YORK®	VARIABLE FREQUENCY DRIVE - MODEL YPAL ROOF TOP UNITS	
INSTALLATION, OPERATION & MAINTENANCE	SUPERCEDES 100.40-N04 (703)	FORM 100.40-N04 (804)

Rotating shafts and electrical equipment can be hazardous. Therefore, it is strongly recommended that all electrical work conform to National Electrical Code (NEC) and all local regulations. Installation, start-up and maintenance should be performed only by qualified personnel. Failure to follow the NEC or local regulations could result in death or serious injury.

Factory recommended procedures, included in this manual, should be followed. Always disconnect electrical power before working on the unit.

Although shaft couplings or belt drives are generally not furnished by the manufacturer, rotating shafts, couplings and belts must be protected with securely mounted metal guards that are of sufficient thickness to provide protection against flying particles such as keys, bolts and coupling parts. Even when the motor is stopped, it should be considered "alive" as long as its controller is energized. Automatic circuits may start the motor at any time. Keep hands away from the output shaft until the motor has completely stopped and power is disconnected from the controller.

Motor control equipment and electronic controls are connected to hazardous line voltages. When servicing drives and electronic controls, there will be exposed components at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case of an emergency. Disconnect power whenever possible to check controls or to perform maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electric control or rotating equipment.

Safety Guidelines

1. The drive must be disconnected from the AC line before any service work is done.
2. The STOP/OFF key on the local control panel of the drive does not disconnect the equipment from the AC line and is not to be used as a safety switch.
3. Correct protective grounding of the equipment must be established. The user must be protected against supply voltage and the motor must be protected against overload in accordance with applicable national and local regulations.
4. Ground currents are higher than 3 mA.

Warnings Against Unintended Start

1. While the drive is connected to the AC line, the motor can be brought to a stop by means of external switch closures, serial bus commands or references. If personal safety considerations make it necessary to ensure that no unintended start occurs, these stops are not sufficient.
2. During programming of parameters, the motor may start. Be certain that no one is in the area of the motor or driven equipment when changing parameters.
3. A motor that has been stopped may start unexpectedly if faults occur in the electronics of the drive, or if an overload, a fault in the supply AC line or a fault in the motor connection or other fault clears.
4. If the LOCAL/HAND key is activated, the motor can only be brought to a stop by means of the STOP/OFF key or an external safety interlock.

Motor Overload Protection

Person installing drive is responsible to provide proper grounding and branch circuit protection for incoming power and motor overload according to National Electrical Code (NEC) and local codes.

The electronic thermal relay (ETR) in UL listed VFDs provides Class 20 motor overload protection in accordance with the NEC in single motor applications when parameter 117 is set for ETR TRIP and parameter 105 is set for rated motor current.

Touching electrical parts may be fatal, even after equipment has been disconnected from the AC input line. To be sure that capacitors have fully discharged, wait 14 minutes for 208 V and 480 V units and 30 minutes for 600 V units over 25 hp after power has been removed before touching any internal component. Failure to wait for capacitors to fully discharge before touching internal components could result in death or serious injury.

Table of Contents

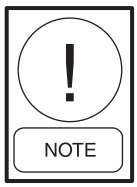
Never ignore warnings, cautions and notes in this manual. They are provided to alert anyone installing, operating, or maintaining this equipment to potential hazards or ineffective practices. Notes are used to call special attention to information which, if ignored or not clearly understood, in most cases will result in degraded or less then optimum equipment operation.

Become familiar with all warnings, cautions, and notes in this manual. These are important guidelines intended for your safety and for full utilization of the operational features of the equipment.

DANGER indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury.

CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.

WARNING indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.



NOTE is used to highlight additional information that may be helpful to you.

SOFTWARE VERSION NOTICE: The software version number for this drive is displayed in parameter 624, *Software Version*.

Input Fuses

All drives must be protected with branch circuit fuses in accordance with the National Electrical Code. Failure to provide branch circuit fuses in accordance with the NEC may result in equipment or property damage.

To comply with UL508C, input fuses shown in the following tables must be installed in the power supply to drives which are 208 V above 30 HP, and 460 V and 600 V drives above 75 HP. The fuse ratings in the tables are the recommended maximum ratings.

York recommends input fuses on all drives. If specified as a drive option, input fuses will be factory installed in an enclosure external to the drive, which may include other optional features. If not supplied, they must be provided by the drive installer as part of installation.

