Appendix A: Accessories

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Fuses/Circuit Breakers

Protection devices are essential to prevent damage to your ACG drive and application equipment. Please use the fuse specification chart below to select fuses that are applicable to your ACG drive. Only use UL-certified 600V fuses which comply with your local regulations.

Drive	Drive Voltage	HP (HD)	Fuse Amps (Class H or RK5)	Suggested ADC Class RK5 Fuses	Circuit Breaker	
					Size	Model*
ACG-20P5	200-240	0.5	10	ECSR10	15	UTE100H
ACG-21P0	200-240	1	10	ECSR10	15	
ACG-22P0	200-240	2	15	ECSR15	15	
ACG-23P0	200-240	3	20	ECSR20	20	
ACG-25P0	200-240	5	30	ECSR30	30	
ACG-27P5	200-240	7.5	50	ECSR50	50	UTS150H
ACG-2010	200-240	10	60	ECSR60	60	
ACG-2015	200-240	15	80	ECSR80	80	
ACG-2020	200-240	20	100	ECSR100	100	
ACG-40P5	380-480	0.5	10	ECSR10	3.2	UTS150L
ACG-41P0	380-480	1	10	ECSR10	6.3	
ACG-42P0	380-480	2	10	ECSR10	12	
ACG-43P0	380-480	3	15	ECSR15	12	
ACG-45P0	380-480	5	20	ECSR20	20	
ACG-47P5	380-480	7.5	30	ECSR30	32	
ACG-4010	380-480	10	35	ECSR35	32	
ACG-4015	380-480	15	50	ECSR50	50	
ACG-4020	380-480	20	60	ECSR60	60	
ACG-4025	380-480	25	70	ECSR70	70	
ACG-4030	380-480	30	100	ECSR100	90	

** Manufactured by LS Electric.*

Caution: Only use 600V Class H or RK5, UL listed input fuses and UL listed circuit breakers. See the table above for the current ratings for fuses and circuit breakers.

Maximum allowed prospective short-circuit current at the input power connection is defined in IEC 60439-1 as 100 kA. Depending on the selected MCCB, the ACG Series is suitable for use in circuits capable of delivering a maximum of 100 kA RMS symmetrical amperes at the drive's maximum rated voltage. The following table shows the recommended MCCB for RMS symmetrical amperes.

High Performance EMI Input Filters

The optional accessories listed in this chapter are available for use with the ACG drive. Selection of these accessories is application specific and may improve drive performance. Additional information regarding filter installation and operation is available in the AutomationDirect white paper, "Applied EMI/RFI Techniques Overview."

Drive	Drive Voltage	HP (HD)	Roxburgh Filters Chassis Type 1ph *1	Roxburgh High Performance Filters *2	Roxburgh Max Performance Filters *3
ACG-20P5	200-240	0.5	RES90F03	KMF306A	MIF310
ACG-21P0	200-240	1	RES90F10	KMF310A	MIF310
ACG-22P0	200-240	2	RES90F16	KMF318A	MIF316
ACG-23P0	200-240	3	RES90F16	KMF318A	MIF316
ACG-25P0	200-240	5	RES90S20	KMF325A	MIF323
ACG-27P5	200-240	7.5	–	KMF336A	MIF350
ACG-2010	200-240	10	–	KMF350A	MIF350
ACG-2015	200-240	15	–	KMF370A	MIF375
ACG-2020	200-240	20	–	KMF3100A	MIF3100
ACG-40P5	380-480	0.5	–	KMF306A	MIF310
ACG-41P0	380-480	1	–	KMF306A	MIF310
ACG-42P0	380-480	2	–	KMF306A	MIF310
ACG-43P0	380-480	3	–	KMF310A	MIF310
ACG-45P0	380-480	5	–	KMF318A	MIF316
ACG-47P5	380-480	7.5	–	KMF318A	MIF323
ACG-4010	380-480	10	–	KMF336A	MIF330B
ACG-4015	380-480	15	–	KMF336A	MIF350
ACG-4020	380-480	20	–	KMF350A	MIF350
ACG-4025	380-480	25	–	KMF350A	MIF350
ACG-4030	380-480	30	–	KMF370A	MIF375

**1 -EMI rating for motor cable length: C2 to 75Ft, C1 to 30ft*
**2 -EMI rating for motor cable length: C2 to 150Ft, C1 to 75ft*
**3 -EMI rating for motor cable length: C2 to 300Ft, C1 to 150ft*

EMI Filter Installation

Electrical equipment like the ACG drive, will generate electrical noise when in operation and may interfere with the normal operation of peripheral equipment. The use of an EMI filter will mitigate this type of power supply interference. Other measures may be required for reduction or mitigation of radiated emissions. Roxburgh EMI filters have been tested with the ACG family of drives and are recommended for the mitigation of interference and the highest performance When the ACG drive and Roxburgh EMI filter are installed and wired according to the user manual, the installation will conform to the following rules:

- *EN61000-6-4*
- *EN61800-3: 1996*
- *EN55011 (1991) Class A Group 1 (1st Environment, restricted distribution)*

General precaution

1) *Install the EMI filter and ACG drive on the same subpanel or metal plate.*
2) *Install the EMI filter as close as possible to the ACG drive.*
3) *Keep wiring between the EMI filter and ACG drive as short as possible.*

4) *The subpanel or metal plate used to support the EMI filter and ACG drive should be well grounded (minimal resistance to ground is typically less then 1Ω).*
5) *To insure that the EMI filter and ACG drive are adequately grounded, insure that both are securely attached to the subpanel or plate.*

Choose suitable motor cable and precautions

Proper installation and the the choice of good motor cable will positively affect the performance of the filter. When selecting motor cable, please observe the following precautions.

1) *Cable shielding (double shielding is best).*
2) *Ground the shield on both ends of the motor cable. Maintain minimum length and employ strong mechanical connection to ground.*
3) *Remove paint on the metal saddle, subpanel or plate to insure good contact to ground.*

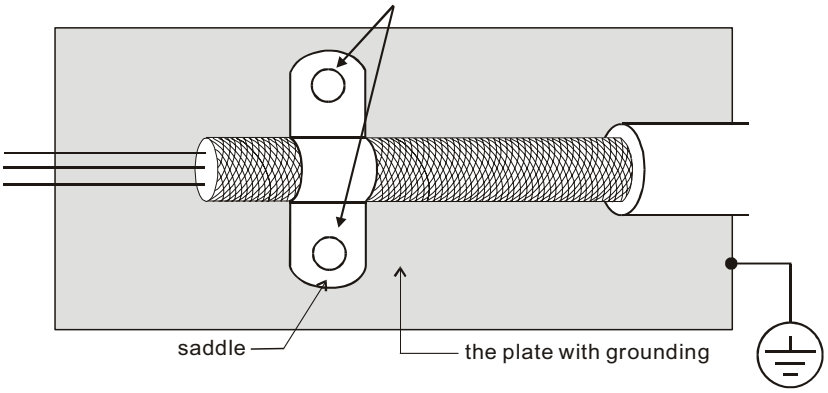


Figure 1

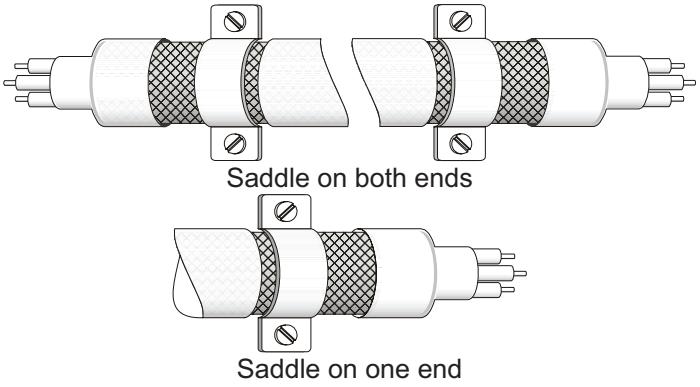


Figure 2

Reflective Wave Phenomenon

The drive section of a PWM drive like the ACG does not produce sinusoidal output voltage wave forms. Rather, the output voltage produced is a continuous train of width modulated pulses, sent to the motor terminals via the motor cable.

Peak pulse voltage at the ACG drive is equal to the drive DC bus voltage and contains steep rise and fall times, the result of the IGBT switching device used in the drive drive section.

Peak pulse voltage at the motor terminals may exceed the drive DC bus voltage and is dependent on the dynamics of the drive output voltage rise time, cable transmission line characteristics, cable length and motor impedance.

The voltage pulse train at the motor terminals experiences momentary transient over voltage as the IGBT transistors switch. The result being voltage levels at the motor terminals double that of the drive bus voltage.

Over voltage of this type has the potential to stress the motor insulation, damaging the motor.

