INVERTER DRIVE® SUPERMARKET

Schneider Altivar ATV12 Frequency Inverter

Easy Start Guide



The Schneider Altivar ATV12 Frequency Inverter range is available to order from inverterdrive.com

This guide is intended to complement the user manual provided by the manufacturer.
It is provided as a basic introduction to the product for Inverter Drive Supermarket customers.
It should not be used as a replacement for the manual issued by the manufacturer.

This product is not a safety device. All safety considerations including but not limited to Emergency Stop provision should be assessed separately and are outside the scope of this guide.

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1. Power and Motor Connections



Before commencing, confirm that the Inverter and all cables are completely isolated from the power supply, have been isolated for at least 5 minutes and that the motor is not turning.

Notes:

The illustration on the left is based on frame size 1 (ratings less than 2.2kW). The terminal layout for frame 2 is similar.

Filtered models are supplied with the internal EMC filter enabled. This can be disabled using the jumper labelled SW100 at the top of the Inverter if required (not usually necessary).

The order of the three motor phases determines the initial direction the motor turns. This can be reversed by physically swapping any two phases, or by changing the Inverter parameters.

Use screened cable between the Inverter and Motor. To minimise electromagnetic interference, ensure the cable screen is grounded.

The supply must match the Inverter specification.

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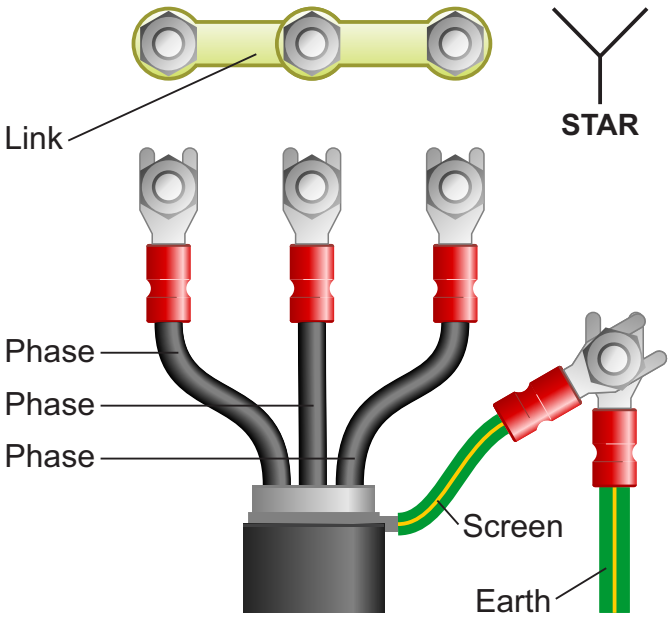
2. Motor Connections - Star and Delta

Dual voltage induction motors typically include terminal boxes with six points. The points can be connected together with links in one of two ways to suit one of the two rated voltages.

The two ways of connecting the links are shown below. These are known as “Star” (the higher voltage) or “Delta” (the lower voltage).

The selection of Star or Delta is not optional and must match the supply voltage.

Dual voltage motor nameplates include symbols to represent voltage and full load current in each configuration.
Delta is represented by a triangle and star by a Y (Wye).



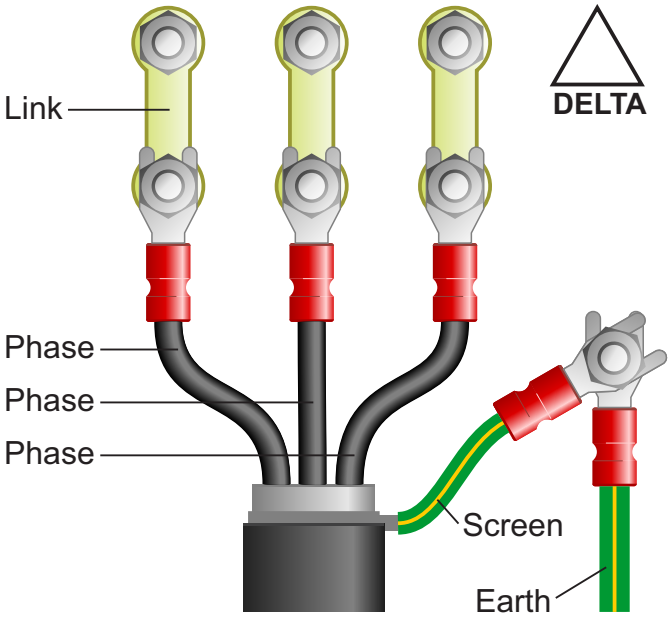
2.1 Motor connected in STAR (or Wye):

For safety purposes, Star (shown opposite) is the default configuration for small motors (usually to 3kW) and is sometimes known as “two at one side”.

