

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

DC MOTOR DRIVE

340XRi / 680XRi / 1220XRi



SPRINT ELECTRIC

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 fixings are in use as recommended.
- Ensure cooling airflow 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 earth. 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 earth.

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

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

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1 Introduction

The 340XRi / 680XRi / 1220XRi DC Drive is an isolated, 4 Quadrant speed controller for brushed shunt wound or permanent magnet DC motors.

This Class 1 product has basic insulation and a protective earth. Its control signals are isolated from the mains AC supply, and their connection to other isolated instruments is permitted.

The drive has both speed and current control modes and can motor or regenerate in both forward or reverse directions of rotation.

It incorporates a fully controlled thyristor bridge with a current loop to protect the drive and motor.

To control the motor speed the drive uses speed feedback derived from either the armature voltage or from a shaft-mounted tachogenerator. It incorporates an accurate current control loop to protect itself and the motor.

Current loop:	full P+I current shunt feedback
Speed loop:	full P+I armature voltage or tacho generator feedback
Speed range:	0-100% (motor dependent)
Load regulation:	typically 0.2% Tacho, 2% Armature Volts

The LV60 suffix, for example 340XRi LV60, denotes a low voltage version.

This component is hazardous. Please obtain expert help if you are not qualified to install this equipment. Make safety a priority.

Read about the general risks and warnings at the front of this manual.

 This apparatus complies with the protection requirements of the relevant EU Directives. UL file: E168302.

2 Installation

2.1 Motor installation

- Foot-mounted motors must be level and secure.
- 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.

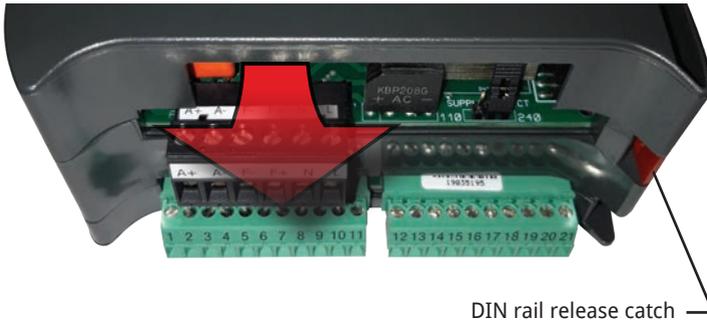
NOTE: This drive does not provide motor over-temperature protection. If this protection is required, fit an external thermal sensor device to the motor that will remove the supply when activated by over-temperature.

Earthing Connect the motor to the system enclosure earth.

2.2 Drive installation

Requirements during installation and operation:

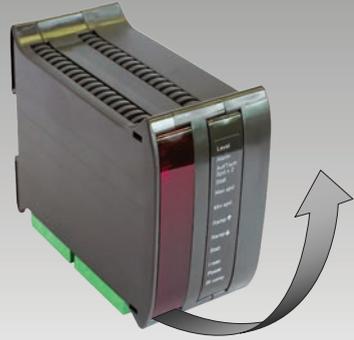
- Avoid vibration.
- Protect the drive from pollutants.
- Avoid ambient temperatures below -10°C and above $+40^{\circ}\text{C}$. To comply with UL requirements, the temperature of the surrounding air must not exceed 50°C .
- The heat dissipation of the drive in Watts approximates to $5 \times$ Armature Current value in Amps. Ensure there is an adequate supply of clean cool air to ventilate the unit and the enclosure it is mounted in.
- Note that on 680XRi and 1220XRi models, the fan exhausts as shown below (red arrow) - it is important to maintain this clear airway.



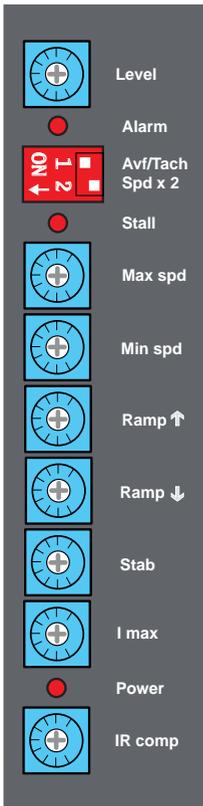


WARNING!

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



USER ADJUSTMENTS



Level: relay driver threshold. +/- (0.5% to 105%). (+/- 10.5V). Symmetrical about zero.

"Fan failure" alarm is active when lit. ●

Refer to "3.2 Operating the drive" on page 13.

Increasing brightness indicates imminent trip. ●

Maximum speed: rotate clockwise to increase speed, 40 V to 200 V (armature or tach feedback Volts). LV60 model has Avf range 10 V to 50 V.