The drives are suitable for use on circuits capable of delivering not more than 100,000 RMS symmetrical amps, 500 volts maximum (600 volts maximum for 575 volt drives), when used with the recommended fuses.

208 Volt Input

Model Number	Maximum Fuse Rating (Amps)	Bussmann Type
AMVII-1-2	10	KTN-R or JJN
AMVII-1H-2	15	KTN-R or JJN
AMVII-2-2	20	KTN-R or JJN
AMVII-3-2	25	KTN-R or JJN
AMVII-5-2	50	KTN-R or JJN
AMVII-7H-2	50	KTN-R or JJN
AMVII-10-2	50	KTN-R or JJN
AMVII-15-2	60	KTN-R or JJN
AMVII-20-2	80	KTN-R or JJN
AMVII-25-2	125	KTN-R or JJN
AMVII-30-2	125	KTN-R or JJN
AMVII-40-2	150	FWX or FWH
AMVII-50-2	200	FWX or FWH
AMVII-60-2	250	FWX or FWH

460 Volt Input

Model Number	Maximum Fuse Rating (Amps)	Bussmann Type
AMVII-1-4	6	KTS-R or JJS
AMVII-1H-4	6	KTS-R or JJS
AMVII-2-4	10	KTS-R or JJS
AMVII-3-4	10	KTS-R or JJS
AMVII-5-4	20	KTS-R or JJS
AMVII-7H-4	25	KTS-R or JJS
AMVII-10-4	30	KTS-R or JJS
AMVII-15-4	40	KTS-R or JJS
AMVII-20-4	40	KTS-R or JJS
AMVII-25-4	50	KTS-R or JJS
AMVII-30-4	60	KTS-R or JJS
AMVII-40-4	80	KTS-R or JJS
AMVII-50-4	100	KTS-R or JJS
AMVII-60-4	125	KTS-R or JJS
AMVII-75-4	150	KTS-R or JJS
AMVII-1A-4	200	FWH
AMVII-1B-4	250	FWH
AMVII-1C-4	300	FWH
AMVII-2A-4	350	FWH
AMVII-2B-4	400	FWH
AMVII-3A-4	500	FWH
AMVII-3B-4	600	FWH
AMVII-4B-4	700	FWH
AMVII-5A-4	800	FWH
AMVII-6A-4	800	FWH

600 Volt Input

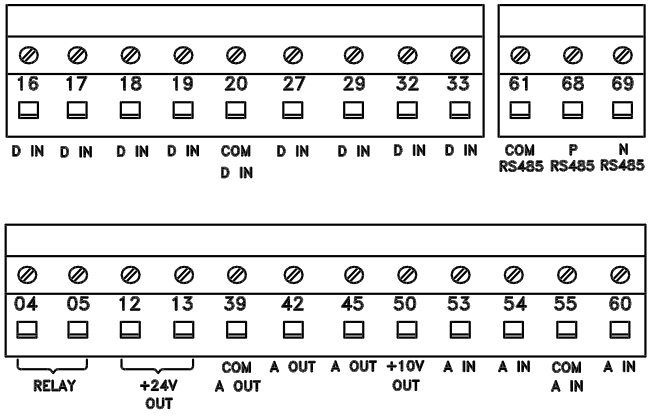
Model Number	Maximum Fuse Rating (Amps)	Bussmann Type
AMVII-2-5	6	KTS-R or similar
AMVII-3-5	6	KTS-R or similar
AMVII-5-5	10	KTS-R or similar
AMVII-7H-5	20	KTS-R or similar
AMVII-10-5	30	KTS-R or similar
AMVII-15-5	40	KTS-R or similar
AMVII-20-5	40	KTS-R or similar
AMVII-25-5	50	KTS-R or similar
AMVII-30-5	60	KTS-R or similar
AMVII-40-5	80	KTS-R or similar
AMVII-50-5	100	KTS-R or similar
AMVII-60-5	125	KTS-R or similar

All fuse ratings are in amps

Control Terminals

Torque control terminals to 5 in-lbs (0.5-0.6 N-m)
Max. wire size: 16 AWG (1.5mm^2)

The diagram below shows the location of the control terminals. The programming section of the manual covers the programmable terminals in greater depth.