Only two links are required for Star. Double-up the links if changing from Delta to allow the motor to be changed back in future.

The order of the three phases determines the direction the motor turns.

Note that the manufacturer recommends that the cable screen is earthed at both ends and the motor and Inverter are earthed separately.



2.2 Motor connected in DELTA:

The link configuration is shown in the illustration opposite and is sometimes referred to as “three-a-breast”.

The order of the three phases determines the direction the motor turns.

Note that the manufacturer recommends that the cable screen is earthed at both ends and the motor and Inverter are earthed separately.

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3. Parameters - overview

The Inverter contains a number of settings which can be changed to tailor it for use in a wide range of applications. These settings are known as parameters.
Parameters are stored within menus and are typically referred to by a code (eg. nCr = Rated Motor Current) with a description available in the manual.

The parameters contain critical information essential to the correct operation of the Inverter. Therefore, they should at least be checked by the user before the Inverter is operated for the first time.
The parameters listed in section 4 are intended to provide a starting point to allow for basic operation of the ATV12 Inverter.

4. Parameters to set before use

Set the following parameters to allow the ATV12 to control a motor with Run, Stop and Speed Control from the keypad.

If any of the parameters have been changed previously, follow the procedure in section 11 to reset the Inverter to Factory Defaults.

See section 5 to learn how to set a parameter value.

4.1 Parameters to check and values to set

Path to parameter	Description	How to set
Conf → FULL → drC → **bFr**	Standard Motor Frequency	Default 50Hz; 60Hz can be selected if required.
Conf → FULL → drC → **tFr**	Maximum Frequency	Default is 60Hz; Sets the upper limit of High Speed setting. Increase this if High speed setting is >60Hz.
Conf → FULL → FUn → SPL → **HSP ***	High Speed	Default is 50Hz; Cannot be set less than LSP or more than tFr.
Conf → FULL → FUn → SPL → **LSP ***	Low Speed	Default is 0Hz; Cannot be set more than HSP.
Conf → FULL → FUn → rPt → **ACC ***	Acceleration Time	Default is 3 seconds; increase or decrease if faster or slower acceleration time is required.
Conf → FULL → FUn → rPt → **dEC ***	Deceleration Time	Default is 3 seconds; increase or decrease if faster or slower deceleration time is required.
Conf → FULL → drC → **Ctt**	Motor Control Type	Default is 'Std'; V/F control. Sensorless Vector is available.
Conf → FULL → drC → **SFr**	Switching Frequency	Default is 4kHz. Default will suit most applications.
Conf → FULL → CtL → **FR1 ***	Reference Channel 1	Default is AI1 (analogue input 1) in remote and AIUI (keypad dial) in local. Leave as default value.
Conf → FULL → drC → **UnS**	Rated Motor Voltage	Rated Voltage of the motor. Set to match the motor nameplate eg 230V.
Conf → FULL → drC → **nCr ***	Rated Motor Current	Rated current of the motor. Set to match the motor nameplate eg 2.4A.
Conf → FULL → drC → **FrS**	Standard motor Frequency	Rated frequency of the motor. Default is 50Hz; change to suit the motor.
Conf → FULL → drC → **nPr ***	Rated Motor Power (kW or HP)	Default is Inverter rating. Set to motor kW for 50Hz or HP for 60Hz.
Conf → FULL → drC → **nSP**	Rated Motor Speed (RPM)	Rated rpm. Set to match the motor nameplate eg 1420 RPM.
Conf → FULL → drC → **Ufr**	IR compensation (V/F)	Default is 100%. Improves low torque performance in V/F mode. Default should suit most applications.
Conf → FULL → Fun→ AdC → **SdC1**	Automatic DC Injection Current	Default is 70% for 0.5 seconds. Default should suit most applications.

*** shortcuts to these parameters can also be found directly under Conf**

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5. How to set a Parameter value



5.1 Access “modes” menu

From the “rdy” prompt press the centre of the dial to access the mode selection menu.

Note: to return to the “rdy” prompt press the “ESC” key repeatedly until it is displayed.