Minimum speed: rotate clockwise to increase minimum speed. * 5K potentiometer provides 0 to 30% of maximum speed.

Ramp up: rotate clockwise for a faster response. 20 to 1 seconds up ramp rate. For +100% speed change.

Ramp down: rotate clockwise for a faster response. 20 to 1 seconds down ramp rate. For -100% speed change.

Stability: gain 1 to 10.

Maximum current: rotate clockwise to increase current limit. 0 to 100% current limit.

Power is present when lit. The LED is brighter for positive current. ●

IR compensation: rotate clockwise to increase level of armature voltage droop compensation. 0 to 25%. Excessive rotation may cause instability. Always set fully anti-clockwise in Tacho mode.

* Assumes using a 10K speed reference potentiometer



ANTI-CLOCKWISE



MID-WAY

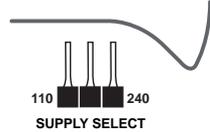


CLOCKWISE

The suggested Commissioning strategy starts in the safest possible mode of operation and progressively exercises each element of the system to achieve full functionality.

2.2.1 Initial settings - without power

- To avoid damage, ensure the supply selection jumper on the drive matches the incoming ac supply: 240 Vac or 110 Vac, (60 Vac or 30 Vac for LV60 models).
- With the unit on the work bench, open the red cover on the front of the drive by inserting a small screwdriver at the bottom of the cover.
- Set the **I MAX** preset to match the motor armature current rating as closely as possible:
 - fully anti-clockwise = 0%
 - fully clockwise = 100% of the drive rating, i.e. 3.4 A (340XRi drive), 6.8 A (680XRi drive), 12.2 A (1220XRi drive)
For example, to adjust the preset on an 340XRi drive for a motor with an armature current rating of 1.7 A, set it to 50%. Use a suitable current meter temporarily connected in series with the armature to achieve accurate settings.
- Set the **STAB** preset to mid-way.
- Set **Level**, **Max spd**, **Min spd**, **Ramp up**, **Ramp down** and **IR comp** presets to fully anti-clockwise.
- The preferred strategy for initial commissioning is to use the armature voltage feedback mode. To use armature voltage feedback:
 - set the **Avf/Tach** switch to ON (left)
 - set the **Spd x 2** switch to OFF (right)



(Temporarily remove any tachogenerator connection made to Terminal 11. Make the wire end safe until later).

2.2.2 Mechanical installation

- Remove the plug-in terminal blocks from the bottom of the unit.
- Clip the drive onto the DIN rail.
 - To release the drive from the DIN rail (with terminal blocks unplugged), insert a screwdriver into the slot in the (red) release catch at the back of the unit and move the catch downwards.

drive model	height/width/depth (mm)
340XRi	105/60/120
340XRi LV60	
680XRi	105/70/120
680XRi LV60	
1220XRi	105/70/120
1220XRi LV60	

2.2.3 Electrical installation



WARNING! **PERSONAL INJURY AND/OR** **EQUIPMENT DAMAGE HAZARD**

Never work on any control equipment without first isolating all power supplies from the equipment.

Protection must be provided by a correctly rated semi-conductor fuse, fitted upstream of the drive. The fuse must have an I²t rating of less than 150 A²s at the applied supply voltage.

9. Wire the plug-in terminal blocks and re-attach to the drive. Refer to the diagrams on page 11 and page 12. **DO NOT APPLY POWER AT THIS TIME.**

Control cable	1.5 mm ²
External control options	Speed setpoint from external 10K potentiometer* or isolated reference voltage
	Optional external contacts for reference voltage invert/non-invert control
	External RUN contact (Terminal 9) for electronic STOP/START
	Built-in functions are ± channel with push button control inputs, and relay driver with variable threshold
* Potentiometer, graduated dial and knob - Sprint Electric part number: POTKIT	

EMC wiring: If the unit is going to be used in the domestic environment, then for installations in the EU, a supply filter is recommended in order to comply with EN61800-3. Sprint Electric part number: FRLN16.

FUSE - Class aR Series semiconductor - fitted upstream of the drive				
To satisfy UL requirements for branch circuit short-circuit protection, the fuse MUST be of type FWH5-020A6FR (part number CH00620A), or a lower rated fuse from the same series.				
drive model	drive rating	fuse rating	Sprint standard fuses	Fuses for UL compliance
340XRi	3.4 A	6.3 A	CH0066A3	Bussmann FWH-6.30A6F
340XRi LV60				
680XRi	6.8 A	12.5 A	CH00612A	Bussmann FWH5-12.5A6FR
680XRi LV60				
1220XRi	12.2 A	20 A	CH00620A	Bussmann FWH5-020A6FR CH00620A
1220XRi LV60				
6 x 32 mm Panel-mount fuse holder - CP102071; DIN rail clip for fuse holder - FE101969				