Recommended Motor Cable Length

1) *Never connect phase lead capacitors or surge absorbers to the output terminals of the drive.*
2) *As cable length increases, capacitance between cables will increase and may result in leakage current and over current faults with the possibility of damage to the ACG drive.*
3) *If more than one motor is connected to the drive, the total cable length is the sum of the cable lengths from the ACG drive to each motor.*
4) *Should an overload relay malfunction occur, lower the ACG drive carrier frequency (Cn.4) or install an output reactor.*
5) *When operating an AC motor with a PWM drive like the ACG, the motor may experience reflective wave as described above. To prevent this situation, please observe the recommendations below:*
   a) Use a motor with enhanced insulation. (1000V, 1200V, 1600V, higher is better)
   b) Connect an output reactor (optional) on the drive output wiring.
   c) Keep motor cable length as short as possible. (65ft, 20m, or less)
   d) Where motor cable lengths will exceed 65ft (20m),

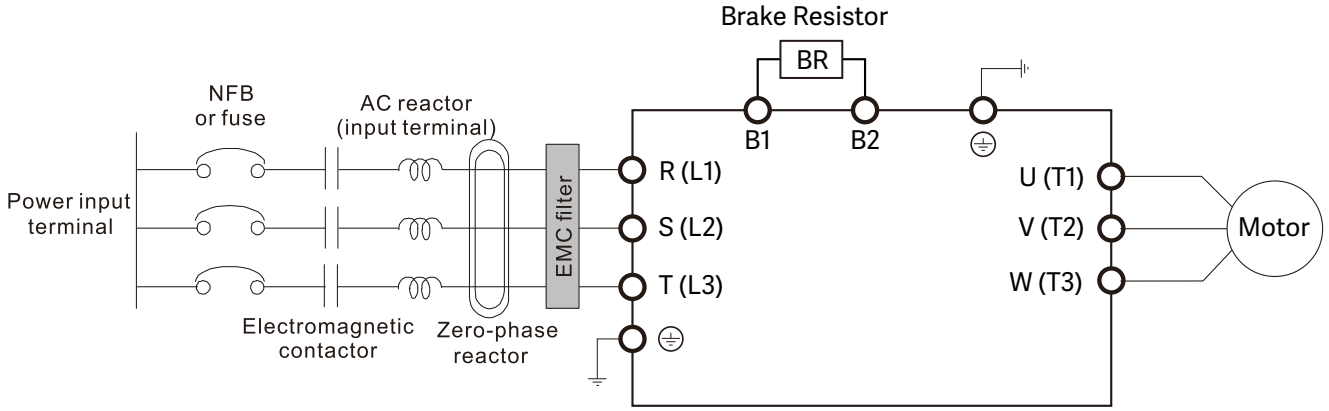
Line Reactors / Voltage Time Filters

Line Reactor

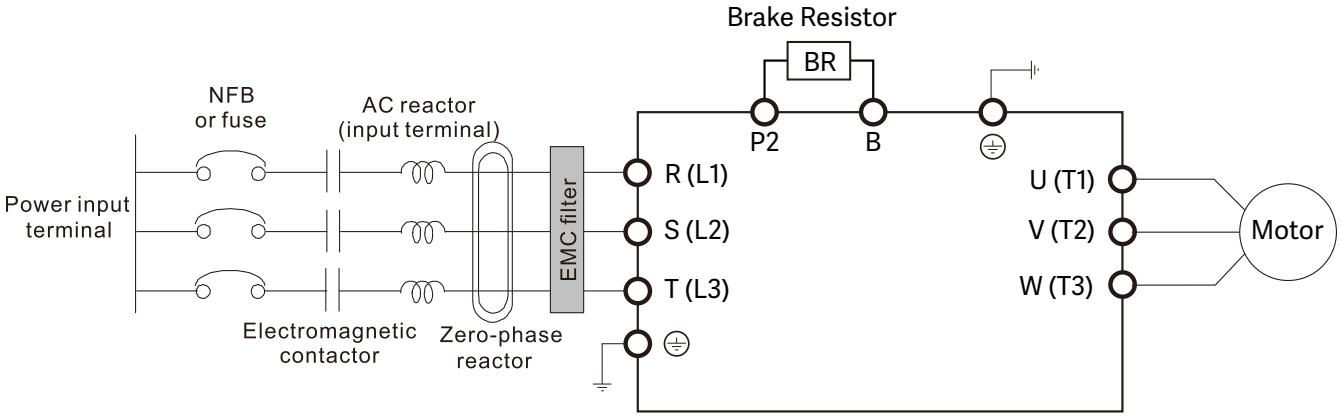
Installing an AC reactor on the input side of an AC motor drive can increase line impedance, improve the power factor, reduce input current, increase system capacity, and reduce interference generated from the motor drive. It also reduces momentary voltage surges or abnormal current spikes from the mains power, further protecting the drive. For example, when the main power capacity is higher than 500 kVA, or when using a phase-compensation capacitor, momentary voltage and current spikes may damage the AC motor drive's internal circuit. An AC reactor on the input side of the AC motor drive protects it by suppressing surges.

Install an AC input reactor in series between the main power and the three input phases R S T, as shown in the figures below:

0.5–10 hp Drives:



15–30 hp Drives:



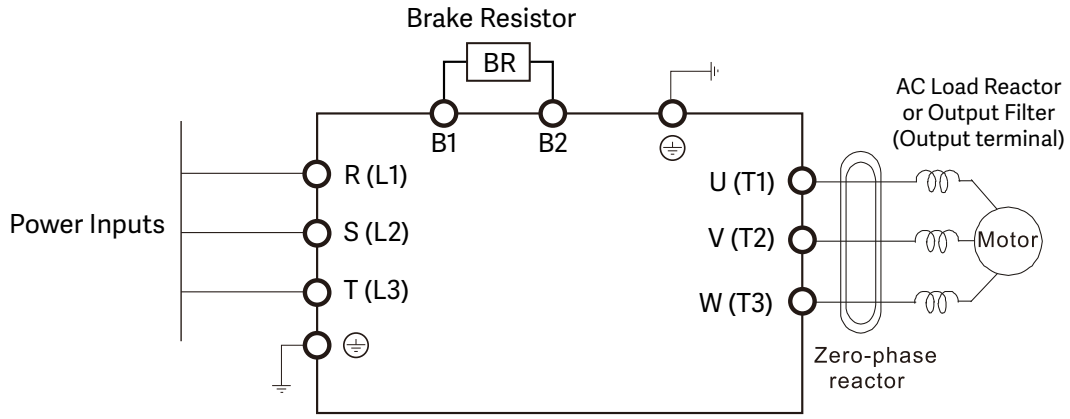
Load Reactor/Voltage Time Filter

When using drives in long wiring output application, ground fault (GFT), over-current (OC) and motor over-voltage (OV) often occur. GFT and OC cause errors due to the drive's self-protective mechanism; over-voltage damages motor insulation.

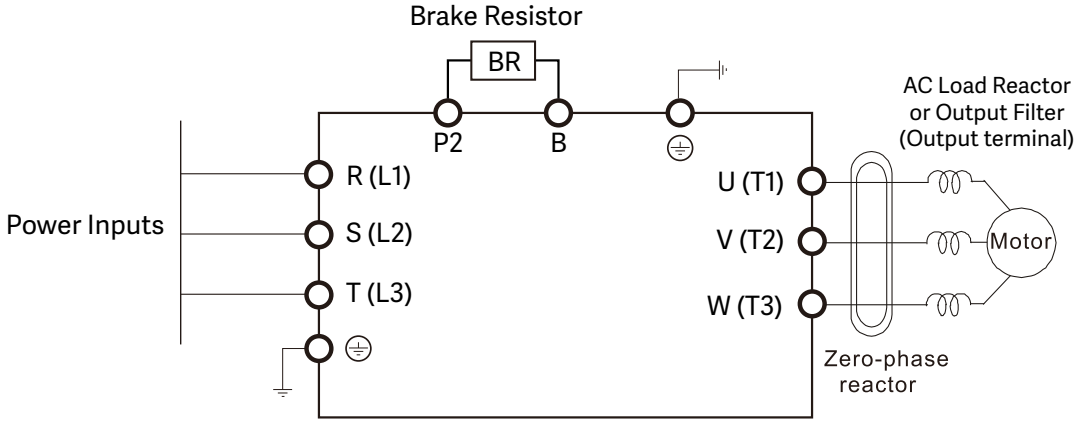
The excessive length of the output wires makes the grounded stray capacitance too large, increases the three-phase output common mode current, and the reflected wave of the long wires makes the motor dv / dt and the motor terminal voltage too high. Thus, installing a reactor on the drive's output side can increase the high-frequency impedance to reduce the dv / dt and terminal voltage to protect the motor. For AC Drive-to-Motor wiring distances over 100 feet, use of a VTF dV/dT output filter is recommended.

Install an AC output reactor or voltage time filter in series between the three output phases U V W and the motor, as shown in the figures below:

0.5–10 hp Drives:



15–30 hp Drives:

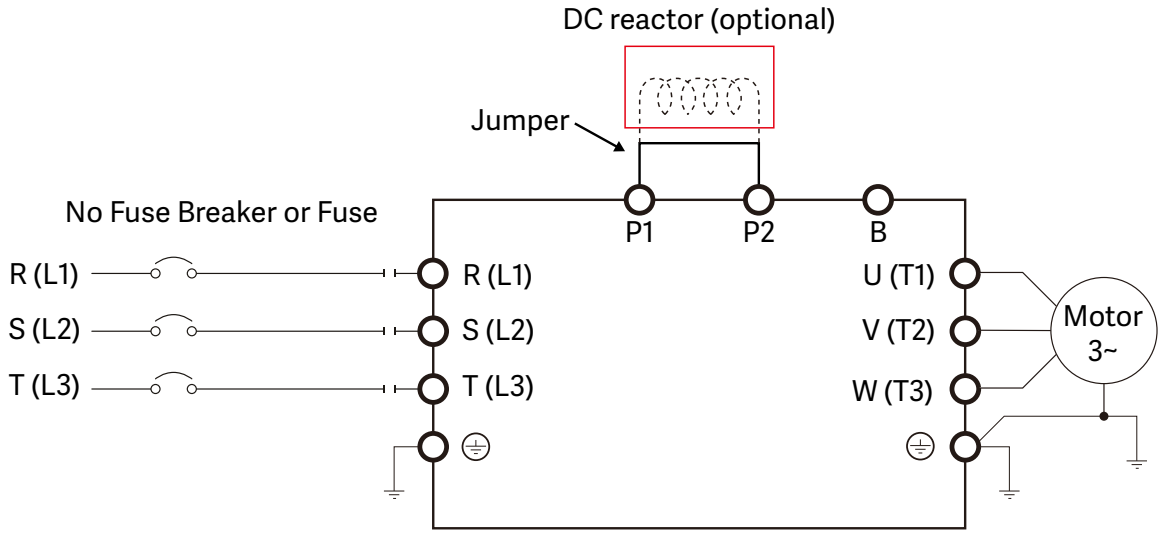


DC Reactor

A DC reactor can also increase line impedance, improve the power factor, reduce input current, increase system power, and reduce interference generated from the motor drive. A DC reactor stabilizes the DC bus voltage. Compared with an AC input reactor, a DC reactor is in smaller size, lower price, and lower voltage drop (lower power dissipation).

