

VFD 4X control panel

INSTALLATION - OPERATION

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READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



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Note

This manual contains vital information for the proper installation and operation of your cooling tower. Carefully read the manual before installation or operation of the tower and follow all instructions. Save this manual for future reference.

This manual is for the Marley VFD 4X control panel with an integrated VFD (Variable Frequency Drive) used to control a cooling tower fan motor. The 4X outdoor VFD package is a stainless steel enclosure including major components listed below:

- ABB ACH550 VFD
- Bypass motor starter
- Enclosure air conditioner

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

Warning

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

Note

Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

introduction

These instructions are intended to assure that field connections are completed properly and the control system serves you for the maximum possible time. Since product warranty may depend on your actions, please read these instructions thoroughly prior to operation.

If you have questions about the operation and/or maintenance of this control system and you do not find the answers in this manual, please contact your Marley sales representative.

Warning

Hazard of electrical shock or burn. Be sure to turn off power to the panel before servicing. If working on equipment out of site of panel disconnect, lockout using standard lockout procedure.

Safety First

The control system by Marley uses UL listed components installed in accordance with the National Electric Code. The location of the cooling tower and field installation of the control system can effect the safety of those responsible for installing, operating or maintaining the tower and controls. However, since Marley does not control the tower location, or field installation, we cannot be responsible for addressing safety issues that are affected by these items.

Warning

The following safety issues should be addressed by those responsible for installation, maintenance or repair of the tower and controls:

- ***Access to and from the control panel (including the disconnect switch).***
- ***Proper grounding of electrical control circuits.***
- ***Sizing and protection of branch circuits feeding the control panel.***
- ***Qualification of persons who will install, maintain and service the electrical equipment.***

These are only some of the safety issues that may arise in the design and installation process. Marley strongly recommends that you consult a safety engineer to be sure that all safety considerations have been addressed.

Other safety issues are addressed in literature supplied with your tower. You should closely review the literature prior to installing, maintaining or repairing your tower.

VFD 4X control panel specifications

- NEMA 4X outdoor stainless steel enclosure
- ABB model ACH550 6 Pulse PWM VFD with IGBT switching.
- Thermal magnetic main circuit breaker disconnect.
- Through the door operating disconnect handle with provisions for lock-out tag-out padlock.
- Traditional bypass starter design with two isolating contactors.
- NEMA 4X stainless steel enclosure air conditioner.
- VFD requires a speed reference input signal from a remote source such as a Building Automation System or Marley RTD with 4-20mA transmitter. VFD will accept a 4-20mA, 0-20mA or 0-1 OVDC signal. Speed may also be controlled via the onboard keypad.
- Field selectable automatic or manual bypass mode.
- 5%-line impedance standard.
- Programmable output relay contacts for connection to Building Automation System. e.g. System run, Drive fault, Bypass fault, Bypass HOA position, System started.
- VFD has embedded fieldbus protocols allowing communications with Modbus RTU, Johnson Controls Metasys N2, Siemens Building Technologies FLN (PI) and BACnet MS/TP.
- Optional communication protocols available: LonWorks, Modbus/TCP, EtherNet/IP, EtherCAT, PowerLink, Profinet IO, Profibus DP, CANopen, DeviceNet, and ControlNet.
- Built in real time clock to recording drive events to actual time and day.
- Fault logger for tracking down drive issues when and why.
- Interactive startup assistance guides user through the startup.
- UL Listed.
- Keypad for VFD control/monitoring and a keypad for bypass control/monitoring.

installation

Description

The Marley 4X package is provided with a VFD enclosed in a water tight NEMA 4X stainless steel enclosure. Since VFDs naturally generate heat, a closed loop type air conditioner is provided to evacuate the internal generated heat.

An as built wiring diagram is included on the inside door of the enclosure showing interconnection of cooling tower devices such as a vibration switch. Contact your local Marley representative for questions and assistance.

The VFD is factory programmed with job specific motor information and a speed reference signal. Program parameters may be adjusted in the field as needed and a speed reference guideline is included in this manual.

If a Marley RTD is being used, the RTD is packaged with the shipment.

Operation Sequence

Utility power applied to the main disconnect provides power to the internal circuits including the enclosure air conditioner.

The main disconnect provides a means to isolate the incoming utility voltage.

Normal operation uses the VFD to run the cooling tower fan motor. The speed is determined based on any one of the three speed reference signals being used.

The bypass motor starter is used when the VFD can no longer run the motor. The transition from VFD mode to by-pass mode is a manual operation accomplished by using the selector switch on the door of the enclosure. While in bypass mode the fan motor will run at full speed only, with no cold water temperature control.