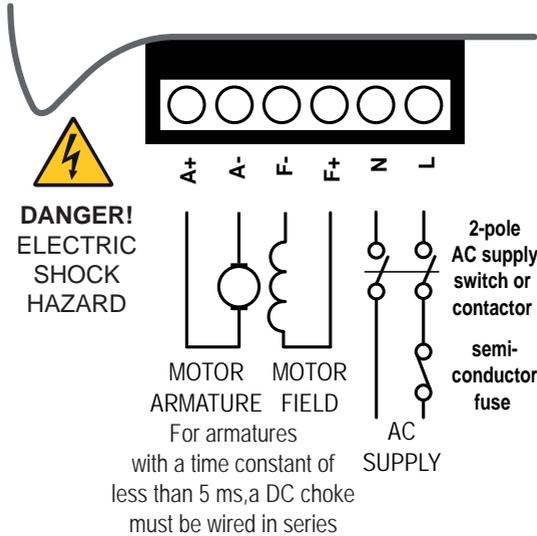
Short Circuit Rating

Suitable for use on a circuit capable of delivering not more than 5000 A RMS Symmetrical Amperes when protected by a Class aR Series semiconductor fuse.



WARNING!
PERSONAL INJURY HAZARD

Terminals A+, A-, F-, F+, N & L are at high potential.
Do not touch the terminals or any connected conductor.



Mains supply contactor When using a mains supply contactor, we recommend connecting a Normally Open auxiliary contact of the contactor in series with the T9 **RUN** input.

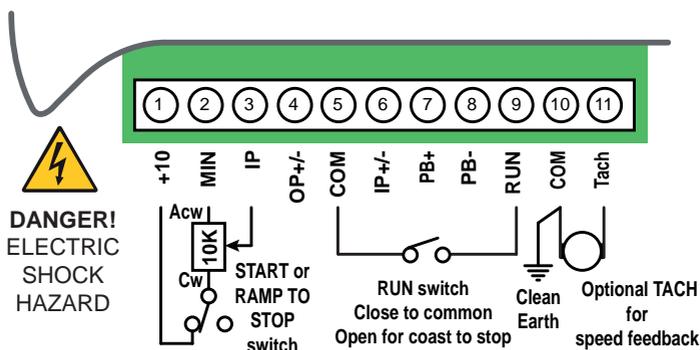
L1/L2/L3, A+/A-	Use correctly rated cable - minimum 600 Vac, 1.5 x armature current
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POWER TERMINAL LISTING - tightening torque: 0.5 Nm (4.4 lbf.in)

A+	* Motor armature +
A-	* Motor armature -
F-	** Motor field - For half wave field Volts 0.45 x AC, connect field to F- and N
F+	** Motor field +
N	NEUTRAL: AC supply
L	LIVE: AC supply

* Form factor typically 1.5 (load dependent)

** No connection required for permanent magnet motors



Basic single direction speed control with tach feedback

Protective Earth: The drive's 0 V (COM) connection at Terminal 10 (or Terminal 5) MUST be connected to a clean Protective Earth. In a multi-drive system, this connection may be made via the system's own signal ground common wire.

START or RAMP TO STOP switch (optional) The +10 V reference is connected to the speed potentiometer by a switch giving a ramp to zero when opened.

Mains supply contactor When using a mains supply contactor, we recommend connecting a Normally Open auxiliary contact of the contactor in series with the T9 **RUN** input.

Control Signals Control signals are isolated from the supply, the unit may therefore be connected to other isolated instruments.

CONTROL TERMINAL LISTING - tightening torque: 0.25 Nm (2.2 lbf.in)

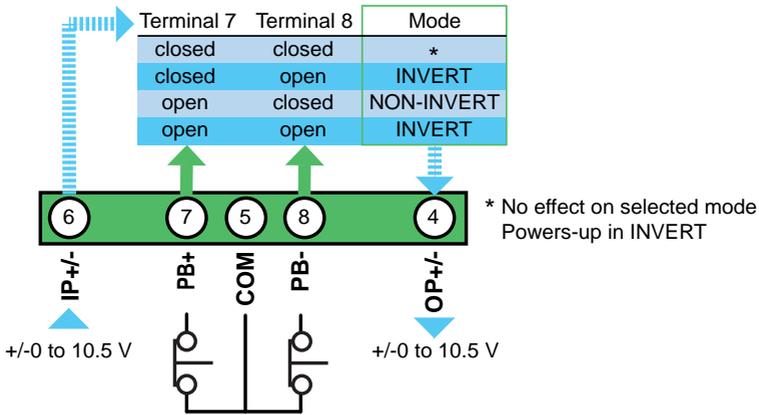
1	+10 +10 V output, 10 mA maximum. Use a 10K potentiometer for external speed reference.
2	MIN Minimum Speed: connect to minimum end of internal speed potentiometer 5K preset to common.
3	IP Speed Input: 0 to ± 10 V speed input from the potentiometer wiper or isolated reference voltage. 47K internal pull-down.