Install a DC reactor between terminals P1 and P2 Remove the jumper, as shown in the figure below, before installing a DC reactor.

Note: DC Reactor is only supported on 15–30 hp drives.



When the ACG drive is connected directly to a large-capacity power transformer (600kVA or above) or when a power correction capacitor is switched on, excessive peak currents may occur in the input power circuit resulting in damage to the ACG drive.

To avoid this, install a line reactor in series with the ACG drive on the input side. The installation of a line reactor will reduce input current peaks and improve the output power efficiency.

Line (load) reactors installed on the output side protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also allow the motor to run cooler by “smoothing” the motor current waveform. They are recommended for operating any motors where the length of wiring between the AC drive and motor is less than or equal to 100 feet. For AC drive-to-motor wiring distances over 100 feet or or when enhanced protection from reflected waves is critical to the application, use of the VTF series output filter is recommended.

Line/Load Reactors and Output Filters Selection Charts

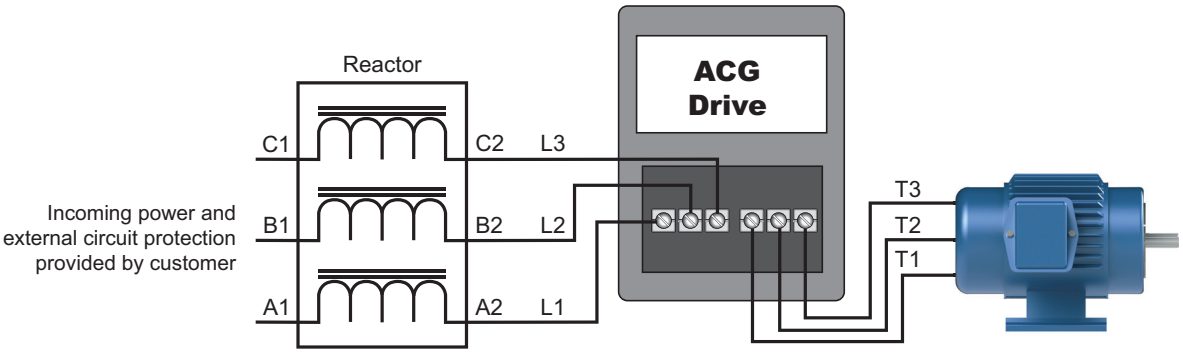
Drive	Voltage	HP	Input (Amps)	Output FLA 3ph (Amps)	AC Input Line Reactor		AC Output Load Reactor		AC dVdT Output Filter**		DC reactor values Induct./ Current
					3ph input	1ph input	3ph input	1ph input	3ph input	1ph input	
ACG-20P5	200-240	0.5	2.2	2.5	LR2-20P5	LR2-20P2	LR2-20P5	LR2-20P2	VTF-246-CFG	VTF-46-DE	*
ACG-21P0		1	4.9	5.0	LR2-21P0	LR2-21P0	LR2-21P0	LR2-20P5	VTF-24-FH	VTF-246-CFG	
ACG-22P0		2	8.4	8.0	LR-23P0	LR-25P0	LR2-22P0	LR2-22P0	VTF-246-GJJ	VTF-24-FH	
ACG-23P0		3	11.8	11.0	LR-23P0	LR-23P0	LR2-22P0	LR2-22P0	VTF-4-M	VTF-246-GJJ	
ACG-25P0		5	18.5	17.0	LR-25P0	LR-2010	LR-25P0	LR2-22P0	VTF-46-LM	VTF-246-HKL	
ACG-27P5		7.5	25.8	24.0	LR-2010	LR-2015	LR-27P5	LR-25P0	VTF-246-KMN	VTF-24-JL	
ACG-2010		10	34.9	32.0	LR-2015	LR-2020	LR-2010	LR-25P0	VTF-246-LPQ	VTF-46-LM	
ACG-2015		15	53.2	47	LR-2020	LR-2030	LR-2015	LR-2010	VTF-246-NRS	VTF-46-NP	0.95/61
ACG-2020		20	68.4	60	LR-2025	LR-2040	LR-2020	LR-2010	VTF-246-PSU	VTF-246-LPQ	0.70/75
ACG-40P5	380-480	0.5	1.1	1.3	LR2-40P5				VTF-46-DE		*
ACG-41P0		1	2.4	2.5	LR2-41P0				VTF-246-CFG		
ACG-42P0		2	4.2	4.0	LR2-42P0				VTF-246-DGH		
ACG-43P0		3	5.9	5.5	LR2-43P0				VTF-24-FH		
ACG-45P0		5	9.8	9.0	LR2-45P0				VTF-46-DE		
ACG-47P5		7.5	12.9	12.0	LR2-47P5				VTF-46-DE		
ACG-4010		10	17.5	16.0	LR-4010				VTF-24-JL		
ACG-4015		15	27.2	24	LR-4015				VTF-246-KMN		1.90/32
ACG-4020		20	35.3	31	LR-4020				VTF-246-LPQ		1.40/41
ACG-4025		25	44.5	39	LR-4025				VTF-246-MQR		1.00/49
ACG-4030		30	51.9	45	LR-4030				VTF-246-MQR		0.70/64

** Only drives from 15–30 hp support DC reactors.*
*** NEMA1 versions also available. Add "-N1" to the end of the part number for NEMA1.*

Line Reactor Applications and Wiring Connections

Input Side of AC Drive

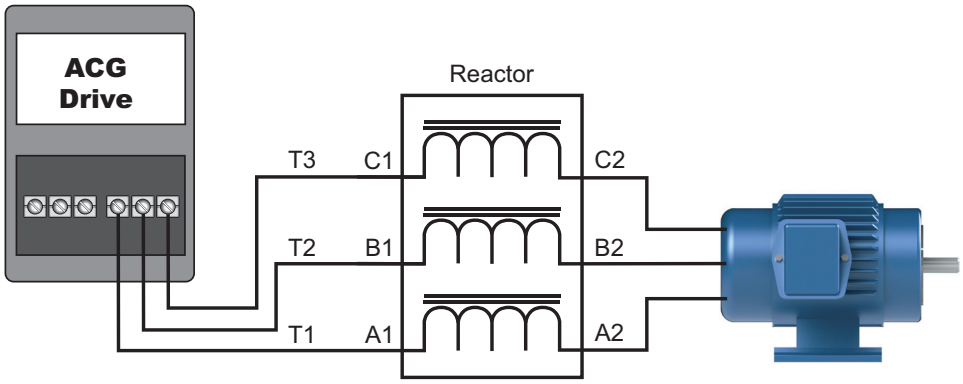
When installed on the input side of the ACG drive, a line reactor will reduce line notching, current peaks, voltage spikes and surges from the incoming line, as well as reduce the available short circuit current. A line reactor will also reduce harmonic distortion from the ACG drive onto the line. The line reactor is installed in front of the ACG drive as shown.



Please refer to "Chapter 2: Installation and Wiring" for detailed wiring information for the ACG drive.

Output Side of AC Drive

When installed on the output side of the ACG drive, line (load) reactors help to protect the ACG drive from short circuits at the load. Voltage and current waveforms from the ACG drive are enhanced, reducing motor overheating and noise emissions.

