DRIVE QUICK START GUIDE

ACM AC DRIVE

This quick start reference is included in the VFD packaging and is meant to be a supplement to the User Manual, which is available for free download at Automationdirect.com. This reference informs the installer of the proper steps for mounting, wiring, and basic programming/operation of the ACM VFD up to 2.2kW/3.0HP.

⚠️ *WARNING: IMPROPER WIRING AND OPERATION MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH*

Follow the recommended wiring practices suggested in this document as well as in the User Manual. The minimum size of the protective earth (ground) conductor must comply with local safety regulations and applicable codes.

Please review all ACM related documents included with the product before proceeding with any installation and wiring.
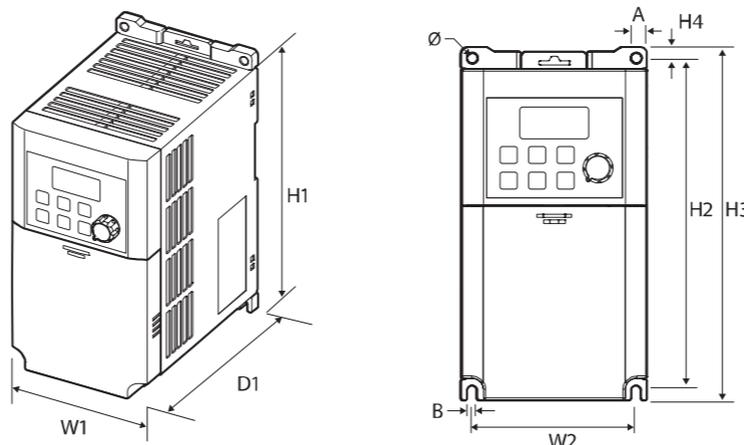
STEP 1 – ACM MODEL NUMBER AND MOUNTING

MODEL NUMBER

Verify that you have the appropriate VFD by checking the namplate information. Use the example name plate shown to assist you with this. The model number and specifications will depend on the drive.

NOTE: Verify that the input voltage rating matches the voltage source applied to the VFD.

NOTE: Confirm that the output power of the VFD is equal to or greater than the rating of the motor which will be connected. Ratings for single-phase input power can be found in the manual.

MODEL : ACM-10P2 | **IE2** (1.4%)

| INPUT | 100-120V HD: 1.8A | 1 Phase | 50/60Hz |
| OUTPUT | 0-Input V HD: 1.4A 1.9kVA (D) | 3 Phase IP 20 | 0.01-400Hz |

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DIMENSIONS

NOTE: Drive diagram (Frame A) is a reference for dimensions chart below. See manual for specific Drive Frame diagrams as they differ slightly

| Dimensions											
Frame	Part no	W1	W2	H1	H2	H3	H4	D1	A	B	Ø
A	ACM-20P1	85 [3.35]	75 [2.95]	135 [5.31]	135.5 [5.33]	145 [5.71]	5 [0.20]	100 [3.94]	5 [0.20]	4.5 [0.18]	4.5 [0.18]
	ACM-20P2										
B	ACM-10P2	85 [3.35]	75 [2.95]	153 [6.02]	153.5 [6.04]	163 [6.42]	5 [0.20]	123 [4.84]	5 [0.20]	4.5 [0.18]	4.5 [0.18]
	ACM-10P5										
	ACM-20P5										
	ACM-21P0										
C	ACM-11P0	100 [3.94]	90 [3.54]	180 [7.09]	180.5 [7.11]	190 [7.48]	5 [0.20]	140 [5.51]	5 [0.20]	4.5 [0.18]	4.5 [0.18]
	ACM-22P0										
	ACM-23P0										
Units: mm [in]											

MOUNTING

When selecting an installation location consider the following points:

• The drive must be installed on a wall or panel that can support the drive's weight.

• The location must be free from vibration. Vibration can adversely affect the operation of the drive.