CONTROL TERMINAL LISTING - tightening torque: 0.25 Nm (2.2 lbf.in)

4 OP± ±10.5 V range. 10 mA maximum. This terminal outputs the input supplied to Terminal 6, as affected by the states of Terminals 7 and 8 (pushbuttons).

From the Truth Table below:

- a) The default mode is to INVERT (no pushbuttons connected - Terminals 7 & 8 open)
- b) With no pushbutton connected to Terminal 7, i.e. open, a pushbutton connected to Terminal 8 (PB-) will select INVERT or NON-INVERT modes.
- c) With closed pushbuttons connected between Terminals 7 & 8 and COM (T5), momentarily opening Terminal 7 selects the NON-INVERT mode, and momentarily opening Terminal 8 selects the INVERT mode. The selected mode remains latched if the pushbutton is released. This function provides pushbutton-controlled forward/reverse or inverts a negative setpoint from another source.



5 COM Common. 0 V (zero).

6 IP± This input to the pushbutton-controlled signal channel INVERTs or NON-INVERTs (buffers) the original input. Refer to 4 above.

- ≤ 50K input impedance for invert mode
- ≤ 10M input impedance for non-invert (buffer) mode

If you non-invert (buffer) a signal, the resulting signal will have a greater drive capability (current capacity). For example, use the non-invert mode to create a usable positive signal from a high-impedance external source such as a 20K external potentiometer.

NOTE: If you non-invert (buffer) a negative signal, the resulting output will be positive. Thus, inputs in the range of ±10.5 V are non-inverted to 0 to +10.5 V.

7 PB+ Pushbutton or volt-free contact input. 47K pull-up to +12 V. Refer to 4 above.

8 PB- Pushbutton or volt-free contact input. 47K pull-up to +12 V. Refer to 4 above.

CONTROL TERMINAL LISTING - tightening torque: 0.25 Nm (2.2 lbf.in)

9 RUN Internal 12K pull-up to +12 V. Close Terminal 9 to COMMON to run the drive.

Open Terminal 9 to stop - this will cause immediate drive inhibit; if the motor is rotating at the time it will coast to STOP (zero speed).



WARNING!
PERSONAL INJURY HAZARD

RUN is an electronic inhibit function. The field remains energised, and all power terminals 'live'. During hazardous operations remove the power source to the system. **RUN must not be relied upon to ensure that the machine remains stationary.** The motor FIELD output remains energised with RUN open, please beware of overheating the motor when stopped (does not apply to permanent magnet motors).

10 COM Common. 0 V (zero).

11 TACH The tachogenerator voltage input must be opposite in polarity to the polarity of the speed input. 1.5 MΩ input impedance. Full scale voltage range = 40 V to 200 V, adjustable using the **Spd x 2** switch and **Max spd** preset. Refer to "4 Options" on page 15.

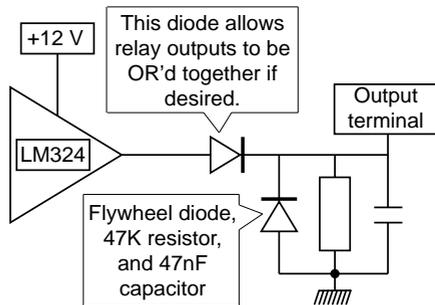
12 RLOP Relay driver output. +10.5 V active high. Flywheel diode to COM.

NOTE: The output is current limited. The output voltage is therefore load dependent. When in current limit, the output voltage achieved depends upon the resistance of the load multiplied by the available current limit at that voltage. Refer to the table opposite for current limit values and the associated output voltages.

relay voltage (V)	typical RLOP current (mA)	typical coil resistance (Ω)
8.0	30	267
8.5	25	340
9.0	20	450
9.5	15	633
10.0	10	1000
10.5	1	>10K

When driving relays, ensure the coil operating range is suitable, e. g. a 12 V relay with a coil operating range of 80-110% will energise at voltages of 9.6 V and above (80% of 12 V). Hence, it must have coil resistance greater than 633 Ω for the output to be capable of achieving the desired voltage.

A suitable UL approved relay is Hongfa type HF41F/9 (coil voltage 9 V).