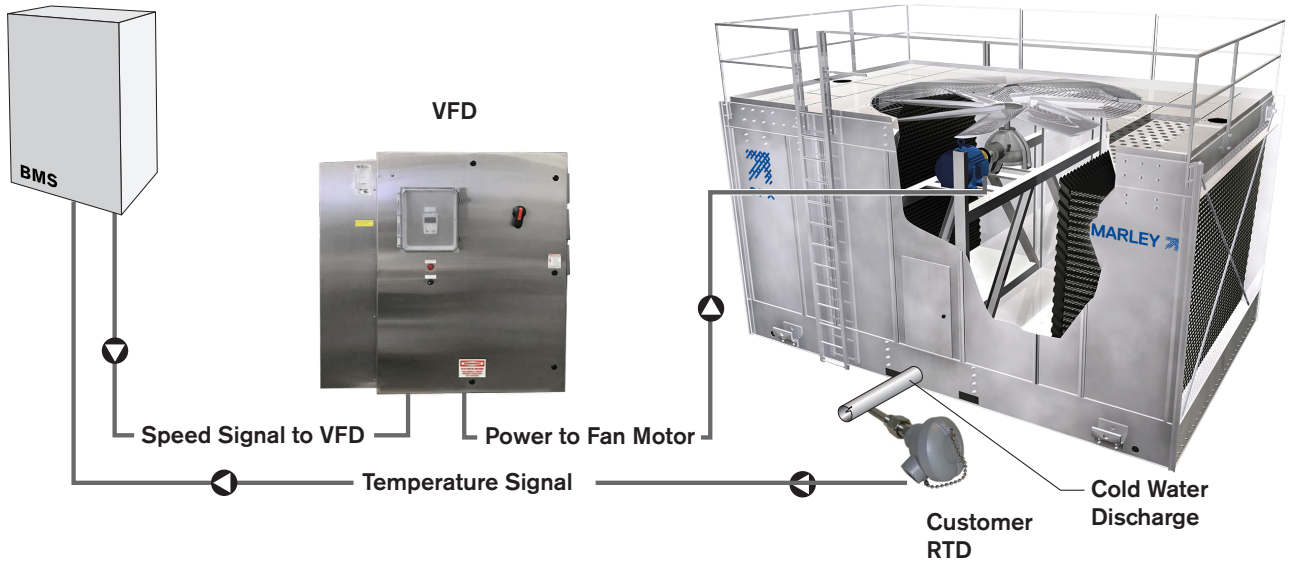
The air conditioner is designed to keep outside air contaminants from entering the VFD enclosure and to reject heat buildup inside the VFD cabinet.

If additional VFD programming assistance is required please contact your Marley sales representative to arrange a call with the SPX Cooling Technologies controls group or request assistance from a certified ABB startup company.

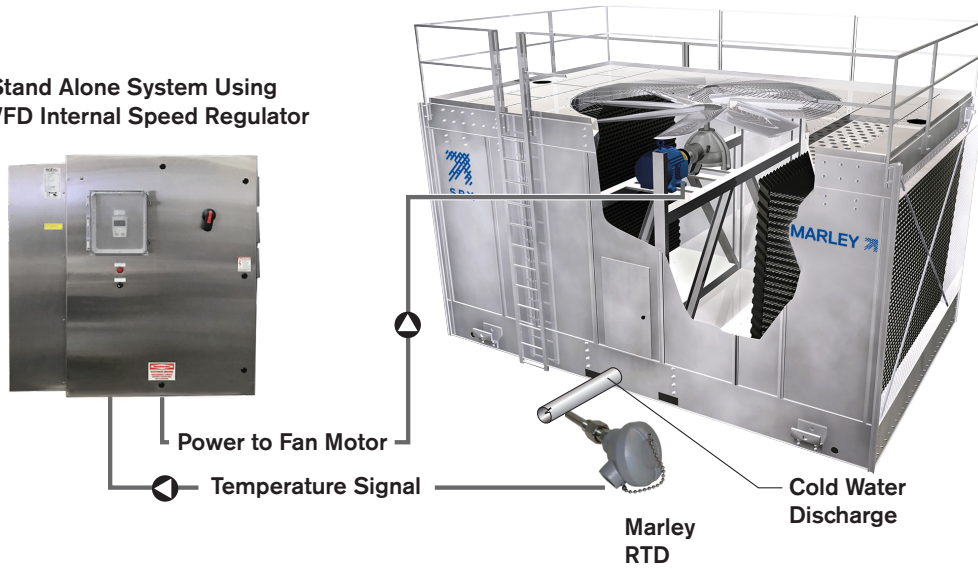
installation

Speed Control Methods

Speed Controlled by Building Management System (BMS)