• The drive can become very hot during operation. Install the drive on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the drive to allow air to circulate. The illustrations below detail the required minimum installation clearances.
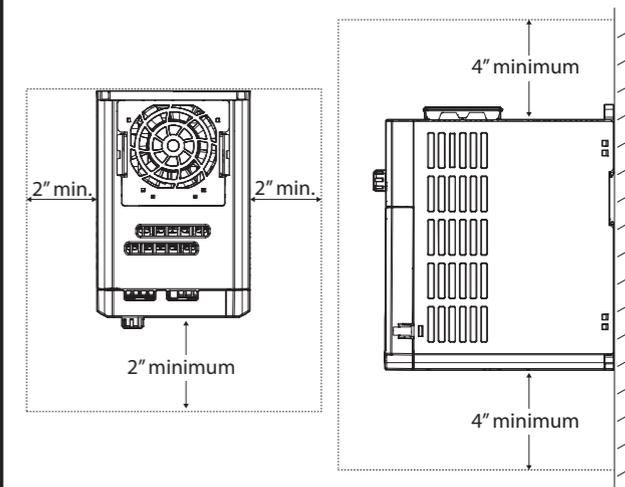
COVER REMOVAL

After mounting, slide the front cover downward while pressing and holding the upper-center part of the cover. Remove the cover by lifting it upward from the bottom and moving it away from the drive.
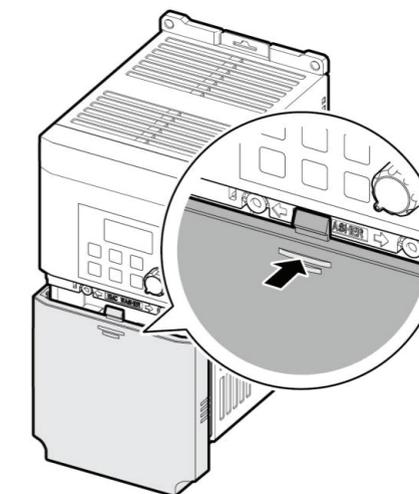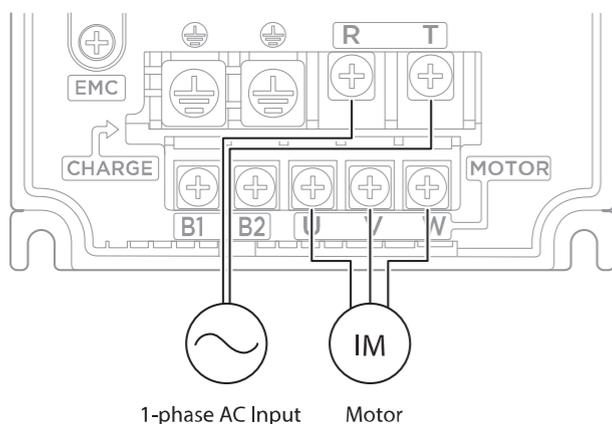
STEP 2 – CONNECT LINE AND MOTOR POWER

Use the wiring diagrams below to properly wire the main power connections to the VFD. This step should be done with power OFF! Refer to the User Manual for additional wiring recommendations. Be sure to follow good wiring and grounding practices. Follow applicable local codes if needed.

⚠️ *DANGER: LETHAL VOLTAGES ARE PRESENT. BE SURE THAT ALL POWER IS TURNED OFF WHILE PERFORMING THE RECOMMENDED POWER WIRING. REINSTALL ALL PROTECTIVE COVERS ON THE ACM BEFORE REAPPLYING POWER*

Proper wiring for 1-Phase applications is shown below. The physical terminal layout varies according to frame size. Terminal names (e.g. R, T, etc) will remain consistent.

Power Terminals Wire Size and Torque				
Part Number	Power Terminal Screw Size	Screw Torque (Nm)	Recommended Wire size AWG [mm²]	
			Power R,S,T	Ground
ACM-10P2	M3	0.5	14 [2.5]	12 [4]
ACM-10P5	M3	0.5	14 [2.5]	12 [4]
ACM-11P0	M4	0.8	12 [4]	12 [4]
ACM-20P1	M3	0.5	14 [2.5]	12 [4]
ACM-20P2	M3	0.5	14 [2.5]	12 [4]
ACM-20P5	M3	0.5	14 [2.5]	12 [4]
ACM-21P0	M3	0.5	14 [2.5]	12 [4]
ACM-22P0	M4	0.8	12 [4]	12 [4]
ACM-23P0	M4	0.8	12 [4]	12 [4]

Use copper wires with 600 V, 75°C [167°F] for power terminal wiring.