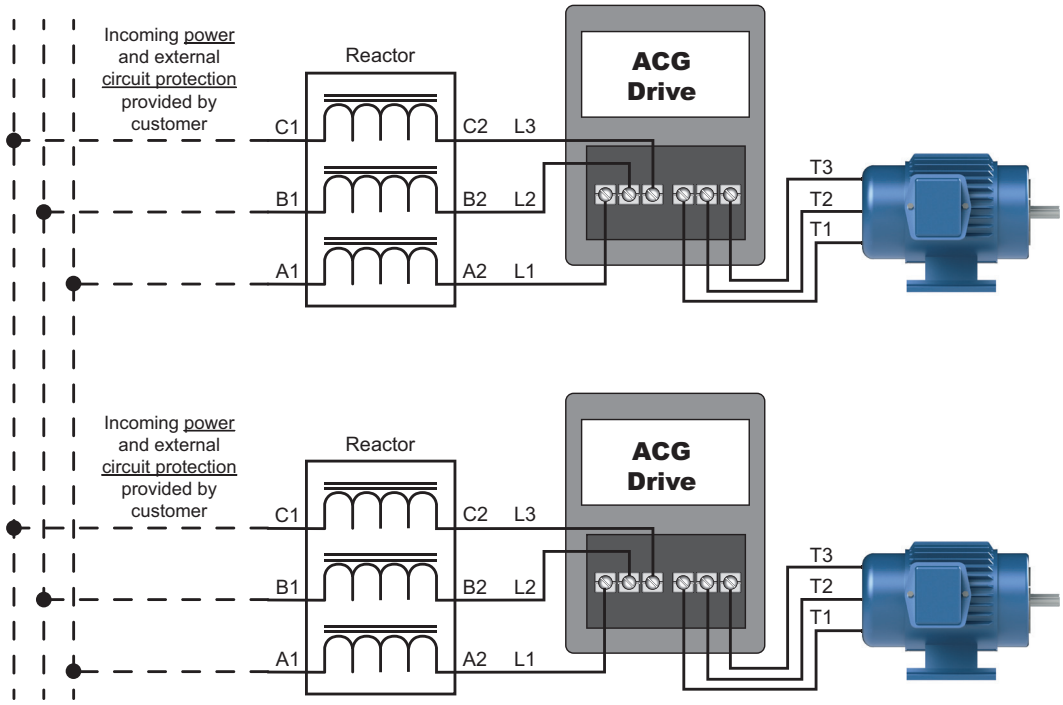


Please refer to "Chapter 2: Installation and Wiring" for detailed wiring information for the ACG drive.

Single phase line reactors should NOT be installed on the output side of an AC Drive. Use only three-phase reactors on drive outputs, and only for three-phase motors.

Multiple AC Drives

Individual line reactors are recommended when installing multiple ACG drives on the same power line. Individual line reactors eliminate cross-talk between multiple ACG drives and provide isolated protection for each ACG drive for its own specific load.

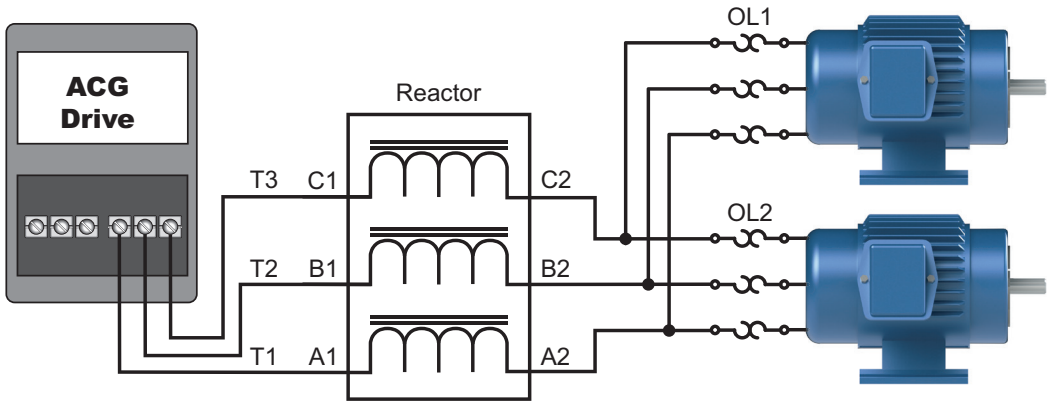


Please refer to "Chapter 2: Installation and Wiring" for detailed wiring information for the ACG drive.

Multiple Motors

A single output (load) reactor can be used with multiple motors on the same ACG drive, but only if the motors operate simultaneously. Size the reactor based upon the total horsepower of all the motors, and select a reactor with a current rating greater than the sum of the motor full-load currents. Overload relays are required for use in multi-motor applications. Additional Motor OL's should be interlocked with the ACG Drive control terminal; "BX" or "EXTERNAL Fault" input.

Multiple motors only work with V/Hz mode.

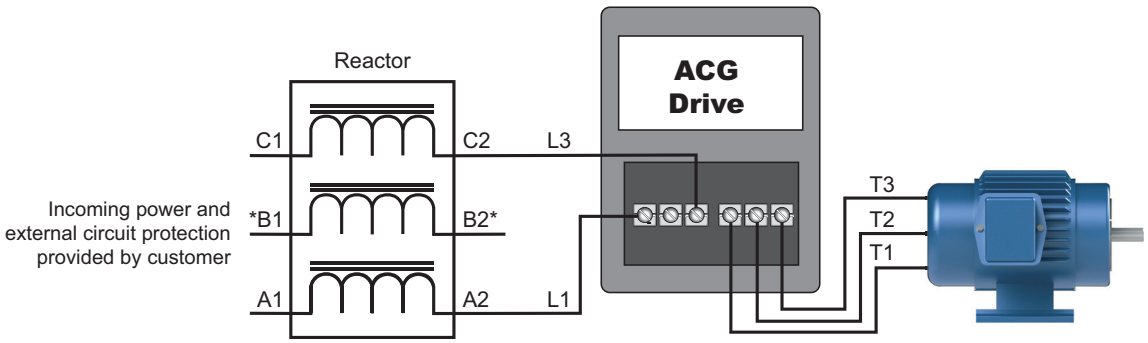


Please refer to "Chapter 2: Installation and Wiring" for detailed wiring information for the ACG drive.

A single reactor should be used with multiple motors ONLY when the motors will operate simultaneously from a single AC drive. OVERLOAD RELAYS are required for use in multiple motor applications.

Single-Phase Applications

Some three-phase line reactors are listed for use with single-phase input power. Follow the connection diagram shown below. Make sure that terminals B1 and B2, if present, are properly insulated before any connections are made. If a 3-phase reactor is used on the line side of a single-phase input drive application, ensure that the actual single-phase current does not exceed the Line Reactor's current rating (example: a 3-phase, 5hp line reactor and 3-phase 5hp drive will not handle enough current to power a 5hp motor on a single-phase supply - both the drive and the line reactor will have to be doubled). An input line reactor is strongly recommended for any single phase applications.



*LR series 1-phase reactors do not include a B-phase winding.

Please refer to "Chapter 2: Installation and Wiring" for detailed wiring information for the ACG drive.

Ensure that you properly insulate terminals B1 and B2 before making any connections to single-phase power.

Recommended Cable Length

Motor Leakage Current

If the cable length is too long, the stray capacitance between cables increases and may cause leakage current. This activates over-current protection, increases leakage current, or may affect the current display. In the worst case, it may damage the AC motor drive. If more than one motor is connected to one AC motor drive, the total wiring length should be the sum of the wiring length from AC motor drive to each motor.

For the 460V series AC motor drive, when you install an overload thermal relay between the drive and the motor to protect the motor from overheating, the connecting cable must be shorter than 50m. However, an overload thermal relay malfunction may still occur. To prevent the malfunction, install an output reactor (optional) to the drive or lower the carrier frequency setting.

Motor Surge Voltage

When a motor is driven by a PWM-type AC drive, the motor terminals experience surge voltages (dv/dt) due to power transistor conversion of the drive. For very long motor cable (especially for the 460V series), surge voltages (dv/dt) may damage the motor insulation and bearing. To prevent this, follow these rules:

A) Use a motor with enhanced insulation.

B) Reduce the cable length between the AC drive and motor to suggested values.

C) Connect an output reactor (optional) to the output terminals of the AC drive.

For drive models < 480V, use a motor with a rated voltage ≤ 500 VAC and an insulation level ≥ 1.35 kVp-p in accordance with IEC 60034-17. For the 575V drive model, use a motor with a rated voltage ≤ 600 VAC and an insulation level ≥ 1.79 kVp-p in accordance with IEC 60034-25.

Dynamic Braking

Dynamic braking resistors dissipate the regeneration energy of AC motors when they are being controlled to a stop faster than a coasting stop. Compatible brake resistors can be viewed by clicking the link in the table below. All drives have the braking function built-in and do not require a separate dynamic braking unit. See "Terminals for Connecting DC Reactor, External Brake Resistor, and DC Circuit" on page 2–18 for brake wiring diagrams.

To avoid possible injury, please refer Chapter 2 of this manual for correct wiring of the braking resistors.

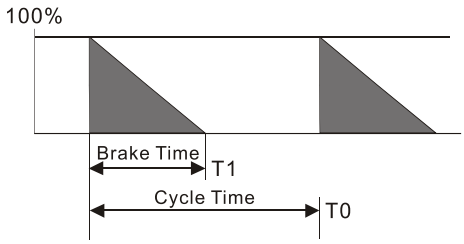
Braking Units

Voltage	Drive	HP	Drive Braking Capacity-Max Torque			Compatible Brake Resistors (150% Torque, 5% Duty Cycle)
			Minimum Resistor	Max Total Brake Current (A)	Peak Power (kW)	
230V	ACG-20P5	0.5	250.0	1.6	0.6	Click here
	ACG-21P0	1	150.0	2.6	1.0	
	ACG-22P0	2	50.0	7.8	3.0	
	ACG-23P0	3	43.0	9.1	3.5	
	ACG-25P0	5	25.0	15.6	6.1	
	ACG-27P5	7.5	18.0	21.7	8.5	
	ACG-2010	10	14.0	27.9	10.9	
	ACG-2015	15	8.6	45.3	17.7	
	ACG-2020	20	8.0	48.8	19.0	
460V	ACG-40P5	0.5	400.0	2.0	1.5	
	ACG-41P0	1	400.0	2.0	1.5	
	ACG-42P0	2	250.0	3.1	2.4	
	ACG-43P0	3	180.0	4.3	3.4	
	ACG-45P0	5	85.0	9.2	7.2	
	ACG-47P5	7.5	75.0	10.4	8.1	
	ACG-4010	10	49.0	15.9	12.4	
	ACG-4015	15	40.0	19.5	15.2	
	ACG-4020	20	22.0	35.5	27.7	
	ACG-4025	25	20.0	39.0	30.4	
	ACG-4030	30	20.0	39.0	30.4	

Please refer to the Dynamic Braking User Manual for more detailed information on braking resistors by clicking here.

