V on terminal 2. The drive will operate from 0 to 100% speed for a 4 to 20 mA input. If a 0 to 20 mA current source is preferred, only fit the top link and set the voltage on terminal 2 to 4 V.

5 Trouble shooting

The drive consists of two highly accurate feedback control loops.



1 STALL problems, indicated by the STALL lamp coming on after running, are caused by the drive unit not able to give set speed.

Typical STALL reasons:

a. MAX CURRENT preset not correctly set, hence insufficient torque.

b. Motor not powerful enough for application. Speed calibration set beyond capability of supply.

c. Any factor which prevents motor from rotating at set speed, e.g. jammed load; low supply voltage.

2 Pot wired with T2 and T1 transposed. motor slows down instead of speeding up.

3 Pot wired with T2 and T3 transposed. Motor slows down for clockwise rotation. T1 may be shorted to T2.

4 Pot wired with T1 and T3 transposed. Motor slows down for counter-clockwise rotation. T1 becomes shorted to T2.

5 Loose or intermittent tach coupling causes instability or overspeeding. make sure coupling is secure and non-elastic.

6 Incorrect feedback scaling causes overspeeding. Calculate the desired maximum tach Volts - adjust S3, S4.

7 Tach failure. Until a replacement is obtained, change to ARMATURE VOLTAGE feedback, S8. Rescale with S3, S4.

8 Armature resistance should normally be a few Ohms. The armature time constant must be greater than 10 milliseconds.

9 Shorted turn on motor armature can cause power device failure. Check resistance through 360º rotation.

10 Brushes should be in good condition, correctly seated, and free to move in brush boxes.

11 Field resistance should normally be a few hundred Ohms. The field must be isolated from ground and the armature.

12 Do not open circuit field with power applied. Do not open circuit armature unless RUN is opened first and the motor is at rest.

13 The AC supply must lie within the limits specified on page 14. Ensure the selection jumper is correct.

6 Specifications

Detail	Specification				Comments
Function					
CONTROL ACTION	DUAL LOOP PROPORTIONAL + INTEGRAL				
FEEDBACK METHOD	ARMATURE VOLTS			DC TACHOMETER	SWITCH SELECTABLE
0-100% REGULATION	2% TYPICAL			0.1% TYPICAL	BEWARE MOTOR HEAT AT LOW SPEED
MAX TORQUE SPEED RANGE	20 : 1			100 : 1	
OVERLOAD	150% CONTINUOUS CURRENT FOR 30 SECONDS				
Customer Presets					
MAX SPEED	25 - 400 V FULL SCALE FEEDBACK				SWITCH SELECTABLE
MIN SPEED	0-30% OF MAX SPEED				NON-INTERACTIVE
UP/DOWN RAMPS	INDEPENDENTLY ADJUSTABLE 1-30 SECONDS				LINEAR RAMPS
STABILITY	VARIES SPEED LOOP GAIN				
IR COMPENSATION	0-30% OF ARMATURE VOLTAGE				DO NOT USE WITH TACH
MAX CURRENT	LINEAR SETTING FROM 0-100%, 4 SWITCHED RANGES				150% OVERLOAD
Switch Selectable					
CURRENT RANGE	FOUR RANGES OF ARMATURE CURRENT				S1, S2
SPEED RANGE	FOUR RANGES OF FEEDBACK VOLTAGE				S3, S4
RELAY FUNCTION	DRIVE STALL AND/OR ZERO SPEED RELAY				S5, S6
POWER UP HOLD	POWER UP INSTALL OR RUN MODE				S7
TACH/AVF	SELECT TACH OR ARMATURE VOLTAGE FEEDBACK				S8
Jumper Functions					
TORQUE MODE	0-10 V INPUT FOR 0-100% CURRENT WITH AUTOMATIC OVERSPEED PROTECTION				JUMPER SELECTABLE
SUPPLY SELECT	DUAL SUPPLY VOLTAGE SELECTOR				JUMPER SELECTABLE
Link Functions					
4-20 mA OR 0-20 mA LOOP	ALLOWS CURRENT LOOP SIGNAL INPUT FOR SPEED				5 V COMPLIANCE
50% STALL LEVEL	ALLOWS LARGE PEAK CURRENTS				150% PEAK
General					
SUPPLY RANGES		**LV30**	**LV60**	**110** **240**	
45 Hz to 65 Hz	**MAX**	36 V	72 V	130 V 264 V	OVER FULL TEMP RANGE WITH OUTPUTS LOADED
AUTO RANGING	**MIN**	27 V	54 V	100 V 200 V	
AC POWER RESET	MINIMUM OFF TIME BEFORE RE-SUPPLY				500 ms
RUN LINE	60 ms ON, 20 ms OFF. ALWAYS USE A RUN CONTACT TO ENABLE THE DRIVE **AFTER** THE APPLICATION OF AC				
SIGNAL OUTPUTS	SPEED, CURRENT, RAMP, DEMAND				ALL BUFFERED
SIGNAL INPUTS	3 SPEED INPUTS -/+ RAMPED, DIRECT, ALL SUMMING				PROTECTED
RELAY DRIVERS	STALL, ZERO SPEED OPEN COLLECTOR PNP				FOR -24 Vdc 100 mA MAX
RAIL OUTPUTS	-24 V UNREGULATED 10 mA				+/- 20%
	+12 V, +10 V, -12 V REGULATED 10 mA				0.01%/DEG C 5%
FIELD OUTPUT	0.9 (0.45) x AC SUPPLY. 1 A.				FULL (0.9) OR HALF WAVE (0.45)
IP RATING	IP00				
ALTITUDE	9842 FEET MAX FOR FULL RATING				DE-RATE 1%/328 feet > 9842 f
HUMIDITY	85% R.H AT 104°F (40°C), NON-CONDENSING				
FORM FACTOR	TYPICAL 1.5 AT MAX OUTPUT				
TEMPERATURE	STORAGE AND OPERATING -14 TO + 122°F (-10 TO + 50°C)				
ARMATURE TIME CONSTANT	MINIMUM 10 ms. USE EXTRA ARMATURE CHOKE TO INCREASE				T= INDUCTANCE/RESISTANCE
MAX I^2t FUSING ($Amps^2seconds$)	1600i = 365 A^2s				RECOMMENDED SEMICONDUCTOR FUSES Refer to page 2

Disposal

Metal and plastic materials can be recycled, however, disposal of the printed circuit board requires compliance with all valid environmental control laws.

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