SINGLE PHASE INPUT

1-phase AC Input   Motor

📋 *NOTE: B1 and B2 terminals (Frame C only) should not be connected to power or ground.*

STEP 3 – KEYPAD NAVIGATION AND PARAMETER CHANGES

OPERATION GROUP

From the main screen (0.00), the UP and DOWN arrows will navigate through the Operation group. The Operation group contains many basic start up parameters for control and monitoring. See the list of Operation group parameters below.
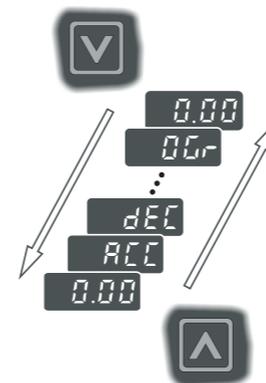
Display	Operation Group	Display	Operation Group
0.00	Command Frequency	IOv	Output voltage setting
ACC	Acceleration time	Ftb	Forward boost
dEC	Deceleration time	rtb	Reverse boost
drv	Command source	CUr	Output current
Frq	Frequency source reference	rPM	Motor RPM
MkW	Motor selection	dCL	Drive DC voltage
MrC	Rated motor current	uOL	User select signal
MbF	Base frequency	nOn	Current fault
FrM	Maximum frequency	OGr	Open hidden groups

Move up and down through the codes using the UP and DOWN arrow keys.

PARAMETER GROUPS

Pressing the MODE/SHIFT button will move through the different parameter groups, while the UP and DOWN arrows will navigate through the different parameter code numbers in the selected group. To display and access all groups, set OGr in Operation group to "1".

| Display	Parameter Group
dr	Drive
bA	Basic
Ad	Expanded
Cn	Control
In	Input Terminal Block
OU	Output Terminal Block
CM	Communication
AP	Application
Pr	Protection
M2	2nd Motor (In.65-69-> any one of these parameters is set to 26)
CF	Configuration

Any of the above parameter and monitor settings can be accessed by pressing the ENT key. Press the MODE key to move to the group you want. Press the ENT key again to save the entered value.

Press MODE with either arrow key to escape and make no change.

ESC
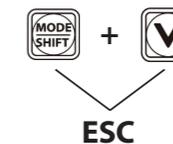
"rd" indicates reserved and cannot be selected.
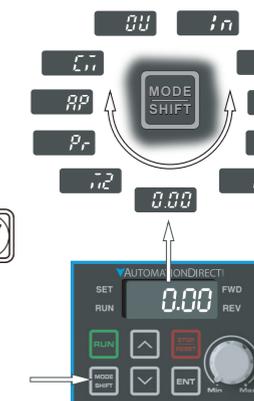
CHANGING ACCELERATION TIME EXAMPLE

1) *Press UP arrow from the main display (0.00) until ACC is displayed.*

2) *Press ENT key one time to display the present value.*

3) *Use the UP and DOWN arrows to increase and decrease the value.*

4) *Use the MODE/SHIFT key to move the cursor over to select different digits.*

5) *Press the ENT key TWO TIMES once the desired value is set. This saves the change.*

6) *ACC will be displayed again indicating the parameter change has taken effect.*

📋 *NOTE: Press the ENT key TWO times to save parameter changes! Press UP and DOWN arrows at the same time to escape parameter setting and make no changes.*

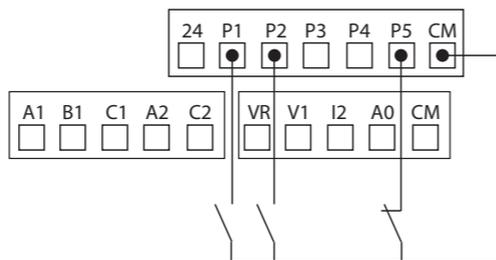📋 *NOTE: "rd" and "OL" can not be selected. "rd" indicates reserved, "OL" indicates set value repetition.*

STEP 4 – CONNECT CONTROL WIRING

CONTROL WIRE SIZE

Terminal	Terminal Screw Size	Screw Torque (Nm)	Wire Size AWG [mm²] Bare Wire	Wire Size AWG [mm²] with Bootlace Ferrule
24, P1–P5, CM, VR, V1, I2, A0, Q1, EG	M2.6	4.0	18 [0.75]	20 [0.5]
A1/B1/C1/ A2/C2	M2.6	4.0	17 [1.0]	15 [1.5]

See User Manual for crimp terminal cable size and detail

RUN COMMAND WIRING

2-Wire Control

2-wire control consists of maintained run signals. This can be accomplished via toggle switches, relays, jumpers, etc. Default parameters support this operation.