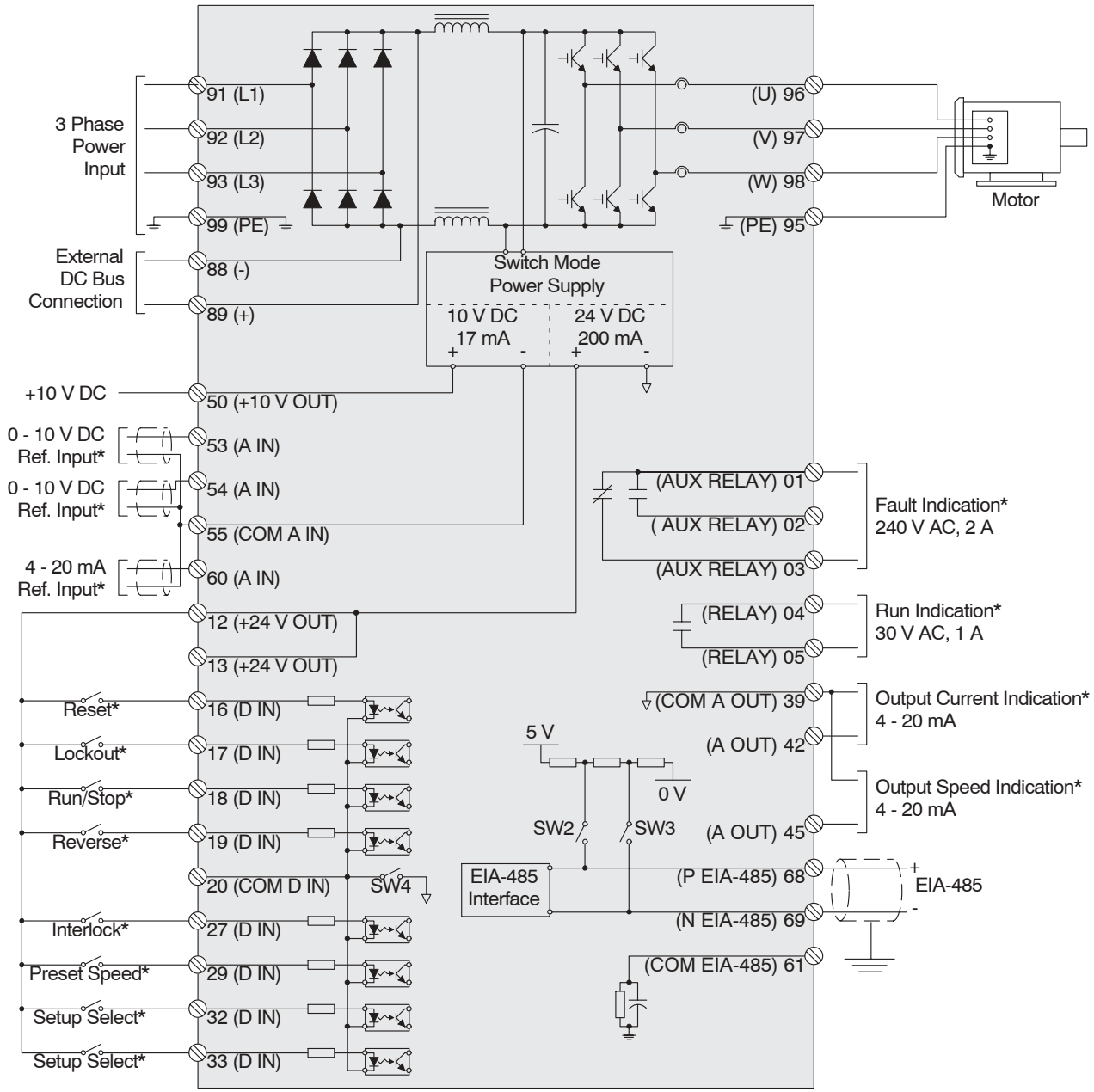
The following is a description of the functions of the control terminals. Many of these terminals have multiple functions determined by parameter settings.