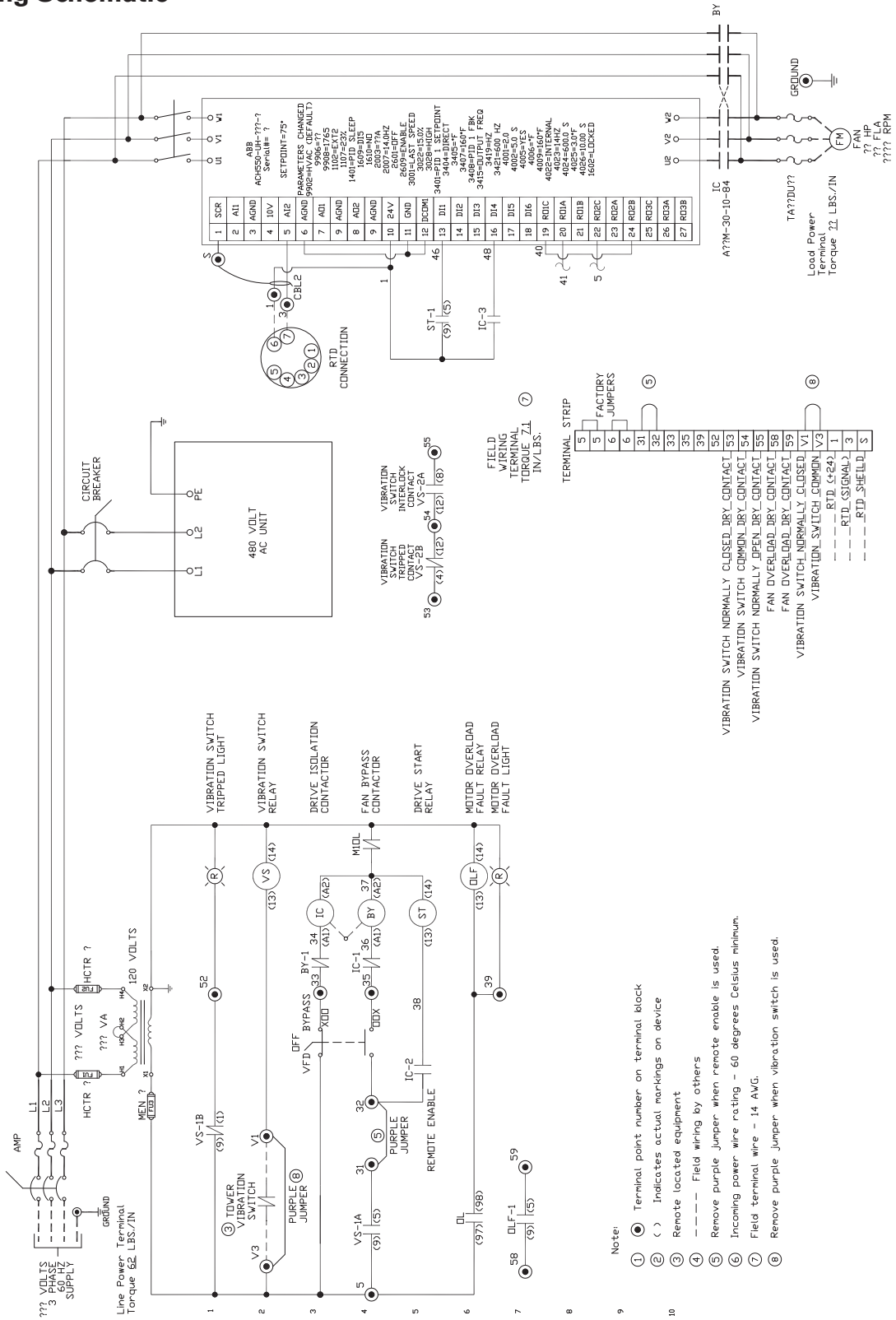


Stand Alone System Using VFD Internal Speed Regulator



installation

Wiring Schematic



installation

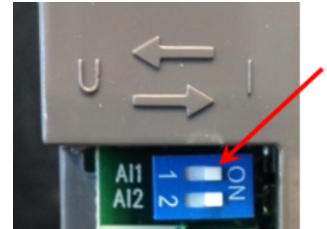
Check List

✓	Equipment Location
	Are the drive(s) mounted in their permanent location?
	Is the work area around the drive(s) accessible?
	Does the work facility have safety provisions? (e.g. first aid, fire extinguishers, etc.)
	Power Connections (Power Supply Side)
	Has the supply voltage been verified and agree with the VFD being installed?
	Is the proper sized incoming power connections installed and completely terminated?
	Are the incoming power leads in the standard (A-B-C) rotation pattern?
	Have proper grounding practices been followed? (National Electrical Code)
	Motor Connections (Load Side Of Drive)
	Have the proper fan motor(s) been installed, wired correctly and ready to run?
	Are the motor leads completely terminated between the VFD and fan motor?
	Can the motor be run at FULL speed in bypass mode?
	Cooling Tower
	Is the cooling tower installed and ready?
	Will hot water over the tower be available during startup?
	Control Circuit Wiring
	Has a Marley 4-20mA RTD been specified? (provides temperature reference input signal)
	If an RTD is to be used, has it been installed properly with a shielded analog signal cable?
	If a vibration switch is used is it wired to the "RUN ENABLE" OR "SAFETY INTERLOCK" of the drive?
	Is control wiring separated from the power wiring?
	If used, does the shielded analog signal cable have the shielding connected at the VFD only?
	Multiple VFDs. Are the output power cables independently routed with respect to other VFD cables?
	Other User Interfaces
	The supplied VFD is designed to be controlled externally from a building automation system or a supplied RTD with a 4-20 mA transmitter. When interfacing with a building automation system, automatic VFD operation is the responsibility of others, such as a controls / programming specialist contractor. In this case, controls contractor needs to be present and their control wiring / BAS installed and operational.
	Authorized Personnel
	Will the person(s) responsible for the entire process be available to verify final operation?
	Will all necessary union trade personnel be ready and available if they need to be present?
	Training
	VFD operation will be reviewed at time of startup. Will the maintenance person be available?

operation

VFD 4X parameters for ABB ACH550 VFD 4-20mA BMS speed signal

Method 1—Program parameters for Marley VFD package using ABB ACH550 VFD, a traditional bypass starter and remote 4-20mA BMS speed signal. See DIP switch J1 on VFD terminal board. Slide top slider switch # 1 towards the right or I position for a 4-20 ma type speed signal wired to analog input AI1 on the VFD terminal strip.