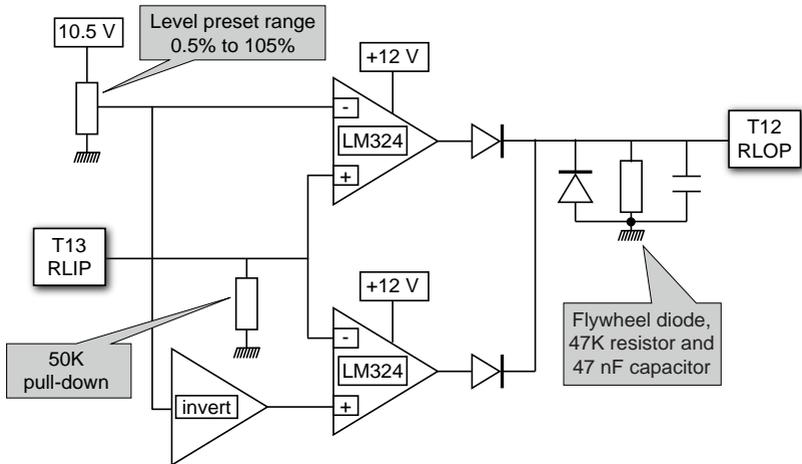


CONTROL TERMINAL LISTING - tightening torque: 0.25 Nm (2.2 lbf.in)

13 RLIP Relay driver input. Accepts 0 to ± 10.5 V signal inputs.

The threshold to activate the relay driver is symmetrical around zero. This is set by the LEVEL preset, between ± 0.05 V and ± 10.5 V. When the T13 input exceeds the positive or negative threshold, then the T12 RELAY DRIVER OUTPUT is turned ON.

Typical uses include zero speed detector, zero current detector, stall detector, etc. This input will accept any output provided on other control terminals, 50K pull-down to common.



14 OVLD Overload. This output goes high (+10.5 V at 10 mA) if the current demand exceeds 110%, and the stall timer starts timing. Flywheel diode to COM. See T12 RLOP for details of the output drive capability and configuration.

NOTE: OVLD stays high if the overload subsequently results in a stall trip condition. The stall timer will allow 150% motor current for approximately 30 seconds before tripping. The overload integrator can tolerate 50% overload x 30 seconds = 1500 units. (A 50% overload is 150% of motor current set on I_{max}).

Stall timer Operation:

Minimum available overload time prior to trip = $1500 / \text{Overload } \%$, in seconds.

Overload time examples: 125% I_{max} current for 60 seconds ($1500 / 25 = 60$)

112.5% I_{max} current for 120 seconds ($1500 / 12.5 = 120$)

NOTE: The stall timer initiates as a result of the current demand exceeding 100% when the desired speed remains unsatisfied. For example, this may be due to excessive load, insufficient supply voltage, loss of feedback, saturated feedback, insufficient torque, jammed shaft. This allows the protection to be more comprehensive than overcurrent alone.

CONTROL TERMINAL LISTING - tightening torque: 0.25 Nm (2.2 lbf.in)

- 15 TRIP** This output goes high (+10.5 V at 10 mA) and latches high when the stall timer has timed out (in which case T14 OVLD will also be high), **OR** if the fan alarm has operated (in which case T14 OVLD will be low). Flywheel diode to COM. See T12 RLOP for details of the output drive capability and configuration.