Terminal No.	Function
01, 02, 03	Form C relay output. Maximum 240 VAC, 2 A. Minimum 24 VDC, 10 mA or 24 VAC, 100 mA. (Location of Form C relay output varies with unit type. See connection diagram with unit for location.)
04, 05	30 VAC, 42.5 VDC, 1 A relay output can be used for indicating status and warnings.
12, 13	Voltage supply to digital inputs and external transducers. For the 24 VDC to be used for digital inputs, switch 4 on the control card must be closed, position "on." The maximum output current is 200 mA.
16 - 33	Digital inputs. R = 2 kohm. <5 V = logical "0", >10 V = logical "1". See parameters 300 through 307, *Digital Inputs*.
20	Common for digital inputs.
39	Common for analog and digital outputs.
42, 45	Analog and digital outputs for indicating frequency, reference, current and torque. The analog signal is 0 to 20 mA, or 4 to 20 mA at a maximum of 500 Ω. The digital signal is 24 VDC at a minimum of 600 Ω. See parameters 319-322, *Analog/digital Outputs*.
50	10 VDC, 17 mA maximum analog supply voltage to potentiometer and thermistor.
53, 54	0 to 10 VDC voltage input, R = 10 kΩ.
55	Common for analog inputs. This common is isolated from the common of all other power supplies. If, for example, the drive's 24 VDC power supply is used to power an external transducer which provides an analog input signal, terminal 55 must be wired to terminal 39.
60	0 to 20 mA or 4 to 20 mA, analog current input, R = 188 Ω. See parameters 314 through 316.
61	Shield for serial communication.
68, 69	RS-485 interface and serial communication. When the drive is connected to an RS-485 serial communication bus, DIP switch settings on the control card may have to be reset. See *DIP Switches 1 through 4* in this manual.

Typical Control Connections

Shown below are typical interfaces between the VFD and other components in an HVAC system. The terminal numbers and the functions of the terminals are identical on all drives. An optional relay card, not shown, can provide four additional Form C output relays. The EIA-485 (formerly RS-485) connections allow direct communication through the drive's built-in serial communication: Johnson Controls Metasys® N2, Siemens Apogee® FLN, Modbus RTU, or VFD FC® protocols. LonWorks® and Profibus® are available through option cards that fit into the back of the control card location. BACnet is also available in an auxiliary enclosure.

Typical VFD Wiring



* The operation of all control inputs and outputs is programmable. Typical terminal functions are shown.

Control Panel

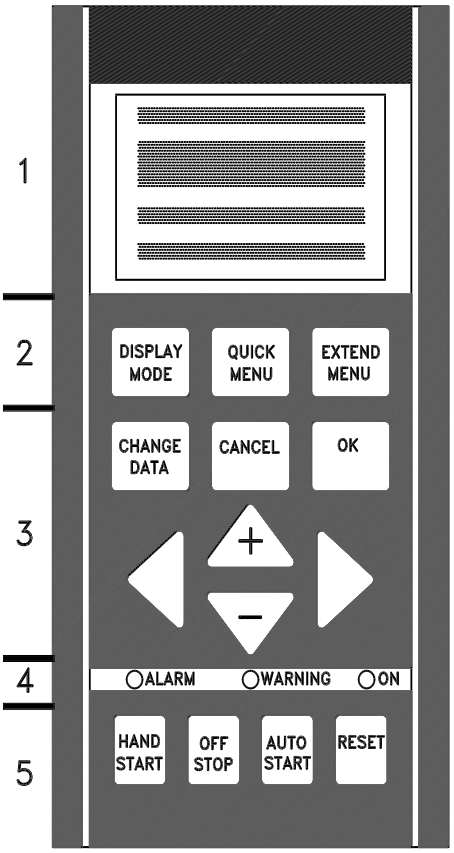
The Local Control Panel (LCP), normally mounted on the front of the drive, is a complete interface for programming and operating the drive. The control panel can be removed from the drive and installed up to 10 feet (3 meters) from the drive by using a remote mounting kit.

The control panel has five functions:

1. Display
2. Keys for changing the display
3. Keys for changing programming parameters
4. Indicator lamps
5. Keys for controlling drive operation

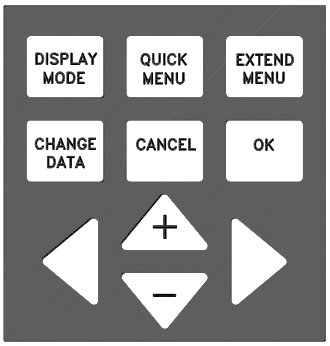
The LCP uses a four-line, alpha-numeric, back-lit, LCD display. The display can show four operating data values and three operating condition values continuously. During programming, all the information required for quick, effective parameter setup of the drive will be displayed. As a supplement to the display, there are three indicator lamps for power on (ON), warning (WARNING) and alarm (ALARM).

All drive parameters can be changed from the control panel, unless this ability has been locked out by setting parameter 016, *Lock for Data Change*, to Locked, or by a digital input to terminals 16 through 33. See the related parameters for more information.