Choosing and Installing a Braking Resistor

1) Select the resistance value, power and brake usage (ED %). Definition for Brake Usage ED%:



ED% = T1 / T0 x 100(%)

Explanation:
Brake usage ED (%) is the amount of time needed for the brake unit and brake resistor to dissipate heat generated by braking. When the brake resistor heats up, the resistance increases with temperature, and braking torque decreases accordingly.

For safety, install a thermal overload relay (O.L) between the brake unit and the brake resistor in conjunction with the magnetic contactor (MC) before the drive for additional protection. The thermal overload relay protects the brake resistor from damage due to frequent or continuous braking. Under such circumstances, turn off the power to prevent damage to the brake resistor and drive.

Note: Never use the thermal overload relay to disconnect the brake resistor.

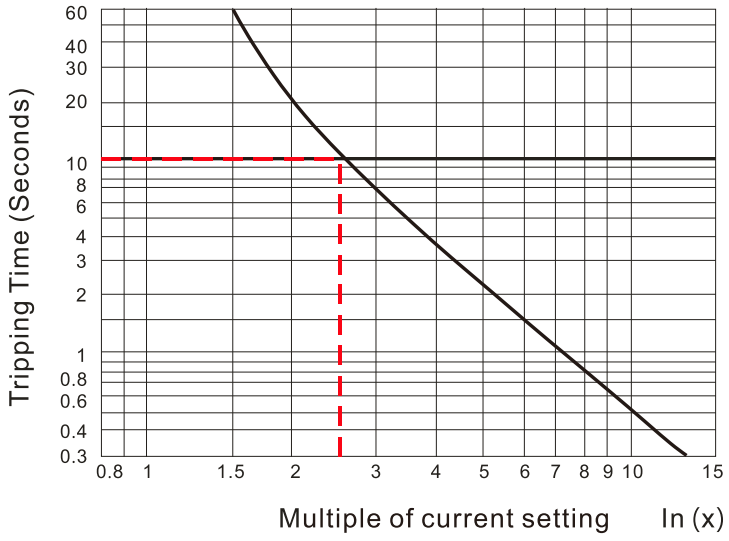
2) Any damage to the drive or other equipment caused by using brake resistors and brake modules that are not provided by AutomationDirect voids the warranty.

3) Consider environmental safety factors when installing the brake resistors. If you use the minimum resistance value, consult AutomationDirect for the power calculation.

4) Refer to the ADC Dynamic Braking unit User Manual for more detail on braking resistors (https://cdn.automationdirect.com/static/manuals/gs3dbm/gs-db_ump.pdf)

5) The selection tables are for 5% duty cycle. If the AC motor drive requires frequent braking, increase the Watts by two to three times.

6) Thermal Overload Relay (TOR):
Thermal overload relay selection is based on its overload capacity. A standard braking capacity of the ACG is 5% ED (Tripping time=10 s). As shown in the figure below, a 460V, 1kw ACAN required the thermal relay to take 260% overload capacity for 10 seconds (hot starting) and the braking current is 24A. In this case, select a thermal overload relay rated at 10A (10 * 260% = 26 A > 24 A). The property of each thermal relay may vary among different manufacturers. Carefully read the specification before using it.



ACG-KPD

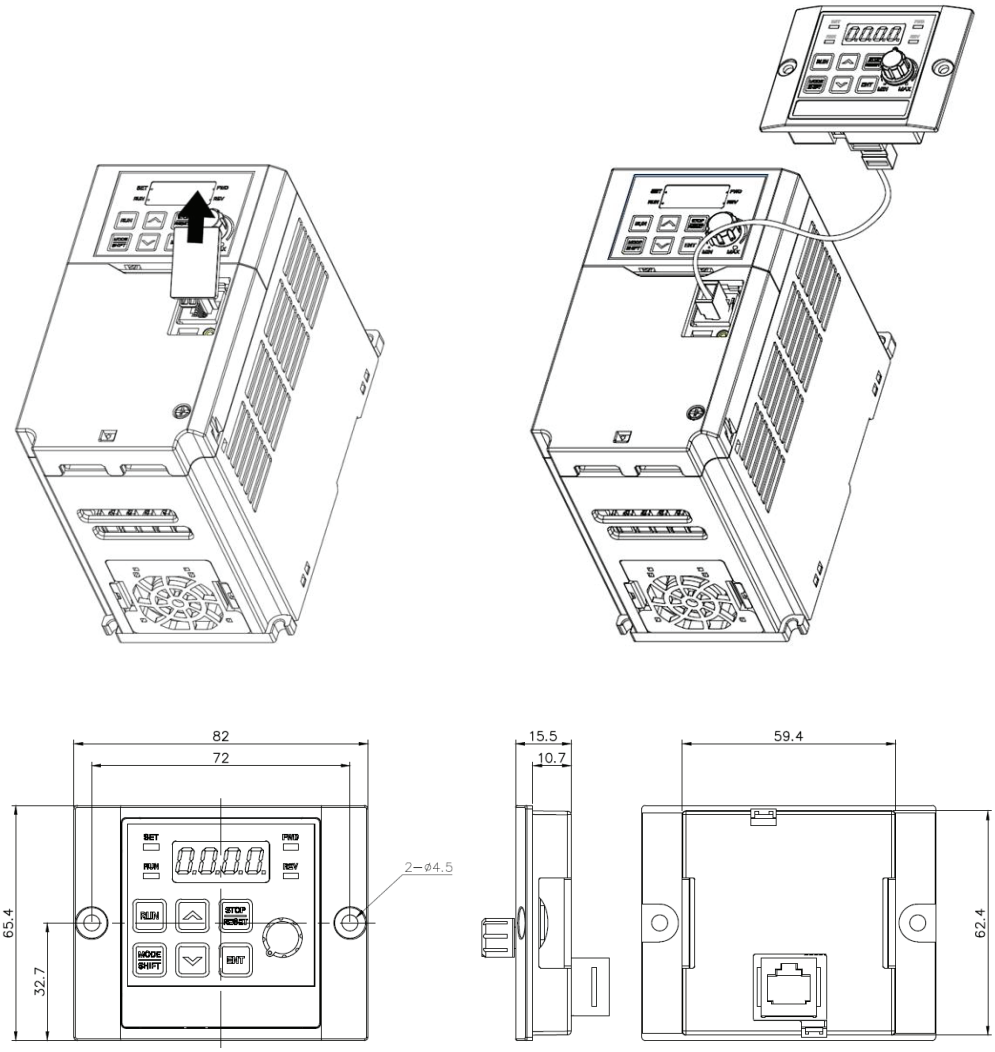
The Remote LED keypad provides access to the ACG series drive from outside of the panel while maintaining the same functionality as the built-in keypad.

About the Keypad

A keypad is used to set drive parameters, monitor the drive's status, and operate the drive. The ACG-KPD accessory consists of a remote keypad and 5m cable.

Key Functions

The remote keypad supports the same functions as the built-in keypad. It can also be used to upload and download parameters to/from the same model drive using parameter dr.91.



Installation

1) *Remove the RJ45 terminal cover on the drive I/O cover. Connect the remote keypad cable to the I/O RJ45 connector.*
2) *Connect the other end of the connector of the remote keypad cable to the remote keypad.*

Operation

1) *Once connected to the remote keypad, the drive keypad and the potentiometer dial are ignored. The input is replaced by the keypad and potentiometer dial input from the remote keypad.*
   - *Within 2 seconds of detaching the remote keypad, the input for the keypad and potentiometer dial is reset to the drive keypad. (If the frequency setting is set to potentiometer dial input, the command frequency will instantly switch between the drive keypad potentiometer dial and the remote keypad potentiometer dial when attaching and detaching. Use caution to ensure that the motor does not switch to the wrong frequency.)*
   - *If communication is not linked between the drive and the remote keypad, "E.vEr" is displayed on the 7-Seg of the remote keypad.*

2) *Set the dr.91 parameter to 4 in a state of connecting the remote keypad to copy the parameter settings saved in the drive to the remote keypad.*
   - *"r-UL" is displayed on the drive I/O 7-Seg keypad while upload is in progress. "d" is displayed on the 7-Seg keypad of the remote keypad. After saving, the message disappears and the default screen is displayed.*
   - *If there is an error, such as poor communication while the upload is in progress, a warning message saying "Fail" is displayed for 3 seconds, and the action of saving the parameters into the remote keypad fails.*

3) *After connecting the remote keypad where the parameter settings are copied to the drive product of same model, set the dr 91 parameter to 5, and copy the parameter settings saved in the remote keypad to the drive.*
   - *While saving, a message saying "W-dL" is displayed on the drive I/O 7-Seg. "U" is displayed on the 7-Seg of the remote keypad. After saving, the message disappears and the default screen is displayed. If parameter data is not saved in the remote keypad, you cannot set the dr 91 parameter to 5.*
   - *If there is an error such, as poor communication with the remote keypad, a warning message saying "Fail" is displayed for 3 seconds, and the action of saving the parameters into the drive fails.*
   - *If the parameter code version or the drive model is different (copying parameters between 230V and 460V products), the WErr warning is displayed for 5 seconds, and the action of saving parameters into the drive fails.*

Caution: Only copy parameters between drives of the same model number.