5.2 Select “Conf” mode

There are a 3 modes; rEF (reference), NOn (monitor) and COnF (configure). Rotate the dial to scroll to “COnF”. Press the centre of the dial to select it.



The corresponding lamp on the left side of the screen also indicates which mode is selected.



5.3 Select shortcut or “FULL” for all parameters

The display will show one of several parameter shortcuts or “FULL”. Rotate the dial to scroll through them. In this example we will set rated motor current “nCr” which has a shortcut. However, to illustrate the process required to set most parameters we will access it via the full list rather than from the shortcut.

Select “FULL” and press the centre of the dial to select it.



5.4 Select the motor control parameter menu

The “nCr” parameter is located within the motor control menu “drC” so it must be selected first.

Rotate the dial until drC is displayed then press the centre of the dial to select it.

Note: some parameters may also require one or more submenus to be selected. The “ESC” key can be used to return to the previous menu if necessary.

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5.5 Select rated motor current

Once the menu (or submenu) has been selected use the dial to scroll through the parameters until “nCr” is displayed.
Press the centre of the dial to access the parameter value.

The “ESC” key can be used to return to the parameter menu if required.



5.6 View the parameter value

The current parameter value is displayed.

The “Value” lamp on the right-hand side of the display illuminates to indicate that a parameter value is being displayed.

The “ESC” key can be used to return to the parameter list if required.



5.7 View the parameter units

Press the centre of the dial to display the parameter units. In this example, rated motor current is in Amps so “ANP” is displayed. The “Unit” lamp on the right-hand side of the display will also illuminate.

After a few seconds, the display will return to the parameter value (see 5.6 above).



5.8 Edit and save the parameter value

Rotate the dial clockwise to increase the value and anti-clockwise to decrease the value. The “CONF” and “Value” lamps will flash when the value changes. Press the “ESC” key to cancel changes and return to the original value.

Press the dial centre to save changes (some parameters may require the dial to be pressed for 2 seconds). The display will return to the parameter list - see 5.5 above.

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6. How to operate the Inverter from the keypad



6.1 Set the Inverter to "Local" control.

The Inverter is supplied with "Remote" control enabled. This means that the IO terminals must be used to start and stop the motor. To operate from the keypad, the Inverter must be changed to "Local" control.

From the "rdy" prompt press and hold the "MODE" key for 3 seconds. The screen will briefly display "LOC".



6.2 Use the dial to set the speed setpoint

In local mode, the lamps on the left-hand side of the screen will continually illuminate in sequence.

Rotate the dial to set the desired speed in Hz.

The display will return to "rdy" after a few seconds.



6.3 Press the green "RUN" button to start the motor.

The green "RUN" button will start the motor. The display will increase from 0.00 to the speed setpoint set in 6.2 above.

To increase the speed whilst the motor is running simply rotate the dial clockwise. To decrease rotate anti-clockwise.

The time taken (in seconds) to accelerate the motor is proportional to parameter ACC.



6.4 Press the red "STOP" button to stop the motor.

The red button will stop the motor. The display will decrease from the current speed to 0.00. When stopped, the display will return to the "rdy" prompt.

The time taken (in seconds) to stop the motor is proportional to parameter dEC.

Note: the display may briefly show "dCb" to indicate that DC Injection Braking is active.

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7. How to enable Sensorless Vector Mode

The standard motor control mode of the ATV12 Inverter is VxF. This simple mode controls motor speed by varying Volts and Frequency in a specific ratio to maintain output torque.
The ATV12 can also operate in Sensorless Vector mode. This can improve motor performance without requiring a separate feedback device. Sensorless Vector mode operates in a similar way as VxF but performs a number of calculations to improve low speed torque.

These calculations require a static "autotune" during which the Inverter operates for a short time to gather the necessary data.

The motor shaft does not normally turn during a static autotune.

To enable sensorless vector control first set the parameter values specified in 7.1 and then follow the steps described in 7.2 and 7.3.

7.1 Parameters to check prior to an Autotune.

Path to parameter	Description	How to set
Conf → FULL → drC → **UnS**	Rated Motor Voltage	Rated Voltage of the motor. Set to match the motor nameplate eg 230V.
Conf → FULL → drC → **nCr** *	Rated Motor Current	Rated current of the motor. Set to match the motor nameplate eg 2.4A.
Conf → FULL → drC → **FrS**	Standard motor Frequency	Rated frequency of the motor. Default is 50Hz; change to suit the motor.
Conf → FULL → drC → **nSP**	Rated Motor Speed	Rated rpm. Set to match the motor nameplate eg 1420 RPM.
Conf → FULL → drC → **nPr** *	Rated Motor Power (kW or HP)	Default is Inverter rating. Set to motor kW for 50Hz or HP for 60Hz.