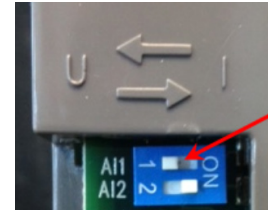


✓	Keypad	Parameter	Title on keypad screen	Enter Value	Comment
	VFD	TIME & DATE	CLOCK VISIBILITY	Show clock	Setting up the clock captures the time and day when a fault occurs.
	VFD	TIME & DATE	TIME FORMAT	12-hour	
	VFD	TIME & DATE	DATE FORMAT	mm/dd/yyyy	
	VFD	TIME & DATE	SET TIME	Today's time	
	VFD	TIME & DATE	SET DATE	Today's date	
	VFD	9902	APPLIC MACRO	HVAC	Do not use any other macro.
	VFD	9906	MOTOR NOM CURR	Motor Nameplate Current at 1.00 S.F.	
	VFD	9908	MOTOR NOM SPEED	Motor Nameplate Speed	Do not enter a value such as 3600, 1800, 1200 or 900. Use the slip speed value on the motor nameplate.
	VFD	1001	EXT1 COMMANDS	DI1,2	DI1=Start and DI2=Reverse
	VFD	1003	DIRECTION	REQUEST	Rotation direction can be changed on command.
	VFD	1104	REF1 MIN	14 Hz	Prevents VFD operation less than 14Hz in either AUTO or HAND mode. This protects the gear box from running dry.
	VFD	1201	CONSTSPEED SELECT	DI2	Activates constant speed.
	VFD	1202	CONST SPEED 1	30 Hz	30 HZ speed
	VFD	1401	RELAY OUTPUT 1	SUPRV 1 UNDER	Sets minimum speed signal is 4-20mA.
	VFD	1405	RO1 OFF DELAY	3.0 S	Delays start of drive for 3 seconds after greater than 4.7mA input on AI1.
	VFD	1610	DISPLAY ALARMS	NO	Hides (4) alarms. Eliminates call back when in current limit.
	VFD	20 03	MAX CURRENT	Motor nameplate Full Load Amps at a Service Factor of 1.00	MAX CURRENT keeps the motor amps at or below motor nameplate while in VFD mode during cold weather operation by limiting fan speed. Some motors also list a value of amps at a service factor higher than 1.00 do not these values.
	VFD	2007	MINIMUM FREQ	14 Hz	Prevents VFD operation less than 14Hz in either AUTO or HAND mode. This protects the gear box from running dry.
	VFD	2601	FLUX OPT ENABLE	OFF	
	VFD	2609	NOISE SMOOTHING	ENABLE	
	VFD	3028	EARTH FAULT LVL	3 (HIGH)	Defines protection level for ground (earth) fault.
	VFD	3201	SUPERV 1 PARAM	AI1	Selects AI1 as input Supervised.
	VFD	3202	SUPERV 1 LIMIT LOW	20%	Sets the low limit for the first supervised parameter to 4mA.
	VFD	3203	SUPERV 1 LIMIT HIGH	20.5%	Sets the high limit for the first supervised parameter. BAS signal ignored until minimum speed (14Hz) signal about 4.7mA.
	VFD	3404	OUTPUT1 DISPLAY	DIRECT	
	VFD	3405	OUTPUT1 UNIT	Hz	This changes the text field on line 1 of VFD display to show HZ.
Check correct fan rotation in VFD mode					
Check correct fan rotation in bypass mode					
	VFD	PAR BACKUP		Upload to panel	Motor must be stopped during this process.
	VFD	1603	PASS CODE	358	To lock or open the keypad 358 must always be entered first.
	VFD	1602	PARAMETER LOCK	Locked	Lock up the key pad to avoid call backs.
Notes					
A	Select the SAVE button to save parameter changes				
B	Do not change the macro from factory default of HVAC				
C	Critical fan speeds should be identified and locked out using program group 25				

operation

VFD 4X parameters for ABB ACH550 VFD 0-10VDC BMS speed signal

Method 2—Program parameters for Marley VFD package using ABB ACH550 VFD, a traditional bypass starter and remote 0-10 VDC BMS speed signal. See DIP switch J1 on VFD terminal strip. Slide top slider switch # 1 towards the left or U position for a 0-10 VDC type speed signal wired to analog input AI1 on the VFD terminal strip..