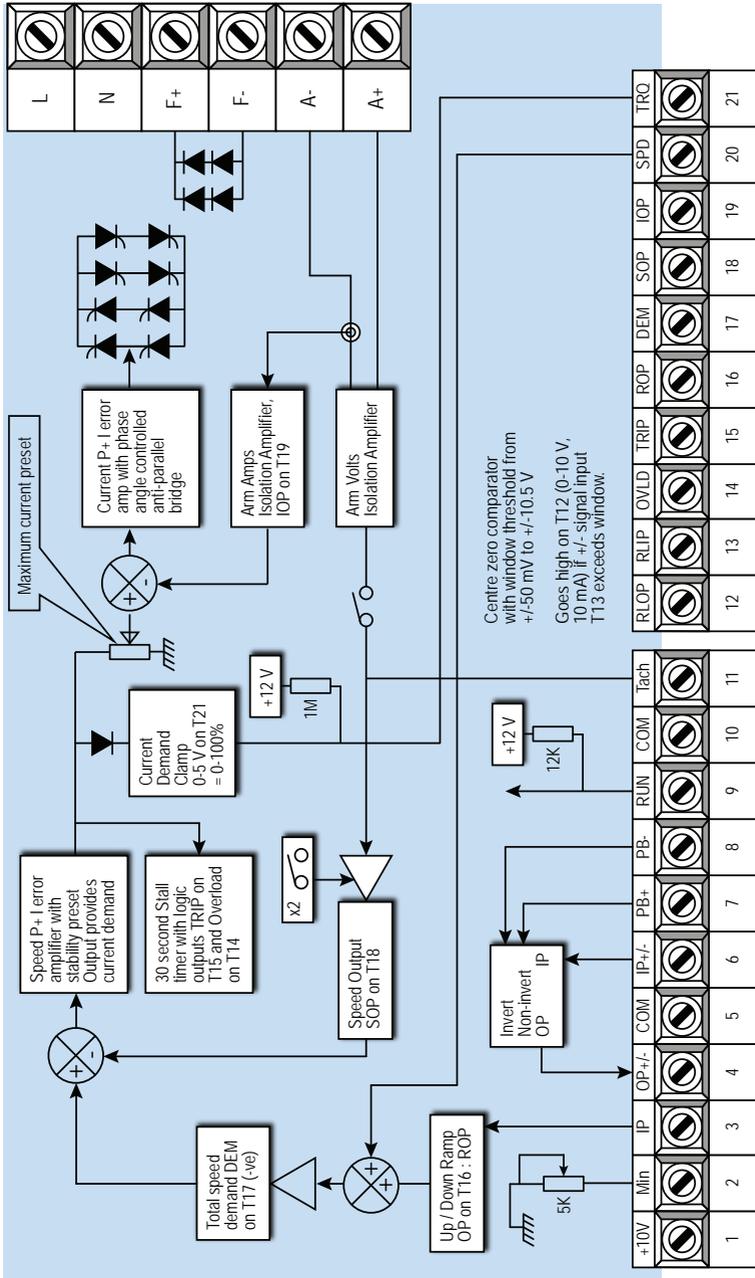


WARNING!
PERSONAL INJURY HAZARD

TRIP is an electronic armature current inhibit function. The field output remains energised, and all power terminals 'live'. During hazardous operations remove the power source to the system. **TRIP must not be relied on to ensure the machine remains stationary.** The motor FIELD output remains energised with TRIP active, please beware of overheating the motor when stopped (does not apply to permanent magnet motors).

- 16 ROP** Ramp output. 0 to ± 10 V output for 0 to ± 10 V input at T3. 1 k Ω output impedance.
- 17 DEM** Demand output. 0 to $-/+10$ V output for 0 to $\pm 100\%$ speed demand. 1 k Ω output impedance. Represents the inverted total speed demand.
- 18 SOP** Speed output. 0 to ± 5 V output for 0 to $\pm 100\%$ speed feedback. 1 k Ω output impedance.
- NOTE:** Prior to LA issue 11 (see side of terminal block), the output at this terminal was 0 to ± 10 V. Special version drives type CON315 also have 0 to ± 10 V output for 0 to $\pm 100\%$ speed feedback.
- 19 IOP** Current signal output. 0 to +5 V output for 0 to 100% armature current. Maximum output +7.5 V for +150% current. 1 k Ω output impedance.
- 20 SPD** Auxiliary speed input. Added to the Setpoint Ramp output. Input impedance 100 k Ω . 0 to ± 10 V input for 0 to $\pm 100\%$ speed demand, direct input, fast response.
- 21 TRQ** Torque input. 100K pull-up to +12 V. 0 to +5 V input for 0 to 100% current clamp level.
- This input acts as a clamp on the current demand produced by the speed loop. For the clamp to operate, the speed loop current demand must be greater than the clamp level set on T21*; if the speed loop current demand falls below this clamp level, then the drive will return to speed loop control.
- * This can be achieved by ensuring that the total speed setpoint input (the sum of the voltages applied to T3 and T20) is greater, in percentage terms, than the speed feedback signal.

2.2.4 Block diagram



3 Operation

3.1 Pre-operation motor check list

10. With no power applied, complete the following check list:

- Check for the correct insulation between individual motor elements, and between these elements and the earthed motor frame. Disconnect all drive cables before testing. The motor elements are: armature winding, field winding*, temperature sensors*, tachogenerator* (* where applicable).
- 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 and that any protective covers have been removed.

3.2 Operating the drive

REFER TO THE WARNING ON PAGE 8.

- 11. For this initial start, disconnect and insulate the (optional) Tacho connection to Terminal 11** as the drive will be using **Armature Voltage** feedback.
- 12. Apply power to the drive.** The drive's Power lamp will light. (Note that the Power lamp intensity is increased when the positive armature bridge is demanded).
- 13.** If fitted, close the START contact. Operate the RUN switch to turn the motor.
- 14.** Slowly increase the external speed potentiometer setting to maximum. The motor will ramp up slowly to about 40 V on the motor armature (to about 10 V for LV60 units).
- 15. Is the motor turning in the required direction?** If not, reverse the system by transposing the A+ and A- motor armature connections.



CAUTION!