Keys for Parameter Changes

The keys are divided into groups by function. The keys between the display and indicator lamps are used for parameter setup, selecting the display indication during normal operation and controlling the drive speed during local speed control operation. The keys below the indicator lamps are used for Start/Stop control and selection of the operating site.



DISPLAY MODE

The DISPLAY MODE key is used to change the mode of the display or to return to the Display Mode from either the Quick Menu or the Extend Menu mode.

QUICK MENU

The QUICK MENU key gives access to the parameters available for the Quick Menu setup. Parameters in this menu are the 12 most important setup parameters for the drive.

EXTEND MENU

The EXTEND MENU key gives access to all parameters.

CHANGE DATA

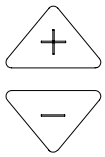
The CHANGE DATA key is used for changing the value of a parameter selected either in the Extend Menu or the Quick Menu mode. The desired parameter is first selected. Then the CHANGE DATA key is pressed to enable the editing of the parameter. The underline in the display will move under the parameter's value to show that it is being edited.

CANCEL

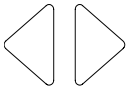
The CANCEL key is used if a change of the selected parameter is not to be carried out.

OK

The OK key is used for confirming a change of the parameter selected.



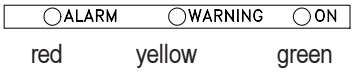
The + and - keys are used to scroll through parameters and to change the value of a chosen parameter. These keys are also used to change the local reference. In Display Mode, these keys are used to switch between readouts.



The ◁ and ▷ keys are used to select a parameter group and also to move the cursor to the desired digit when changing numerical values.

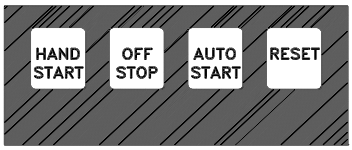
Indicator Lamps

At the bottom of the control panel is a red alarm LED, a yellow warning LED, and a green power on LED.



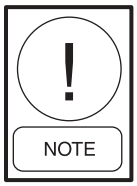
If certain threshold values are exceeded, the alarm and/or warning lamps will flash and text describing the alarm or warning condition will be displayed.

Local Control



Below the indicator lamps are keys which are used to determine the point of control. Each of these keys can be individually enabled or disabled using parameter 012 through 015. The Hand Start and Auto Start keys will also be disabled if any of the control terminals are programmed for either Remote Hand or Remote Auto.

The HAND START key is used if the drive is to be started from the control panel. Pressing HAND START will give a start command to the drive.



If a minimum speed is set in parameter 201,* Output Frequency, Low Limit*, the motor will start and ramp up to this frequency when HAND START is pressed. If drive is running in Auto Mode when the HAND START key is pressed, drive control will switch to Hand Mode.

The OFF/STOP key is used for stopping the connected motor in either the Hand or Auto mode. Enable or disable via parameter 013. If this stop function is activated, the second line in the LCD display will flash.

AUTO START is used if the drive is to be started via the control terminals and/or serial communication. When a remote start signal is active, the drive will start if the AUTO START key has been pressed.

In Auto Mode, a start signal via digital inputs may cause drive to start at any time. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness in Auto Mode could result in death, serious injury, or equipment or property damage.

The RESET key is used for manually resetting the drive after a fault trip (alarm). In this case, the top line of the display will show TRIP (RESET). If the top line of the display shows TRIP (AUTO START), the drive will automatically restart. If the top line of the display shows TRIPLOCK (DISC. MAINS), input power to the drive must be removed before the trip can be reset.

Display Modes

In Auto operational mode, information is displayed in any of three programmable displays. Pressing the DISPLAY MODE key enters display mode and toggles between modes I and II. While in Display mode, the [+] and [-] keys scroll through all data display options. When in Mode II, holding down the DISPLAY MODE key enters Mode III which identifies the units on the top line that the display is showing. Mode IV is available only in local Hand operation and displays the local speed reference.

In normal operation, three data readouts can be shown on the first (top) line of the display. Parameters 008, 009 and 010 select the data displayed on the top line. One readout is available for the large display (line 2). Parameter 007, *Large Display Readout,* selects the data displayed on line 2. The list on the next page defines the operating data that can be selected for the display readouts.

During an alarm (fault trip), ALARM and the alarm number are shown on the large display. An explanation is given in line 3 or in lines 3 and 4. For a warning, WARN. and the warning number are shown with an explanation in line 3 and/or 4. Both alarms and warnings cause the display to flash.

Line 4 (bottom line), in normal operation, automatically displays the operating status of the drive.