Forward-Run/Reverse-Run
drv=2 (FX/RX-2)
P1(In.65)=0 Fx (1=Run, 0=Stop)
P2 (In.66)=1 Rx (1=Reverse, 0=Forward)
CM=Common
Run/Direction
drv=2 (FX/RX-2)
P1(In.65)=0 Fx (1=Run,0=Stop)
P2(In.66)=1 Rx (1=Reverse, 0=Forward)
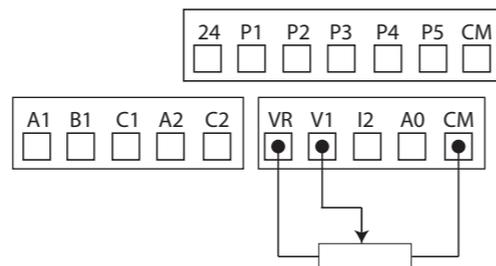
3-Wire Control

3-Wire control consists of momentary push buttons to run and stop the VFD. The Forward and Reverse buttons are Normally Open while the Stop button is Normally Closed.

drv=1 (FX/RX-1)
P1(In.65)=0 (FWD Run, Fx)
P2(In.66)=1 (REV Run, Rx)
P5(In.69)=17 (3-Wire Stop)
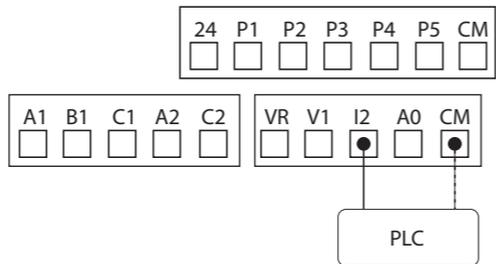CM=Common

FREQUENCY REFERENCE WIRING

Speed Pot Wiring (0–10 VDC)

Controlling the VFD with an external speed potentiometer can be accomplished by setting Operation Menu parameter frq=3 and wiring according to the example below. For 0-10VDC signals from a PLC or controller, simply wire to V1 and CM.

VR = 10 VDC
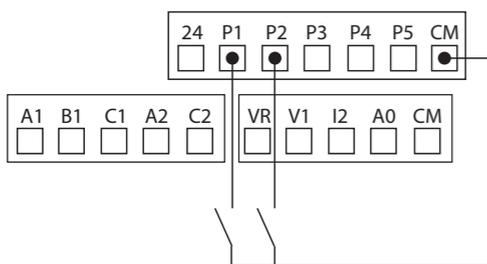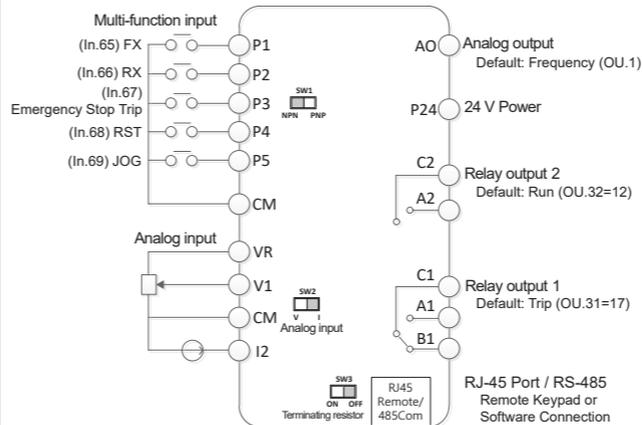VI = Wiper
CM = Common

PLC or Controller Wiring (4–20 mA)

For speed control with a 4–20 mA signal, set Operation Menu parameter frq=4.