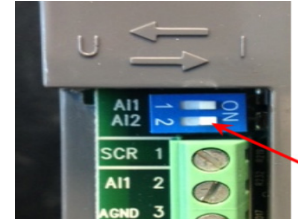
✓	Keypad	Parameter	Title on keypad screen	Enter Value	Comment
	VFD	TIME & DATE	CLOCK VISIBILITY	Show clock	Setting up the clock captures the time and day when a fault occurs.
	VFD	TIME & DATE	TIME FORMAT	12-hour	
	VFD	TIME & DATE	DATE FORMAT	mm/dd/yyyy	
	VFD	TIME & DATE	SET TIME	Today's time	
	VFD	TIME & DATE	SET DATE	Today's date	
	VFD	99 02	APPLIC MACRO	HVAC	Do not use any other macro.
	VFD	99 06	MOTOR NOM CURR	Motor Nameplate Current at 1.00 S.F.	
	VFD	99 08	MOTOR NOM SPEED	Motor Nameplate Speed	Do not enter a value such as 3600, 1800, 1200 or 900. Use the slip speed value on the motor nameplate.
	VFD	10 01	EXT1 COMMANDS	DI1,2	DI1=Start and DI2=Reverse
	VFD	10 03	DIRECTION	REQUEST	Rotation direction can be changed on command.
	VFD	11 04	REF1 MIN	14 Hz	Long term operation below 14Hz may damage a gear box.
	VFD	12 01	CONST SPEEDSELECT	DI2	Activates constant speed.
	VFD	12 02	CONST SPEED 1	30 Hz	30 Hz speed
	VFD	14 01	RELAY OUTPUT 1	SUPRV 1 UNDER	Sets minimum speed signal is 0 minimum -10 VDC.
	VFD	14 05	RO1 OFF DELAY	3.0 S	Delays start of drive for 3 seconds after greater than 2.2 volt input on AI1.
	VFD	16 10	DISPLAY ALARMS	NO	Hides (4) alarms. Eliminates call back when in current limit.
	VFD	20 03	MAX CURRENT	Motor nameplate Full Load Amps at a Service Factor of 1.00	MAX CURRENT keeps the motor amps at or below motor nameplate while in VFD mode during cold weather operation by limiting fan speed. Some motors also list a value of amps at a service factor higher than 1.00 do not these values.
	VFD	20 07	MINIMUM FREQ	14 Hz	Prevents VFD operation less than 14Hz in either AUTO or HAND mode. This protects the gear box from running dry.
	VFD	26 01	FLUX OPT ENABLE	OFF	
	VFD	26 09	NOISE SMOOTHING	ENABLE	
	VFD	30 28	EARTH FAULT LVL	3 (HIGH)	Defines protection level for ground (earth) fault.
	VFD	32 01	SUPERV 1 PARAM	AI1	Selects AI1 as input Supervised.
	VFD	32 02	SUPERV 1 LIMIT LOW	20%	Sets the low limit for the first supervised parameter to 2 volts.
	VFD	32 03	SUPERV 1 LIMIT HIGH	20.5%	Sets the high limit for the first supervised parameter. BAS signal ignored until minimum speed (14Hz) signal about 2.2 volts.
	VFD	34 04	OUTPUT1 DISPLAY	DIRECT	
	VFD	34 05	OUTPUT1 UNIT	Hz	This changes the text field on line 3 of VFD display to show Hz.
	VFD	34 19	OUTPUT3 UNIT	V	This changes the text field on line 3 of VFD display to show Volts for a remote 0-10 volt speed signal. Allows you to see the actual speed signal from the controls contractor.
	VFD	34 21	OUTPUT3 MAX	10V	
	Check correct fan rotation in VFD mode				
	Check correct fan rotation in bypass mode				
	VFD	PARBACKUP		UPLOAD TO PANEL	Motor must be stopped during this process.
	VFD	16 03	PASS CODE	358	To lock or open the keypad 358 must always be entered first.
	VFD	16 02	PARAMETER LOCK	LOCKED	Lock up the key pad to avoid call backs.

Notes					
A	Select the SAVE button to save parameter changes				
B	Do not change the macro from factory default of HVAC				
C	Critical fan speeds should be identified and locked out using program group 25				

operation

VFD 4X parameters for ABB ACH550 VFD Marley RTD speed signal

Method 3—Marley program parameters for factory built ACH550 with or without a traditional bypass. A Marley item # E16086 RTD transmitter for PI temperature control is provided. RTD includes a integrated transmitter in the conduit head providing a 4-20 mA signal representing water temperature scaled at 0-160 degree F directly to the drive. Configured with this RTD, the following parameters allow the ACH550 drive to operate the cooling tower fan in a regulated “stand alone”, independently controlled operation. (No external speed control needed.) See DIP switch J1 on VFD terminal strip. Slide bottom slider switch # 2 towards the right or I position for a 4-20mA RTD temperature signal wired to AI2 on the VFD terminal strip.