The active setup number and an arrow indicating the direction of motor rotation is shown on the right side of the large display. Clockwise indicates forward and counterclockwise indicates reverse. The arrow body is removed if a stop command is given or if the output frequency falls below 0.01 Hz.

The table below gives the operating data options for the first and second lines of the display.

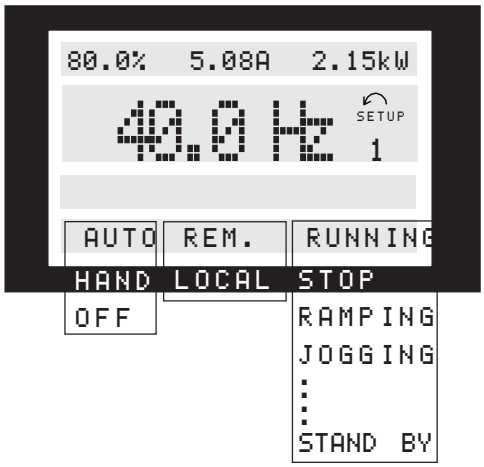
Data Item:	Unit:
Resulting reference, %	%
Resulting reference	unit chosen in par. 415
Frequency	Hz
% of maximum output frequency	%
Motor current	A
Power	kW
Power	HP
Output energy	kWh
Hours run	hours
User defined readout	unit chosen in par. 006
Setpoint 1	unit chosen in par. 415
Setpoint 2	unit chosen in par. 415
Feedback 1	unit chosen in par. 415
Feedback 2	unit chosen in par. 415
Feedback	unit chosen in par. 415
Motor voltage	V
DC link voltage	V
Thermal load on motor	%
Thermal load on drive	%
Input status, digital input	binary code
Input status, analog terminal 53	V
Input status, analog terminal 54	V
Input status, analog terminal 60	mA
Pulse reference	Hz
External reference	%
Heat sink temperature	°C

Display Mode I:

In Display mode I, the drive is in Auto mode with reference and control determined via the control terminals. Following is an example in which the drive is running in setup 1, in Auto mode, with a remote reference, and at an output frequency of 40 Hz.

The text in line 1, FREQUENCY, describes the meter shown in the large display. Line 2 (large display) shows the current output frequency (40.0 Hz), direction of rotation (reverse arrow), and active setup (1). Line 3 is blank. Line 4 is the status line and the information is automatically generated for display by the drive in response to its operation. It shows that the drive is in auto mode, with a remote reference, and that the motor is running.

Status line (Line 4): Additional automatic displays for the drive status line are shown below. See *Status Messages* section in this manual for additional information.



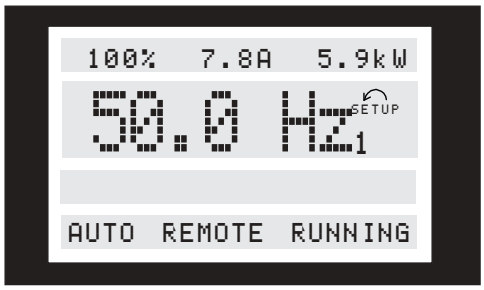
The left indicator on the status line displays the active control mode of the drive. AUTO is displayed when control is via the control terminals. HAND indicates that control is local via the keys on the LCP. OFF indicates that the drive ignores all control commands and will not run.

The center part of the status line indicates the reference element that is active. REM. (Remote) means that reference from the control terminals is active, while LOCAL indicates that the reference is determined via the [+] and [-] keys on the control panel.

The last part of line 4 indicates the drive's operational status, for example: RUNNING, STOP, or RUN REQUEST, and so on.

Display Mode II:

This display mode shows three operating data values in the top line programmed via parameters 008, 009, and 010. Pressing the DISPLAY MODE key toggles between Display modes I and II.



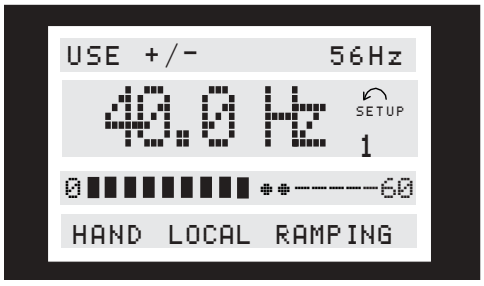
Display Mode III:

Press and hold the [DISPLAY MODE] key while in Mode II. Mode III is visible as long as the key is depressed. The top line changes to identify the data names and units displayed. Lines 2 and 4 are unchanged. When the key is released, the display returns to Mode II.