Parameter Lock

Use parameter view lock to hide parameters after registering and entering a user password.

Group	Pr. Code	Name	Parameter Setting	Setting Range	Unit
dr	dr.94	Password registration	–	0–9999	–
	dr.95	Parameter lock settings	–	0–9999	–

Parameter Lock Setting Details

<table>
<tr><th>Code and Features</th><th>Description</th></tr>
<tr><td>dr.94</td><td>Register a password to prohibit parameter modifications. Follow the procedures below to register a password.
<table>
<tr><th>Step</th><th>Procedures</th></tr>
<tr><td>1</td><td>Press the [ENT] key on dr.94 code and the saved password input window will be displayed. If password registration is being made for the first time, enter 0. It is the factory default.</td></tr>
<tr><td>2</td><td>If a saved password has been set, enter the saved password.</td></tr>
<tr><td>3</td><td>If the entered password matches the saved password, then a new window to enter a new password will be displayed. (The process will not move to next stage until the user enters a valid password).</td></tr>
<tr><td>4</td><td>Register a new password.</td></tr>
<tr><td>5</td><td>After registration, Code dr.94 will be displayed.</td></tr>
</table></td></tr>
<tr><td>dr.95</td><td>Press the [ENT] key when the change prevention feature is disabled, and UL (Unlocked) is displayed. Press the [ENT] key again a field to input password is shown. Enter the password and the Locked display is shown. Even if you press [ENT] key from the function code to change the changing the parameter, this will not be changed to edit mode. Enter password again to display UL (Unlocked). The change prevention feature is disabled.</td></tr>
</table>

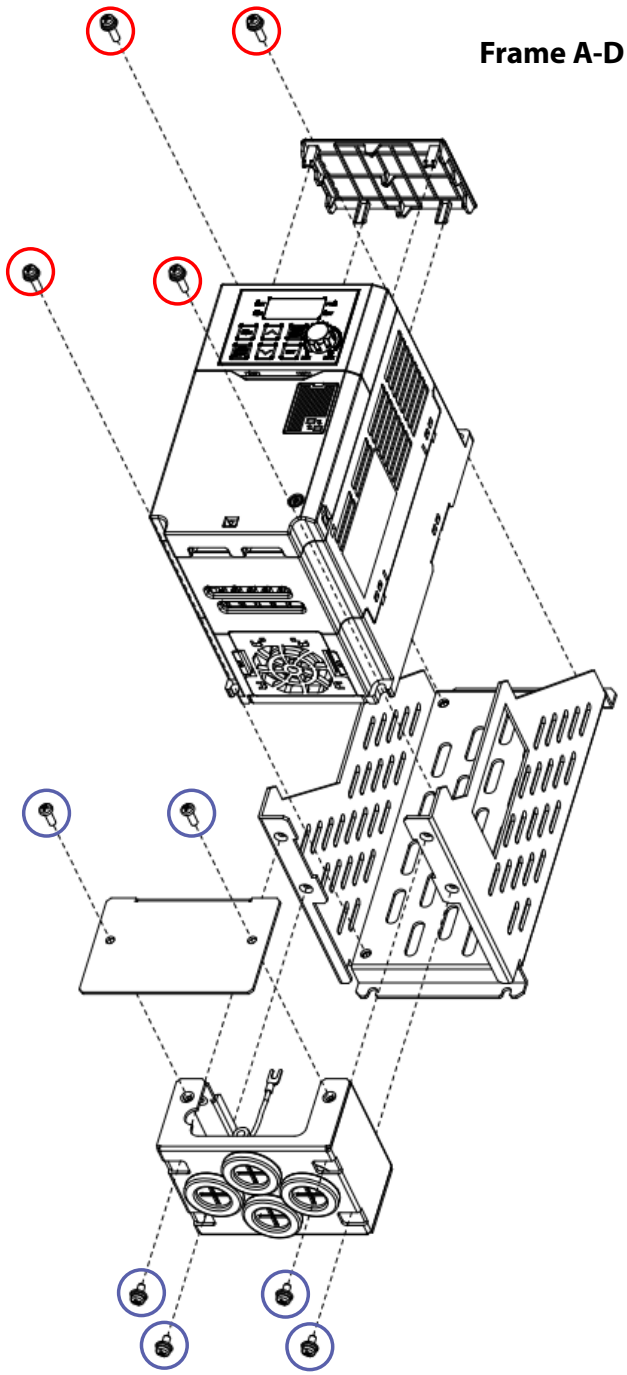
If parameter view lock and parameter lock functions are enabled, no drive operation related function changes can be made. It is very important that you memorize the password.

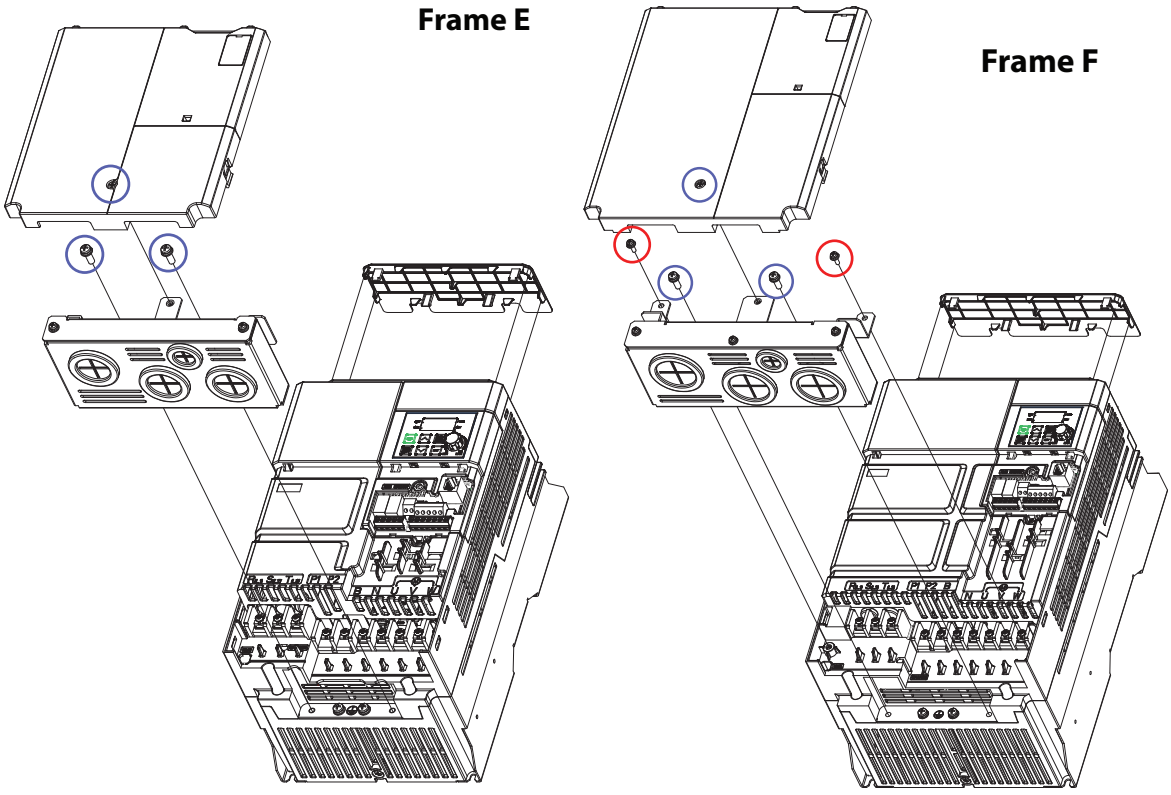
ACG Conduit Boxes

NEMA 1/UL Type 1 compliant conduit boxes are available for all frame sizes (A–F). The following steps illustrate how to install a conduit box on the IronHorse ACG series drive.

WARNING; Ensure all power is removed from the drive before installing or removing the conduit. Failure to comply will damage the drive.