*** shortcuts to these parameters can also be found directly under Conf**



7.2 Start Autotune.

Once the parameters in 7.1 have been set, select parameter Conf → FULL → drC → tUn and rotate the dial to change the value from "nO" to "YES".

For safety, ensure that the motor is decoupled from the load before pressing the centre of the dial to begin the autotuning process. The display will show "tUn" and motor excitation noise will be heard.



7.3 Enable Sensorless Vector Control.

When the process is complete the excitation noise will stop. To confirm this, press the centre of the dial. The display will show "donE" once complete. However, sensorless vector mode is not enabled automatically.

Important: To enable sensorless vector mode once the autotune is complete change parameter:
Conf FULL drC Ctt
from "std" to "PErF".

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8. How to connect and configure a Potentiometer for remote speed control

If the integrated dial on the keypad is unsuitable for the application, a remote Potentiometer can be used instead.

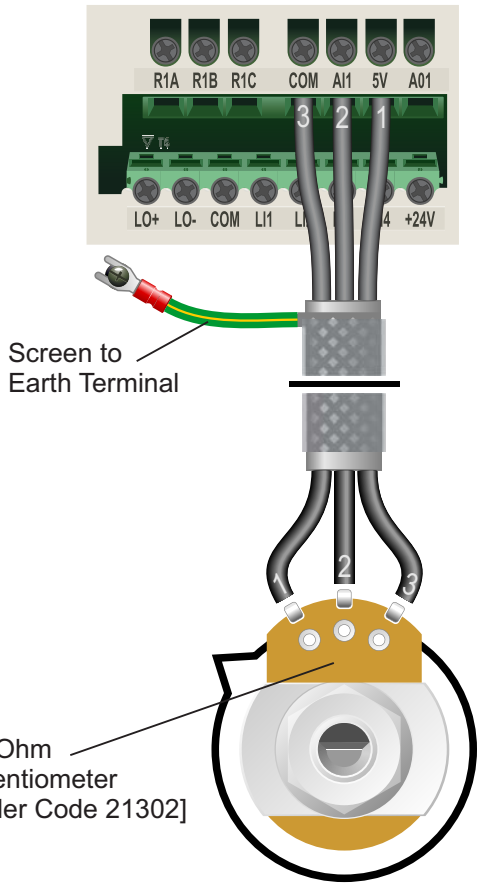
This provides the benefit of allowing motor speed to be controlled from a more convenient location such as a cabinet door (if the ATV12 is cabinet-mounted) or on the machine itself.

A 10kΩ Potentiometer should be used.

A Potentiometer can be used with start/stop via the keypad (local) or terminals (remote). However, either local or remote must be selected before the parameters listed below are set.
For this example, **the Inverter should be in terminal (remote) control mode** (no lamps illuminated on the left side of the display). Press and hold the "MODE" key for 3 seconds to switch from local to remote if required.

8.1 Relevant parameters for remote Potentiometer speed control

Parameter	Description	How to set
Conf → **FR1**	Reference Channel 1	Default is "AI1" (analogue input 1) in remote and "AIUI" (keypad dial) in local. Set to **"AI1"** for speed control via potentiometer connected to AI1.
Conf → FULL → CtL → **CHCF**	Channel Configuration	Default is "Sin"; set to **"SEP"** to separate speed and control commands.
Conf → FULL → CtL → **Cd1**	Command Channel 1	Default is "ter" (terminals) in both remote and local. Set to "ter" if using remote start/stop or **"LOC"** for start/stop via Inverter keypad.



8.2 Connecting the Potentiometer

A wiring diagram is shown opposite. The most important connection at the Potentiometer is the centre terminal or "wiper".

The wiper will output a variable voltage between 0 and 5 volts and should be connected to the AI1 terminal at the Inverter. It is this voltage which provides the speed signal with 0V being slowest and 5V fastest. The default output frequency at 0V is 0Hz and at 5V is 50Hz.

If the rotation of the Potentiometer is the opposite to that required (ie. turn anti-clockwise to increase speed instead of clockwise) reverse connections 5V and COM.