When reversing the system: To prevent damage, do not transpose the motor armature connections until the motor has stopped rotating.

16. **Speed Feedback selection:** Set the correct **Armature Voltage** using the **Spd x 2** switch and the **Max spd** preset:



WARNING!
PERSONAL INJURY AND/OR
EQUIPMENT DAMAGE HAZARD

If you change the Spd x 2 switch position while running, the speed will undergo an immediate step change.

a. Set the **Spd x 2** switch to suit the drive's armature voltage rating (ranges given below):

	340Xri / 680Xri / 1220Xri		340Xri LV60 / 680Xri LV60 / 1220Xri LV60
OFF	40 to 100 V	OFF	10 to 25 V
ON	0 to 200 V	ON	23 to 50 V



b. Adjust the **Max spd** potentiometer setting to achieve the required shaft speed.

17. **MIN SPEED:** The Min spd potentiometer can now adjust between 0% and 30%. (This assumes that a 10K potentiometer is being used to provide the speed setpoint at terminals 1, 2 and 3.)
18. **UP & DOWN RAMPS:** Set the ramp up rate as required (from 20 seconds to 1 second). Note that the DOWN RAMP rate becomes the UP RAMP rate for negative inputs to Terminal 3.
19. **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 to use Armature Voltage feedback.

4 Options

- **Speed Feedback selection:** If the system is to use **Tacho** feedback you can now adjust for the tachogenerator's output voltage, and hence the speed of the motor.

Run the drive in **Armature Voltage** feedback mode and check the polarity of the tacho using a voltmeter. The tacho feedback polarity must be negative with respect to COMMON, Terminal 10 for a Positive Speed Demand on Terminal 3.

REFER TO THE WARNING ON PAGE 8.

NOTE: IR COMP must not be used with Tacho feedback - set the potentiometer fully anti-clockwise.

- a. With the power off, connect the tachogenerator's output voltage to Terminal 11. Set the **Avf/Tach** switch to OFF (right).

Calculate the output voltage from the tachogenerator:

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. While still in Avf mode and running at 100% speed, measure the tacho volts on the wire intended for connection to Terminal 11 - **WARNING: possible high voltage.** Note this voltage, **stop the motor and turn off the supply.**
 2. Set the Avf/tach switch to off (right) to disconnect Avf and then reconnect the tacho wire to Terminal 11.
- b. Set the **Spd x 2** switch to suit the measured or calculated feedback voltage (refer to the switch ranges given for Armature Voltage).
 - c. With the drive running, adjust the **Max spd** preset to achieve the required shaft speed.



- **Jogging:** We recommend using the RUN input (Terminal 9) for stopping or jogging. If you use a mains contactor, connect a spare normally-open contact of the contactor in series with the RUN input. Also refer to **Supply switching** below.
- **Auxiliary input:** If the system is using **Armature Voltage** feedback, then Terminal 6 (TACH) may be used as an auxiliary fast +/- speed trim (approximately 5-10%).

- Alarms



WARNING!
PERSONAL INJURY HAZARD

The following alarm provides an electronic armature current inhibit function. **The field output remains energised and all power terminals are LIVE (shock hazard)**, hence these terminals must not be relied upon to ensure the machine is stationary during hazardous operations.

The motor FIELD output remains energised; please beware of overheating the motor when stopped - this does not apply to permanent magnet motors.

- **"Alarm Failure" Alarm:** Models 680XRi and 1220XRi use an internal fan for cooling. The **Alarm** lamp will light if the internal fan fails, the TRIP output (Terminal 15) will go high - the drive will electronically shut down. Refer to the T15 terminal description for further information.
- **Stall Alarm:** The brightness of the Stall lamp will increase progressively as a Stall condition is approached. If the overload condition is not remedied, the lamp will eventually latch into a fully-lit condition and the drive will electronically shut down. At the same time the TRIP output (T15) will go high. Warning of an impending Stall trip condition is given by the OVLD output (T14). Refer to the T14 and T15 descriptions for further information.
- **POWER** on lamp:
 - Bright lamp indicates positive armature current.
 - Dim lamp indicates negative armature current.
- **LEVEL:** This adjustment sets a threshold for Terminal 13 (RLIP), symmetrical about zero, that creates a change in state for Terminal 12 output (RLOP). When the input to Terminal 13 exceeds this threshold, Terminal 12 (0 V) goes high (10 V, 10 mA).
- **Forward / Reverse using pushbuttons:** By connecting Terminal 7 (PB+) and Terminal 8 (PB-) to common, forward/reverse pushbutton operation can be established. Refer to Terminals 4-8 on page 13 for details; see the wiring diagram below.
- **Guidelines when using filters:**



WARNING!
PERSONAL INJURY AND/OR
EQUIPMENT DAMAGE HAZARD

The AC supply filters must not be used on supplies that are un-balanced or float with respect to earth.