1) *Install the ACG drive into the conduit as shown in the diagrams below.*

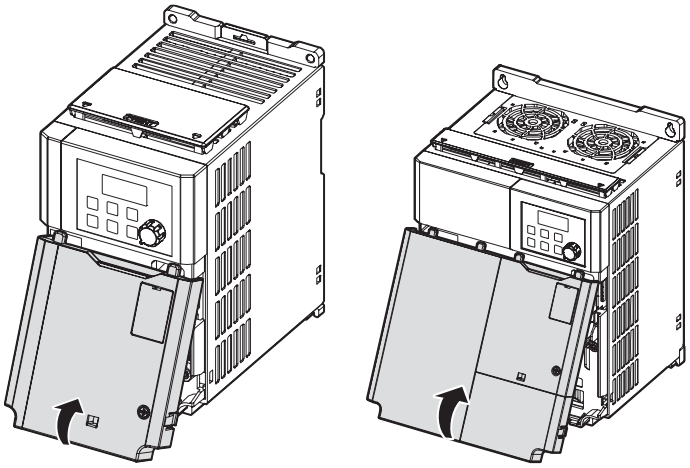




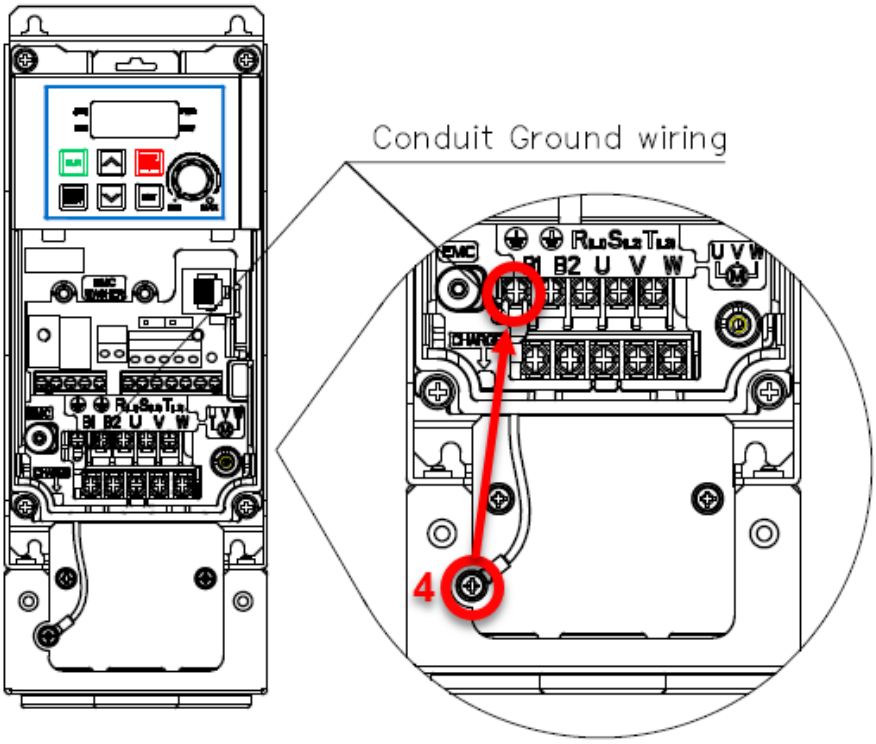
2) *Fasten all of the screws circled in the diagram for your frame size.*

Frame Size	*Diagram Screw Color*	*Number*	*Screw Size*	*Torque Value*
A	Red	4	M4	10 kgf·cm
	Blue	6	M4	18 kgf·cm
B	Red	4	M4	10 kgf·cm
	Blue	6	M4	18 kgf·cm
C	Red	4	M4	10 kgf·cm
	Blue	6	M4	18 kgf·cm
D	Red	4	M4	10 kgf·cm
	Blue	6	M4	18 kgf·cm
E	Blue	2	M5	35 kgf·cm
F	Red	2	M4	13 kgf·cm
	Blue	2	M5	35 kgf·cm

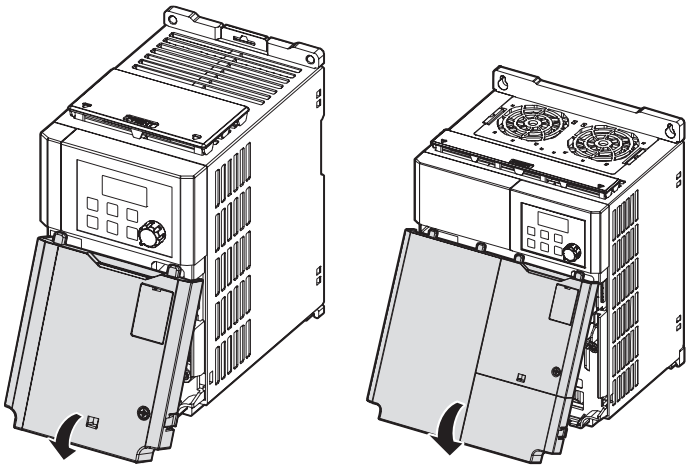
3) *Remove the I/O cover plate from the ACG drive.*



4) *Connect the conduit ground wire to the ACG drive ground terminal as shown below.*



5) *Replace the the I/O cover plate on the ACG drive and re-fasten.*



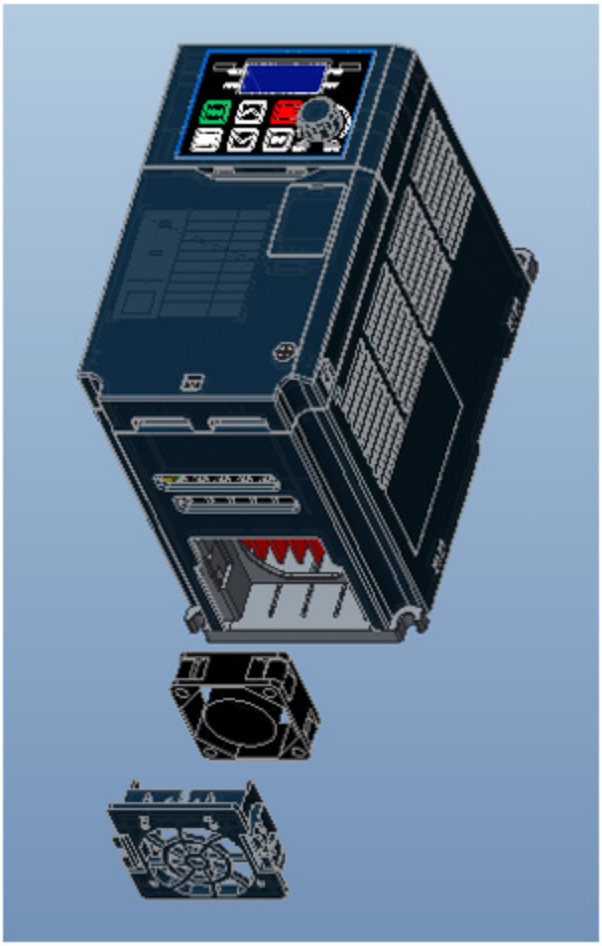
Replacement Cooling Fans

Replacement cooling fans are available for all ACG series drives. Replace the fan if your drive is experiencing overheating issues. We also recommend replacing cooling fans on a 3 year interval.

Replacement Fan	Drive Compatibility
ACG-FAN-A	ACG series 1/2 to 1 hp AC drives.
ACG-FAN-BC	ACG series 2 to 5 hp AC drives.
ACG-FAN-D	ACG series 7.5 to 10 hp AC drives.
ACG-FAN-E15	ACG series 15 hp AC drives.
ACG-FAN-E20F	ACG series 20 to 30 hp AC drives.

To replace the cooling fan in your ACG series drive, follow the steps below:

1) Remove the fan cover by pressing the hook located by the arrow.



2) Disconnect the fan wire and remove the fan from the drive.

3) Attach the fan wire to the new fan and insert the fan into the drive.

4) Replace the fan cover.

VFD Suite

VFD Suite is the configuration software for the Automation Direct Ironhorse AC family of variable frequency drives, featuring the ACG IP20 series and the ACN Nema4X series. It is designed to allow connection of a personal computer to the drives and perform a variety of functions:

- *Create new drive configurations*
- *Upload/Download drive configurations*
- *Edit/Compare drive configurations*
- *Utilize Parameter Wizard for easy configuration*
- *Archive/Store multiple drive configurations on your PC*
- *Trend drive operation parameters*
- *Tune the drive PID loop*
- *View real time key operating parameters*
- *Start/Stop drive and switch directions, provided drive is set up for remote operation*
- *View drive faults*

VFD Suite includes a PDF help file for explanation of the software and features. VFD Suite can be downloaded for free from Automationdirect.com.

System Requirements

Category	Requirement
Windows	Windows 8/10/11
Processor	1 GHz or higher
RAM	1 GB (32-bit) or 2 GB (64-bit)
HDD	16 GB (32-bit) or 20 GB (64-bit)
Graphics	Graphic card supporting MS DirectX 9

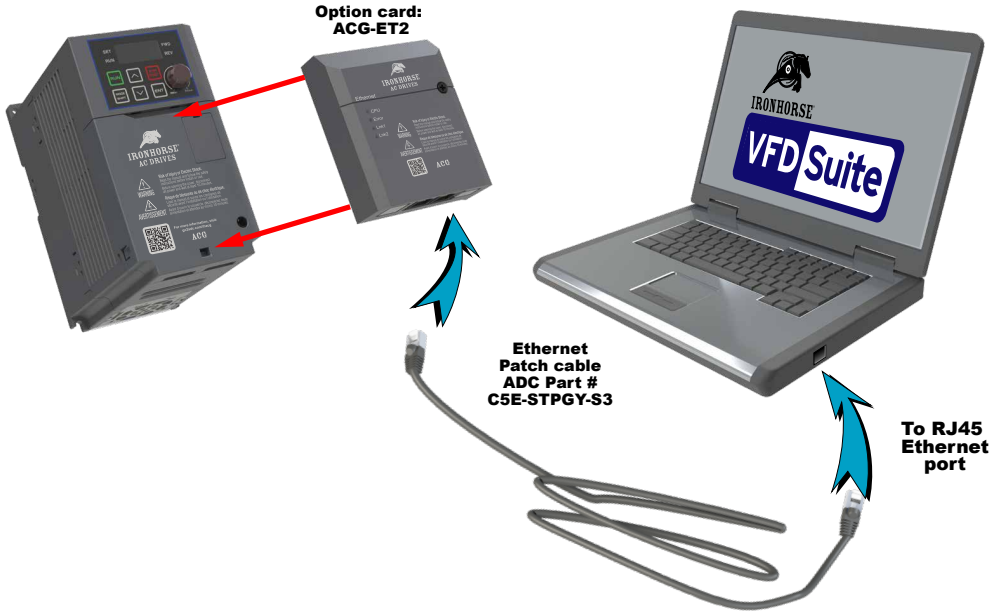
ACG Connection to VFD Suite

Set the network to connect with the drive.