Use shielded cable between Potentiometer and Inverter and ensure that the cable screen is connected to the Inverter earth terminal only.

Note: if using remote start/stop ensure parameter Cd1 is set to "ter".

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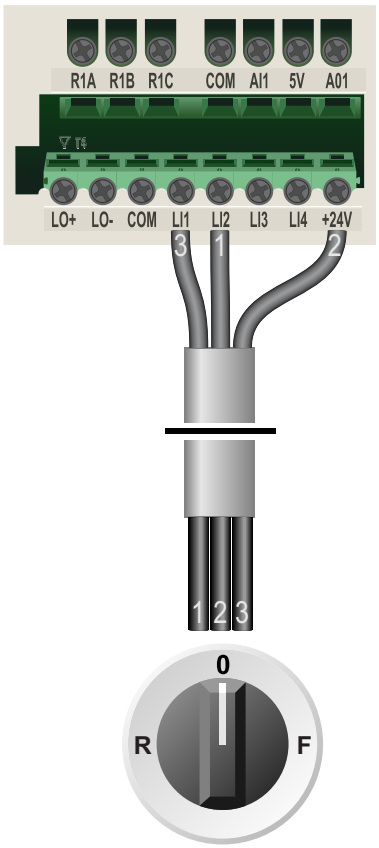
9. How to connect and configure a Run Forward or Run Reverse switch

The procedure described in section 6 enables Run/Stop operation via the red and green buttons on the Inverter.
If this is unsuitable for the application, a remote switch can be used instead.
This section explains how to enable 2-wire control with Run Forward / Stop / Run Reverse commands via a single selector switch.

For this example, **the Inverter should be in terminal (remote) control mode** (no lamps illuminated on the left side of the display). Press and hold the "MODE" key for 3 seconds to switch from local to remote if required.

9.1 Relevant parameters for remote Run/Stop

Parameter	Description	How to set
Conf → FULL → CtL → **CHCF**	Channel Configuration	Default is "Sin"; set to **"SEP"** to separate speed and control commands.
Conf → FULL → CtL → **Cd1**	Command Channel 1	Default is **"ter"** (terminals); default is required for this example.
Conf → FULL → I_O → **tCC**	Type of Control	Default is **"2C"** (2-wire control); default is required for this example. **Press and hold the dial centre until the CONF and Value lamps stop flashing (approx. 2 seconds) to save changes.**
Conf → FULL → Fun → **rrS**	Reverse Direction	Default is "n0"; change to **"L2H"** for reverse via LI2 high (+24V).



Switch, 3 Position
Normally Open
"Run Forward / Stop / Run Reverse"

9.2 Connecting the Switch

A wiring diagram is shown in the illustration opposite.
A suitable 3 position NO (Normally Open) switch should be installed between terminals COM, LI1 and LI2. The centre position should remain open circuit.

When run forward is selected (+24V to LI1) the motor will accelerate from 0 to the currently-selected speed set point.

When run reverse is selected (+24V to LI2) the behavior is the same but the motor will run in reverse. The speed shown on the display will be prefixed with a minus (-) to indicate reverse.

When stop is selected (open circuit) the motor will decelerate to zero. The display will revert to the "rdy".

If the application only requires the motor to turn in one direction, change the 3 position switch to a 2 position switch and remove the connection to terminal LI2.