I2 = + Signal
CM = - Common

I/O WIRING

Digital Input Description

Terminal Labels	Description
P1–P5	Multi-Function Inputs with Default value and NPN sink mode wiring. Parameters In.65–In.69.
CM	Common terminal

Analog Input Description

Terminal Labels	Description
VR	Power Terminal for Setting Frequency 12V/100mA
V1	Frequency Setting (Voltage): 0–10 V Parameters In.7–11
I2	Frequency Setting (Current): 4–20 mA Voltage: 0–10 V (12 V max) Parameters In.52–In.56

Output Description

Terminal Labels	Description
AO	Analog Output: 0–10 V Use CM for Common. Parameter OU.1 Default: 0 (Frequency)
P24	External 24 V Power
A1/C1/B1	Relay 1: Multi-Function Output Parameter OU.31 Default: 17 (Fault output setting)
A2/C2	Relay 2: Multi-Function Output Parameter OU.32 Default: 12 (RUN)

STEP 5 – BASIC SETUP PARAMETERS

REQUIRED MOTOR PARAMETERS

Set these motor parameters based on the nameplate.

Group	No	Description	Default	Set Options
OPG	MkW	Motor capacity	Model dependent	Model dependent
bA	11	Poles	4	2–12
OPG	MrC	Motor rated current	Model dependent	Model dependent
OPG	IOv	Motor voltage	Model dependent	Model dependent

dr.14: HP to kW Conversion Chart (Parameter in kW)

HP	kW
1/4	0.2
1/2	0.4
1	0.75
1.5	1.1
2	1.5
3	2.2
5	3.7
7	5.5
10	7.5
15	11
20	15
25	18.5
30	22
40	30

Motor RPM to Poles Chart

RPM	3600	1800	1200
Poles	2	4	6

EXAMPLE: If actual motor RPM is 3450, set Motor Poles = 2. This is due to motor slip. In this example, the motor has 150 RPM of slip. (Slip=Synchronous speed - Rated Speed)

OPTIONAL PARAMETERS

- To automatically start after a power loss, set Ad.10=1. To enable power-on run, set the Operation Group drv parameter to Fx/Rx-1 or Fx/Rx-2. Run signal must stay present on power up.
- Enable phase loss protection by setting Pr.5=1.
- Enable auto restart after a fault trip by setting the following...
  - » Pr.8 = 1
  - » Pr.9 = # of retry attempts

STEP 5 – BASIC SETUP PARAMETERS (CONT'D)

FAULT CODES

Keypad Display	Fault Name	Description
olt	Overload	Motor overload trip. Operates when Pr.20 > 0
oct	Over Current	Drive output current exceeds 200% of rated current
ovt	Over Voltage	Internal DC voltage exceeds the specified value
lvt	Low Voltage	Internal DC circuit voltage less than the limit
gft	Ground Trip	Ground Fault trip occurs on drive output side and causes the current to exceed limit
eth	E-Thermal	Thermal load calculation determines motor overheating. Operates when Pr.40 >0
opo	Out Phase Open	Drive output phase(s) in open circuit condition. Operates when Pr.05 Bit 1=1
iol	Drive OLT	Overload and resultant overheating based on thermal limits
rot	rOt*	Displayed when input power is unstable or an initial charging circuit trip occurs while supplying power to the drive.
oht	Over Heat	Drive heat sink temperature exceeds limit
ntc	NTC Open	Insulated Gate Bipolar Transistor (IGBT) Temperature sensor error
fan	Fan Trip	Cooling Fan malfunction.
eta, etb	External Trip A,B	External fault input signal is ON. Operates when In.65-69=4
com	Communication Trip	Displayed when communication between drive and IO CPU is disconnected for more than 500 ms.
nbr	nbr	Drive's output current is below value in Ad.41 during the external brake signal operation when OU.31 or OU.32 = 19.
hold, errc	IO Board Trip	Hold: Displayed when power is supplied to the drive and communication is disconnected. ErrC: Displayed when communication is disconnected for more than 2 seconds.

ACM drives rated for 2.2 kW or less are the only models that support "rOt" fault. There is a possibility of a "rOt" fault when power is turned on within 1 second of an lvt fault due to power off.