Connecting to the ACG drive with VFD Suite can be accomplished in 2 ways:

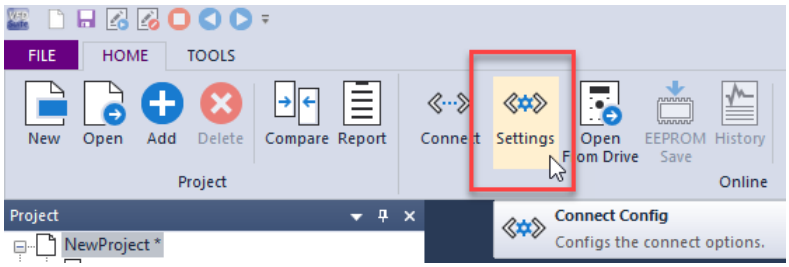
1) Serial communication (Modbus-RTU) via S+ and S- port integrated in the drive and USB-485M adapter.

2) Ethernet communication (Modbus TCP) via the optional ACG-ET2 card

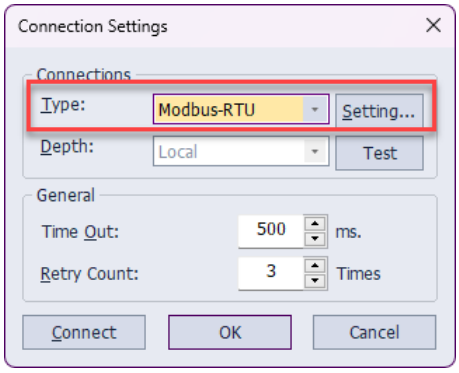


VFD Suite Serial Connection Setup

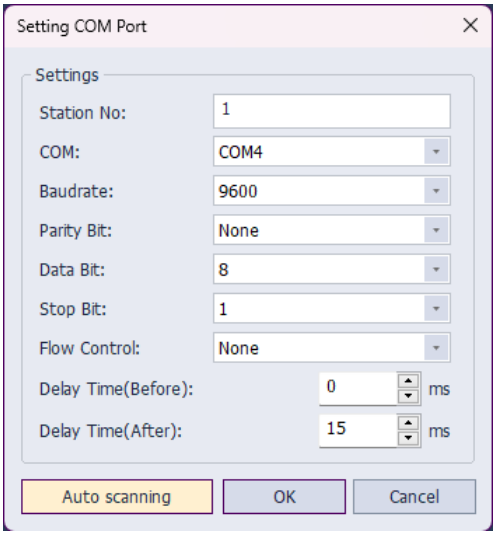
1) Select the menu HOME→Settings.



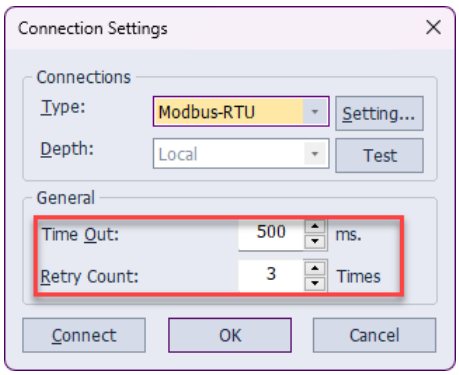
2) Choose Modbus-RTU for the communication type and press the Setting… button.



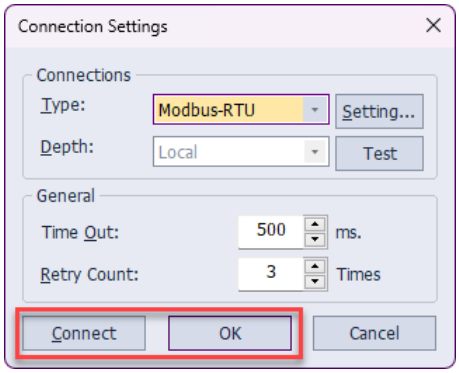
3) Enter in the COM Port settings. Pressing the Auto Scanning button will let VFD Suite try to automatically configure these settings. Press OK when done.



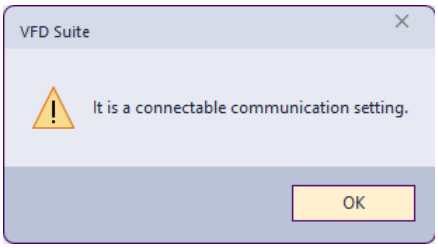
4) Enter the Time out value in milliseconds for setting the communication timeout value. Enter a value in to Retry Count to configure the number of communication attempts to try after communication failure.



5) Press Connect to attempt a connection to the drive over Modbus-RTU. Or Press OK to save connection setting without connecting to the drive.



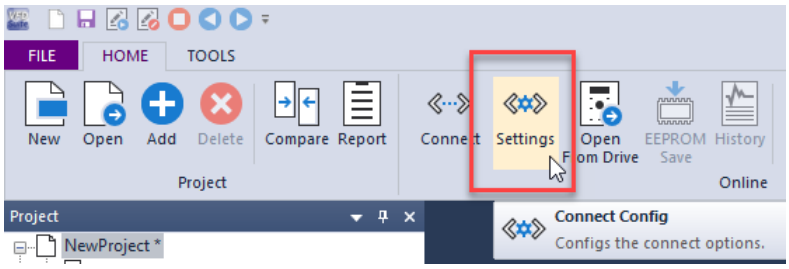
6) VFD Suite will display the below message when successfully connecting to the drive.



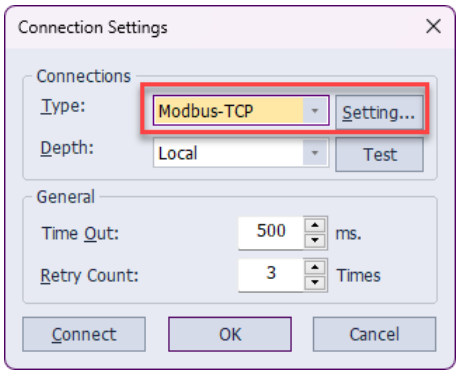
VFD Suite EtherNet Connection Setup

ACG-ET2 has a default IP Address of 192.168.1.101 and a default Subnet mask of 255.255.255.0.

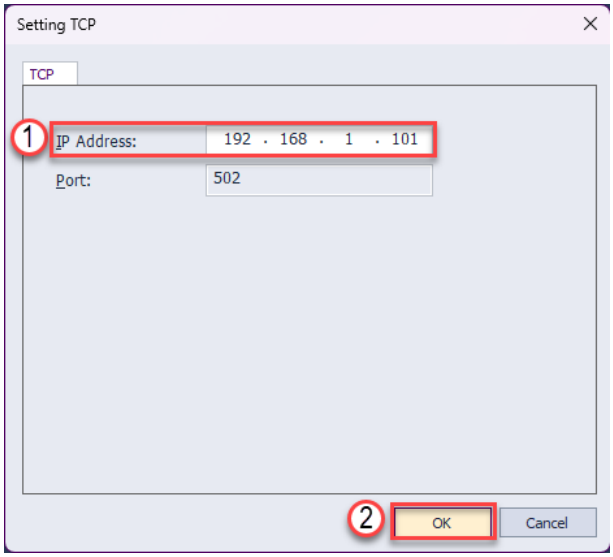
1) Select the menu HOME→Settings.



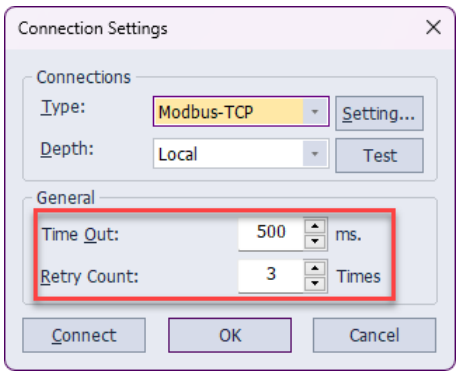
2) Choose Modbus-TCP for the communication type and press the Setting… button.



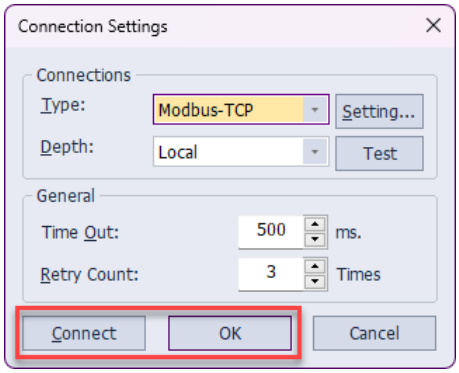
3) Enter in the IP address of the drive and press the OK button.



4) Enter the Time out value in milliseconds for setting the communication timeout value. Enter a value in to Retry Count to configure the number of communication attempts to try after communication failure.



5) Press Connect to attempt a connection to the drive over Modbus TCP. Or Press OK to save connection setting without connecting to the drive.



6) VFD Suite will display a connection status at the bottom of the screen when successful.

NOTE: FOR AN ETHERNET CONNECTION, THE PC MUST HAVE AN ETHERNET PORT CONFIGURED WITH AN IP ADDRESS AND SUBNET MASK IN THE SAME NETWORK RANGE AS THE DRIVE. PING CAN BE USED TO TEST THE CONNECTION BETWEEN THE PC AND THE DRIVE.