Display Mode IV:

This display mode is available when local reference is selected. In this display mode, the speed reference is increased or decreased via +/- keys.

The first line shows the present speed reference. The second line shows the present drive output frequency. The third line show a bar graph of the relative value of the present drive output frequency in relation to the maximum frequency.



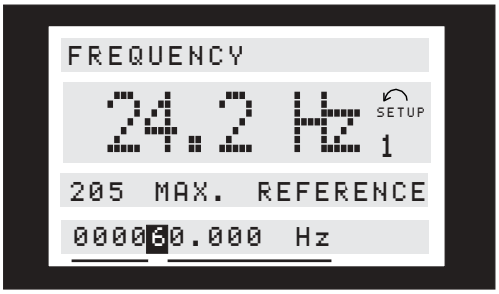
Changing Data

Regardless of whether a parameter has been selected under the Quick Menu or the Extend Menu, the procedure for changing data is the same. Pressing the CHANGE DATA key gives access to changing the selected parameter. Line 3 displays the parameter number and title. The underlined function or number flashing in line 4 on the display is subject to change.

The procedure for changing data depends on whether the selected parameter represents a numerical data value or a function.

Changing Numeric Values

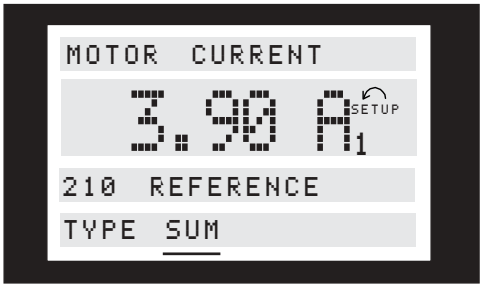
If the chosen parameter represents a number value, the flashing digit can be changed by means of the [+] and [-] keys. Position the cursor by using the [<] and [>] keys, then change the data value using the [+] and [-] keys.



The selected digit is indicated by a flashing cursor. The bottom display line gives the data value that will be entered (saved) by pressing the OK button. Use CANCEL to ignore the change.

Changing Functional Values

If the selected parameter is a functional value, the selected text value can be changed by means of the [+] and [-] keys.



The functional value flashes until signing off by pressing the OK button. The functional value has then been selected. Use CANCEL to ignore the change.

Changing Numeric Values in a List

A few parameters offer numeric lists of values that can be selected from or changed. This means that if the numeric value is not listed, a value may be entered using the procedure for changing numeric values. This applies to parameter 102, *Motor power*, parameter 103, *Motor voltage,* and parameter 104, *Motor frequency*.

Quick Menu

The Quick Menu gives access to the 12 most important setup parameters of the drive. After programming the Quick Menu items, the drive will, in many cases, be ready for operation. The Quick Menu parameters are described in the table below. A detailed description of the functions are given in the Programming section of this manual. The Quick Menu is activated by pressing the QUICK MENU key on the control panel.

Quick Menu Item Number	Parameter Name	Description
1	001 Language	Selects language used for all displays.
2	102 Motor Power	Sets output characteristics of drive based on kW (HP) of motor. See chart in parameter 102, *Motor Power*, to convert HP to kW.
3	103 Motor Voltage	Sets output characteristics of drive based on voltage of motor.
4	104 Motor Frequency	Sets output characteristics of drive based on nominal frequency of motor. This is typically equal to line frequency.
5	105 Motor Current	Sets output characteristics of drive based on full load current in amps (FLA) of motor. This sets overload protection for motor.
6	106 Motor Nominal Speed	Sets output characteristics of drive based on nominal full load speed of motor.
7	201 Minimum Frequency	Sets minimum controlled frequency at which motor will run.
8	202 Maximum Frequency	Sets maximum controlled frequency at which motor will run.
9	206 Ramp Up Time	Sets time to accelerate motor from 0 Hz to nominal motor frequency set in Quick Menu Item 4.
10	207 Ramp Down Time	Sets time to decelerate motor from nominal motor frequency set in Quick Menu Item 4 to 0 Hz.
11	323 Relay 1 Function	Sets function of high voltage Form C relay.
12	326 Relay 2 Function	Sets function of low voltage Form A relay.

To Enter or Change Quick Menu Parameter Data

Enter or change parameter data or settings in accordance with the following procedure.