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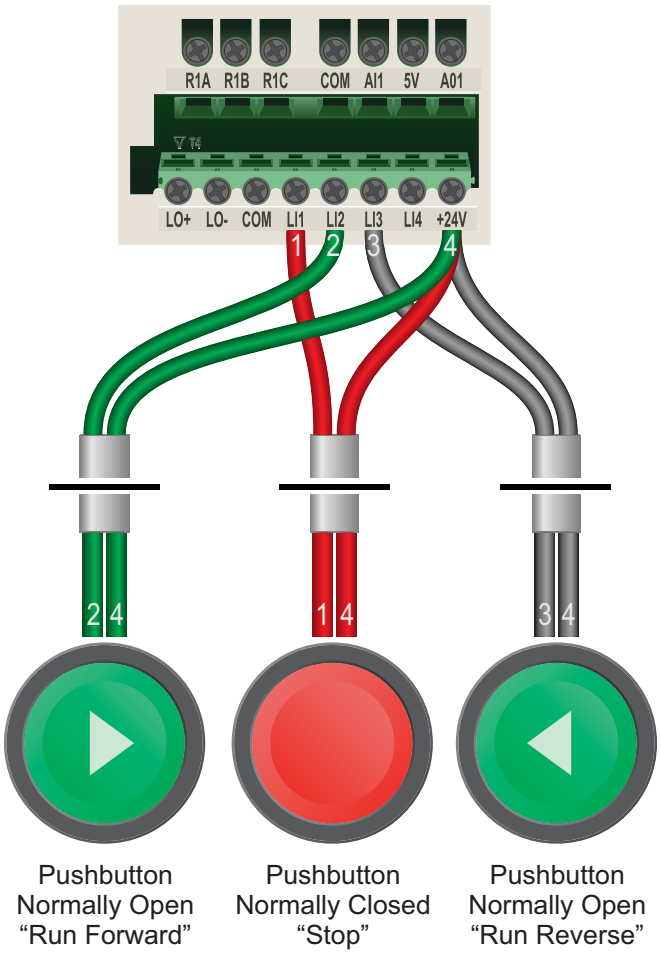
10. How to configure “3-Wire” control with Run Forward Run Reverse and Stop pushbuttons

The procedure described in section 6 enables Run/Stop operation via the red and green buttons on the Inverter.
If this is unsuitable for the application, remote switches can be used instead.
This section explains how to enable 3-wire control with Run Forward, Run Reverse and Stop commands via separate pushbuttons

For this example, **the Inverter should be in terminal (remote) control mode** (no lamps illuminated on the left side of the display). Press and hold the “MODE” key for 3 seconds to switch from local to remote if required.

10.1 Relevant parameters for remote 3-wire control

Parameter	Description	How to set
Conf → FULL → CtL → **CHCF**	Channel Configuration	Default is “Sin”; set to **“SEP”** to separate speed and control commands.
Conf → FULL → CtL → **Cd1**	Command Channel 1	Default is **“ter”** (terminals); default is required for this example.
Conf → FULL → I_O → **tCC**	Type of Control	Default is “2C” for 2-wire control; change to **“3C”** for 3-wire control. **Press and hold the dial centre until the CONF and Value lamps stop flashing (approx. 2 seconds) to save changes.**
Conf → FULL → Fun → **rrS**	Reverse Direction	Default is “n0"; change to **“L3H”** for reverse via LI3 high (+24V).



Pushbutton Normally Open “Run Forward”

Pushbutton Normally Closed “Stop”

Pushbutton Normally Open “Run Reverse”

10.2 Connecting the Switches

A wiring diagram is shown in the illustration opposite.
Three suitable pushbuttons should be installed:-
Stop: a normally closed contact between terminals +24V and LI1
Run Forward: a normally open contact between terminals +24V and LI2.
Run Reverse: a normally open contact between terminals +24V and LI3.

A momentary connection between +24V and LI2 will start the motor (forward). It will continue to run until the connection between +24V and LI1 is broken. A momentary connection between +24V and LI3 will behave in the same way but the motor will run in reverse.

If the application only requires the motor to turn in one direction, the “Run Reverse” switch can be omitted.

The display will show “nST” if LI1 and +24V are not connected and the motor is stopped.

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11. How to reset the Inverter to Factory Defaults



11.1 Access “modes” menu

Important: remove or disable any cables connected to the green IO terminal block that may cause the motor to start when the reset process completes.
From the “rdy” prompt press the centre of the dial to access the mode selection menu.
Note: to return to the “rdy” prompt press the “ESC” key repeatedly until it is displayed. If the Inverter is in “local” control (left lamps flashing in sequence) press and hold the “MODE” key for 3 seconds to switch to “remote”.



11.2 Select “Conf” mode

Rotate the dial until COnF (configure) is displayed. Press the centre of the dial to select it.

The corresponding lamp on the left side of the screen also indicates which mode is selected.



11.3 Select the “FCS” parameter shortcut.

Rotate the dial until “FCS” (Factory / recall customer parameter set) is displayed.

Press the centre of the dial to select it.



11.4 Change the value to “Inl”.

The display will initially show “nO” to indicate no reset. Rotate the dial to select “Inl” for a reset to factory defaults.
Press and hold the dial centre until the CONF and Value lamps stop flashing (approx. 2 seconds) to start the reset process.

The Inverter will reset and return to the “FCS” prompt above. Press “ESC” twice to return to “rdy”.

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