✓	Keypad	Parameter	Title on keypad screen	Enter Value	Comment
	VFD	TIME & DATE	CLOCK VISIBILITY	Show clock	Setting up the clock captures the time and day when a fault occurs.
	VFD	TIME & DATE	TIME FORMAT	12-hour	
	VFD	TIME & DATE	DATE FORMAT	mm/dd/yyyy	
	VFD	TIME & DATE	SET TIME	Today's time	
	VFD	TIME & DATE	SET DATE	Today's date	
	VFD	99 02	APPLIC MACRO	HVAC	Do not use any other macro.
	VFD	99 06	MOTOR NOM CURR	Motor Nameplate Current at 1.00 S.F.	Use NEC FLA
	VFD	99 08	MOTOR NOM SPEED	Motor Nameplate Speed	Do not enter a value such as 3600, 1800, 1200 or 900. Use the slip speed value on the motor nameplate. For example 1775 RPM.
	VFD	11 02	EXT1/EXT2 SEL	EXT2	DI1=Start and DI2=Reverse
	VFD	11 07	REF2 SELECT	23%	While in AUTO Sets min speed to 13.8Hz when RTD ref is 4mA
	VFD	14 01	RELAY OUTPUT 1	PID SLEEP	
	VFD	16 10	DISPLAY ALARMS	NO	Hides (4) alarms. Eliminates call back when in current limit.
	VFD	20 03	MAX CURRENT	Motor nameplate Full Load Amps at a Service Factor of 1.00	MAX CURRENT keeps the motor amps at or below motor nameplate while in VFD mode during cold weather operation by limiting fan speed. Some motors also list a value of amps at a service factor higher than 1.00 do not these values.
	VFD	20 07	MINIMUM FREQ	14 Hz	Prevents VFD operation less than 14Hz in either AUTO or HAND mode. This protects the gear box from running dry.
	VFD	26 01	FLUX OPT ENABLE	OFF	
	VFD	26 09	NOISE SMOOTHING	ENABLE	
	VFD	30 01	AI < MIN FUNCTION	LAST SPEED	Relates to 3022
	VFD	30 22	AI2 FAULT LIMT	15%	If RTD signal to VFD is lost then motor will run at last speed (3001) until signal is restored. VFD keypad will show alarm 2007 AI2 loss.
	VFD	30 28	EARTH FAULT LVL	3 (HIGH)	Defines protection level for ground (earth) fault
	VFD	34 01	SIGNAL1 PARAM	PID1 SETPNT	Line 1 on keypad displays the cold water set point temperature. This value is selectable by the customer using the up and down arrow keys. Marley default temperature is 75°F.
	VFD	34 04	OUTPUT1 DISPLAY	DIRECT	
	VFD	34 05	OUTPUT1 UNIT	Hz	This changes the text field on line 3 of VFD display to show Hz.
	VFD	34 07	OUTPUT1 MAX	160.0°F	
	VFD	34 08	SIGNAL2 PARAM	PID 1 FDBK	Line 2 on the keypad displays the actual cold water temperature the RTD is seeing.
	VFD	34 15	SIGNAL3 PARAM	OUTPUT FREQ	Line 3 on the keypad displays motor speed in hertz
	VFD	34 19	OUTPUT3 UNIT	Hz	



operation

VFD 4X parameters for ABB ACH550 VFD Marley RTD 4-20A speed signal

	VFD	34 21	OUTPUT3 MAX	600 Hz	
	VFD	40 01	GAIN	2	
	VFD	40 02	INTEGRATION TIME	5.0s	
	VFD	40 05	ERROR VAL INV	YES	
	VFD	40 06	UNITS	°F	
	VFD	40 09	100% VALUE	160.0°F	
	VFD	40 22	SLEEP SELECTION	INTERNAL	If sleep function is not desired this feature may be turned off by changing to NOT SEL
	VFD	40 23	PID SLEEP LEVEL	14.0 Hz	
	VFD	40 24	PID SLEEP DELAY	600.0 s	Use 10 seconds for test.
	VFD	40 25	MAKE-UP DEVIATION	3.0°F	
	VFD	40 26	MAKE-UP DELAY	10.00 s	This changes the text field on line 3 of VFD display to show Hz.
	Check correct fan rotation in VFD mode				
	Check correct fan rotation in bypass mode				
	VFD	PARBACKUP		UPLOAD TO PANEL	Motor must be stopped during this process.
	VFD	16 03	PASS CODE	358	To lock or open the keypad 358 must always be entered first.
	VFD	16 02	PARAMETER LOCK	LOCKED	Lock up the key pad to avoid call backs.
Notes					
A	Select the SAVE button to save parameter changes				
B	Do not change the macro from factory default of HVAC				
C	Critical fan speeds should be identified and locked out using program group 25				
D	RTD scaling: 0 to 160°F				