See User Manual for other fault codes.

COMMONLY SET PARAMETERS

Pr.Code	Parameter Name	Setting Range		Units	Initial Value
Op Menu: 0.00	Command Frequency	Start Freq(dr.19) - Max Freq(dr.20)		Hz	0
Op Menu: ACC	Acceleration Time	0.0 - 6000.0		sec	5.0
Op Menu: dEC	Deceleration Time	0.0 - 6000.0		sec	10.0
Op Menu: drV	Command Source	0: Keypad 1: Fx/Rx -1 (Fwd/Rev Run) 2: Fx/Rx -2 (Run/Dir)	3: RS-485	-	1
Op Menu: Frq	Frequency Source Reference	0: Keypad-1 1: Keypad-2 2: V0: Built-in potentiometer 3: V1 (0–10 V) 4: I2 (0–20 mA) 5: I2 (0-10 V)	6: V0+I2 (0-20 mA) 7: V0+I2 (0-10 V) 8: V0+V1 9: RS-485 10: Up-Down 11: V1+I2 (0-10 V)	-	0
dr.9	Control Mode	0: V/F 1: Slip Compensation	2: IM Sensorless	-	1
dr.11	JOG Frequency	0.00, Start frequency-Maximum frequency		Hz	10.00
dr.19	Start Frequency	0.01 - 10.00		Hz	0.50
dr.20	Rotation direction	F: Forward run R: Reverse run		–	F
Op Menu: MbF	Base frequency	30.00–400.00 Hz		Hz	60.0
Op Menu: FrM	Maximum frequency	40.00–400.00 Hz		Hz	60.0
cf.93	Parameter Initialize (Reset to Defaults)	0: No 1: All groups 2: Operation group 3: dR group 4: bA group 5: Ad group 6: Cn group	7: In group 8: OU group 9: CM group 10: AP group 11: Pr group 12: M2 group 13: Run group	-	0
bA.19	AC Input Volt	170 - 480		V	220
Ad.9	Rotation direction prevention	0: None 1: Forward Prevent	2: Reverse Prevent	-	0
Ad.10	Power-on Run	0: No 1: Yes		-	0
In.65	P1 Define	See Multifunction Discrete Input Selection Chart		-	0: Fx
In.66	P2 Define			-	1: Rx
In.67	P3 Define			-	2: Bx
In.68	P4 Define			-	3: Rst
In.69	P5 Define			-	4: JOG
OU.1	Analog output setting	See Analog Output (AO) Selection Chart		-	0: Freq
OU.31	Relay 1 (A1/B1/C1)	See Multifunction Relay Output Selection Chart		-	17: Trip
OU.32	Relay 2 (A2/C2)			-	12: Run

MULTIFUNCTION INPUT/OUTPUT SELECTION CHARTS

Multi-Function P1-P5 Discrete Input Selections	Multi-Function R1/R2 Relay Output Selections	Multi-Function AO Selections
0: Fx	0: FDT-1	0: Frequency
1: Rx	1: FDT-2	1: Output Current
2: Emergency Stop Trip	2: FDT-3	2: Output Voltage
3: Reset (RST)	3: FDT-4	3: DCLink Voltage
4: JOG	4: FDT-5	
5: Spd-L	5: Over Load	
6: Spd-M	6: IOL	
7: Spd-H	7: Motor Stall	
8: Xcel-L	8: Over voltage (Ovt)	
9: Xcel-M	9: Low voltage (Lvt)	
10: Xcel-L	10: Over Heat (OHt)	
11: DC Braking	11: Lost Command	
12: 2nd Motor	12: Run	
13: Reserved	13: Stop	
14: Reserved	14: Steady	
15: Up-down Freq Up	15: Speed Search	
16: Up-down Freq Dwn	16: Ready	
17: 3-wire	17: Fault Output	
18: EtA	18: Fan Alarm	
19: EtB	19: Brake Signal Setting	
20: Reserved		
21: PID to general op		
22: 2nd Source		
23: Fix Analog Command Frequency		
24: ACC/DEC Stop		
25: Init Up-down Freq		
26: FWD JOG		
27: REV JOG		