The drive and AC filter must only be used with a permanent earth 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 20 seconds after removal of the AC supply.

Filter part number: FRLN16.

1. The AC connections from the filter to the drive must be less than 0.3 m or, if longer, correctly screened.
2. The AC filter and motor cable screen should connect directly to the metal of the cabinet.
3. Do not run filtered and unfiltered AC supply cables together.
4. The AC input filter has earth leakage currents. RCD devices may need to be set at 5% of rated current.
5. The AC supply filter must have a good earth connection to the enclosure back plane. Take care with painted metal. Remove paint and ensure good connection.

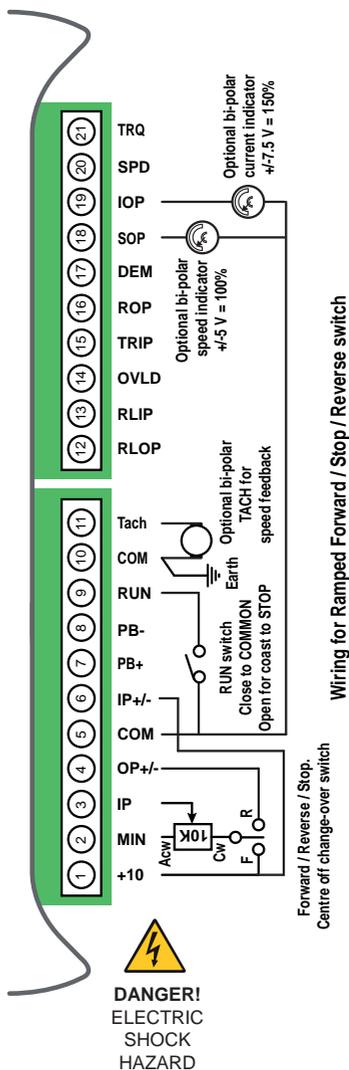
- **Alternative wiring option** The wiring diagram below shows the addition of speed and current indicators on Terminal 18 and Terminal 19 respectively.

The +10V reference (T1) is inverted by connecting it to T6 to produce a -10V ref on T4. The changeover centre-zero switch then selects forward (+10V), reverse (-10V), or centre off for a ramp to zero.

NOTE: The AVF/tach select switch must be set:

- **AVF:** Set the appropriate speed scale range for the maximum Feedback Volts, dependent upon the source of speed feedback.
- **Tach:** If a tachogenerator is used, the polarity on T11 must be opposite to the speed reference on T3. Do not use an AC rectified tachogenerator as they are unsuitable for bi-directional feedback.

A protective earth connection is made to terminal 10.



CAUTION! EQUIPMENT DAMAGE HAZARD

Do not disconnect the supply while the drive is running. For drives supplied via an AC supply contactor, either open the T9 RUN input, or ensure that motor shaft is stationary and is not under load, before opening the contactor.

When using a mains supply contactor, we always recommend to connect a Normally Open auxiliary contact of the contactor in series with T9 RUN input.

5 Specifications

All specifications in this document are nominal.
This product conforms to IP00 protection.

RATINGS					
drive model	AC supply input 1 ph 50-60 Hz (Vac ±10%)	maximum output			power rating (kW / hp)
		armature voltage (Vdc)	armature current (Adc)	field current ** (Adc max)	
340XRi 340XRi LV60	110 or 240 30 or 60	90–180 (200 V max) 24–48 (50 V max)	3.4 3.4	1 1	0.55 / 0.5 *
680XRi 680XRi LV60	110 or 240 30 or 60	90–180 (200 V max) 24–48 (50 V max)	6.8 6.8	1 1	0.75 / 1 *
1220XRi 1220XRi LV60	110 or 240 30 or 60	90–180 (200 V max) 24–48 (50 V max)	12.2 12.2	1 1	1.8 / 2 *

kW / hp ratings are for typical motor ratings at or below the available terminal ratings of
Watts = armature Volts x armature Amps.

* Note that the power output of LV60 versions will be proportionately lower than is shown above.

** Volts DC = 0.9 x AC supply Volts (0.45 x AC supply Volts for field connected to F- and N)

A+ / A- motor armature terminals have Form Factor typically 1.5 (load dependent).

Disposal

This product contains materials that are considable waste under the Hazardous Waste Regulations 2005. Metal and plastic materials can be recycled, however, disposal of the printed circuit board requires compliance with all valid environmental control laws.



Products that must be recycled in accordance with the WEEE Regulations are marked with the symbol opposite. Contact us when recycling the product.

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It is the user's responsibility to ensure the unit is correctly used and installed.

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