ACH550 vfd standard features

- UL, cUL labeled and CE marked
- EMI/RFI Filter (1st Environment, Restricted Distribution)
- Start-Up Assistants
- Maintenance Assistants
- Diagnostic Assistants
- Real Time Clock
 - Includes Day, Date and Time
- Operator Panel Parameter Backup (read/write)
- Full Graphic and Multilingual Display for Operator Control, Parameter Set-Up and Operation
- Data Display:
 - Output Frequency (Hz)
 - Speed (RPM)
 - Motor Current
 - Calculated % Motor Torque
 - Calculated Motor Power (kW)
 - DC Bus Voltage
 - Output Voltage
 - Heatsink Temperature
 - Elapsed Time Meter (resetable)
 - kWh (resetable)
 - Input/Output Terminal Monitor
 - PID Actual Value (Feedback) and Error
 - Fault Text
 - Warning Text
 - Three (3) Scalable Process Variable Displays
 - User Definable Engineering Units
- Two (2) Programmable Analog Inputs
- Six (6) Programmable Digital Inputs
- Two (2) Programmable Analog Outputs
- Up to Six (6) Programmable Relay Outputs
 - (Three (3) Standard)
- Adjustable Filters on Analog Inputs and Outputs
- Mathematical Functions on Analog Reference Signals
- All Control Inputs Isolated from Ground and Power
- Four (4) Resident Serial Communication Protocols
 - Johnson Controls N2
 - Siemens Building Technologies FLN (P1)
 - Modbus RTU
 - BACnet (MS/TP)
- Input Speed Signals
 - Current 0 (4) to 20 mA
 - Voltage 0 (2) to 10 VDC
 - Increase/Decrease Reference Contacts (Floating Point)
 - Serial Communications
- Start/Stop
 - 2-Wire (Dry Contact Closure)
 - 3-Wire (Momentary Contact)
 - Application of Input Power
 - Application of Reference Signal (PID Sleep/Wake-Up)
 - Serial Communications
- Start Functions
 - Ramp
 - Flying Start
 - Premagnetization on Start
 - Automatic Torque Boost
 - Automatic Torque Boost with Flying Start
 - Auto Restart (Reset) – Customer Selectable and Adjustable
- Stop Functions
 - Ramp or Coast to Stop
 - Emergency Stop
 - DC Braking/Hold at Stop
 - Flux Braking
- Accel/Decel
 - Two (2) sets of Independent Ramps
 - Linear or Adjustable S-Curve Accel/Decel Ramps
- HVAC Specific Application Macros
- Separate Safety (2) and Run Permissive Inputs
- Damper Control
- Override Input (Fire Mode)
- Timer Functions
 - Four (4) Daily Start/Stop Time Periods
 - Four (4) Weekly Start/Stop Time Periods
 - Four (4) Timers for Collecting Time Periods and Overrides
- Seven (7) Preset Speeds
- Supervision Functions
- Adjustable Current Limit
- Electronic Reverse
- Automatic Extended Power Loss Ride Through (Selectable)
- Programmable Maximum Frequency to 500 Hz
- PID Control
 - Two (2) Integral Independent Programmable PID Setpoint Controllers (Process and External)
 - External Selection between Two (2) Sets of Process PID Controller Parameters
 - PID Sleep/Wake-Up
- Motor Control Features
 - Scalar (V/Hz) and Vector Modes of Motor Control
 - V/Hz Shapes
 - Linear
 - Squared
 - Energy Optimization
 - IR Compensation
 - Slip Compensation
 - Three (3) Critical Frequency Lockout Bands
- Preprogrammed Protection Circuits
 - Overcurrent
 - Short Circuit
 - Ground Fault
 - Overvoltage
 - Undervoltage
 - Input Phase Loss
 - Output Device (IGBT) Overtemperature
 - Adjustable Current Limit Regulator
 - UL508C Approved Electronic Motor Overload (I²T)
- Programmable Fault Functions for Protection Include
 - Loss of Analog Input
 - Panel Loss
 - External Fault
 - Motor Thermal Protection
 - Stall
 - Underload
 - Motor Phase Loss
 - Ground Fault
- 5% Input Impedance
 - Equivalent 5% Impedance with Internal Reactor(s)
 - Patented Swinging Choke Design for Superior Harmonic Mitigation (R1 to R4)
- Optional Features**
- Fieldbus Adapter Modules
 - LonWorks
 - Profibus
 - Ethernet

ACH550 vfd specifications

Input Connection

Frequency	48 - 63 Hz
Line Limitations	Max +/-3% of nominal phase to phase input voltage
Fundamental Power Factor (cos ϕ)	0.98 at nominal load
Connection	U ₁ , V ₁ , W ₁ (U ₁ , V ₁ , 1-phase)
Output (Motor) Connection	
Output Voltage	0 to U ₁ , 3-phase symmetrical, U ₂ at the field weakening point
Output Frequency	-500 to 500 Hz
Frequency Resolution	0.01 Hz
Continuous Output Current	
Variable Torque	1.0 I _{2N} (nominal rated output current, variable torque)
Short Term Overload Capacity	
Variable Torque	1.1 I _{2N} (1 min/10 min)
Peak Overload Capacity:	
Variable Torque	1.35 I _{2N} (2 sec/1 min)
Base Motor Frequency Range	10 to 500 Hz
Switching Frequency	1, 4, 8 or 12 kHz
Acceleration Time	0.1 to 1800s
Deceleration Time	0.1 to 1800s
Efficiency	0.98 at nominal power level
Short Circuit Withstand Rating	100,000 AIC (UL) w/o fuses
Connection	U ₂ , V ₂ , W ₂
Enclosure Style	UL (NEMA) Type 1,
Agency Approval Listing and Compliance	UL, cUL, CE

Ambient Conditions, Operation

0 to 40°C (32° to 104°F), above 40°C the maximum output current is derated 1% for every additional 1°C (up to 50°C(122°F)) maximum limit.
5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses

Contamination Levels

IEC	60721-3-1, 60721-3-2 and 60721-3-3
Chemical Gasses	3C1 and 3C2
Solid Particles	3S2

0 to 1000 m (3300 ft) above sea level. At sites over 1000 m (3300 ft) above sea level, the maximum power is derated 1% for every additional 100 m (330 ft).

If the installation site is higher than 2000 m (6600 ft) above sea level, please contact your local ABB distributor or representative for further information.

Max 3.0 mm (0.12 in) 2 to 9 Hz, Max 10 m/s² (33 ft/s²) 9 to 200 Hz sinusoidal

Ambient Conditions, Storage (in protective shipping package)

Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95%, no condensation allowed
Vibration Tested to (IEC 60068-2-6)	In accordance with ISTA 1A and 1B specifications
Bump Tested to (IEC 60068-2-29)	Max 100 m/s ² (330 ft/s ²) 11 ms (tested 500 times each axis, each pole; 3000 times total)

Ambient Conditions, Transportation (in protective shipping package)

Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95%, no condensation allowed
Atmospheric Pressure	60 to 106 kPa (8.7 to 15.4 psi)
Vibration Tested to (IEC 60068-2-6)	Max 3.0 mm (0.14 in) 2 to 9 Hz, Max 15 m/s ² (49 ft/s ²) 9 to 200 Hz sinusoidal
Bump Tested to (IEC 60068-2-29)	Max 100 m/s ² (330 ft/s ²) 11 ms (Tested 500 times each axis, each pole; 3000 times total)
Shock Tested to (IEC 60068-2-27)	R1: 76 cm (30 in), R2: 61 cm (24 in), R3: 46 cm (18 in), R4: 31 cm (12 in), R5 and R6: 25 cm (10 in)

Analog Inputs

Quantity	Two (2) programmable
Voltage Reference	0 (2) to 10 V, 250 kOhm, single-ended
Current Reference	0 (4) to 20 mA, 100 Ohm, single-ended
Potentiometer	10 VDC, 10 mA (1K to 10 KOHms)
Input Updating Time	8 ms
Terminal Block Size	2.3 mm ² /14 AWG

ACH550 vfd specifications

Cooling Information

Integral Fan(s) Power Loss _____ Approximately 3% of rated power

Reference Power Supply

Reference Voltage _____ +10 VDC, 1% at 25°C (77°F)
Maximum Load _____ 10 mA
Applicable Potentiometer _____ 1 kOhm to 10 kOhm
Terminal Block Size _____ 2.3mm²/14AWG

Analog Outputs

Quantity _____ Two (2) programmable current outputs
Signal Level _____ 0 (4) to 20 mA
Accuracy _____ +/- 1% full scale range at 25°C (77°F)
Maximum Load Impedance _____ 500 Ohms
Output Updating Time _____ 2 ms
Terminal Block Size _____ 2.3mm²/14AWG

Digital Inputs

Quantity _____ Six (6) programmable digital inputs
Isolation _____ Isolated as one group
Signal Level _____ 24 VDC, (10V Logic 0)
Input Current _____ 15 mA at 24 VDC
Input Updating Time _____ 4 ms
Terminal Block Size _____ 2.3mm²/ 4AWG

Internal Power Supply

Primary Us _____ Internal supply for digital inputs
Voltage _____ +24 VDC, max 250 mA
Maximum Current _____ 250 mA
Protection _____ Short circuit protected

Relay Outputs

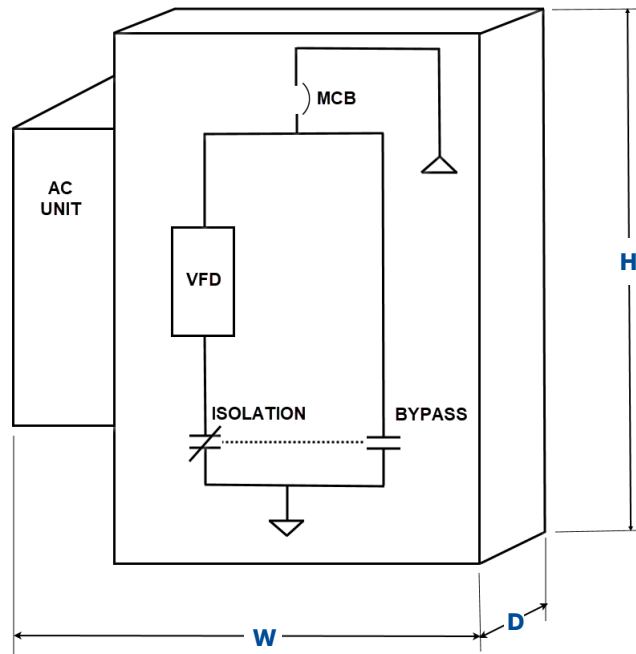
Quantity _____ Three (3) programmable relay (Form C) outputs
Switching Capacity _____ 8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC
Max Continuous Current _____ 2A RMS
Contact Material _____ Silver Cadmium Oxide (AgCdO)
Isolation Test Voltage _____ 4 kVAC, 1 minute
Output Updating Time _____ 12 ms
Terminal Block Size _____ 2.3mm²/14AWG

Protections

Single Phase _____ Protected (input and output)
Overcurrent Trip Limit _____ $3.5 \times I_{2N}$ instantaneous
Adjustable Current Regulation Limit _____ $1.1 \times I_{2N}$ (RMS) max.
Overvoltage Trip Limit _____ $1.30 \times U_N$
Undervoltage Trip Limit _____ $0.65 \times U_N$
Overtemperature (Heatsink) _____ +115°C (+239°F)
Auxiliary Voltage _____ Short Circuit Protected
Ground Fault _____ Protected
Short Circuit _____ Protected
Microprocessor Fault _____ Protected
Motor Stall Protection _____ Protected
Motor Overtemperature Protection (I_2t) _____ Protected
Input Power Loss of Phase _____ Protected
Loss of Reference _____ Protected
Short Circuit Current Rating _____ 100,000 RMS symmetrical amperes
Input Line Impedance _____ Swinging choke 5% equivalent R1-R6, 3% equivalent R8

U_1 = Input Voltage U_N = Nominal Motor Voltage U_2 = Output Voltage f_N = Nominal Motor Frequency
 P_N = Power – Normal Duty (hp) I_{2N} = Nominal Motor Current

Dimensions



Fan Motor Horsepower	W	H	D
1-7.5	34"	36"	8"
10-20	42"	36"	11"
25-30	48"	48"	11"
40-60	52"	48"	16"
75-100	52"	60"	16"

All wiring should be in and out of the bottom of the enclosure.
Width dimension includes the air-conditioning unit.

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