1. Press Quick Menu key.
2. Use ◀ and ▶ keys to find parameter group to edit.
3. Use '+' and '-' keys to find parameter you chose to edit.
4. Press Change Data key.
5. Use '+' and '-' keys to select correct parameter setting. Or, to move to digits within a number, use ◀ and ▶ arrows. *Flashing cursor indicates digit selected to change.*
6. Press Cancel key to disregard change, or press OK key to accept change and enter new setting.

Example of Changing Parameter Data

Assume Parameter 206, *Ramp Up Time,* is set at 60 seconds. Change the ramp up time to 100 seconds in accordance with the following procedure.

1. Press Quick Menu key.
2. Press '+' key until you reach Parameter 206, *Ramp Up Time*.
3. Press Change Data key.
4. Press ◀ key twice – hundreds digit will flash.
5. Press '+' key once to change hundreds digit from '0' to '1.'
6. Press ▶ key to move cursor to tens digit.
7. Press '-' key until '6' counts down to '0' and setting for *Ramp Up Time* reads '100 s.'
8. Press OK key to enter new value into drive controller.

NOTE

Programming additional parameter functions available through Extended Menu key is done in accordance with same procedure as described for Quick Menu functions.

Extended Menu

In some applications, the Quick Menu will not access all additional parameters necessary to set up the drive. To access all parameters, including Quick Menu items, use the Extended Menu. The Extended Menu is enabled by pressing the EXTEND. MENU key. The Programming section of this manual describes in detail all the parameters available through the Extended Menu.

Manual Initialization of Parameters

Manual initialization using either procedure described below, or in parameter 620, will reset drive to standard default parameters. Any special application programming performed at the factory, during start-up or thereafter, will be lost. As a backup, upload drive settings into the local control panel (LCP) keypad on the drive as described in parameter 004, **LCP Copy.**

It is possible to reset parameters back to their original default values at once. To reset the drive parameters to their read only default values, first remove power from the drive. Then press and hold the DISPLAY MODE, the CHANGE DATA and the OK keys down simultaneously while reapplying power. Continue to hold down the three keys. Shortly after power is reapplied, the bottom line of the display will read "Initialized." After the display stops changing, release the keys. If "Initialized" did not appear, repeat the procedure.

These parameters are not reset by manual initialization:

Parameter 600	Operating hours
Parameter 601	Hours run
Parameter 602	kWh counter
Parameter 603	Number of power-ups
Parameter 604	Number of overtemperatures
Parameter 605	Number of overvoltages

Initialization can also be done using Parameter 620.

Uploading Parameters

At any time the present parameters may be copied to the local control panel (LCP). This may be useful when setting up multiple drives. It is also useful when it is desired to return to a previous set of parameters. See parameter 004, *LCP Copy*, for more information.

Manually initializing the drive using either the procedure described above or parameter 620, *Operating Mode*, does not change the values uploaded to the local control panel.

VFD Drive Replacement

Pre-installation Checks

1. Compare drive model number to what was ordered.
2. Ensure each of following are rated for same voltage:
   - Drive
   - Power line
   - Motor
3. Record following motor data:
   - Voltage
   - Frequency
   - Full load current
   - Motor nameplate RPM
   - Power — convert HP to kW (See conversion table in parameter 102, *Motor Power*, in this manual.)
4. Ensure that rated drive current is equal to or greater than total full load current.
   - For multiple motor operations, add up full load current ratings of all motors.
   - Drive can be *at most* one size smaller than motor.
   - If drive rating is less than motor, full motor output cannot be achieved.
5. Check motor wiring:
   - Ensure terminal screws and wiring connections are secured in Air Modulator panels.
   - No power factor correction capacitors can be connected between drive and motor.

Setting Up Drive for Motor Start

Enter motor nameplate data into drive through Quick Menu.

1. Parameter 101:
   - If one motor is connected to drive, set to AEO FUNCTION.
   - If more than one motor connected to drive, set to MULTIPLE MOTORS. (Parameter 108, MULTIPLE MOTOR STARTING VOLTAGE should be adjusted later to provide reliable starts and minimum starting current.)
2. Parameter 102, MOTOR POWER (in kW) (See conversion table in parameter 102, *Motor Power*, in this manual.)
3. Parameter 103, MOTOR VOLTAGE
4. Parameter 104, MOTOR FREQUENCY
5. Parameter 105, MOTOR CURRENT
6. Parameter 106, MOTOR SPEED
7. Parameter 107, (optional) select AUTOMATIC MOTOR ADAPTATION and run AMA in accordance with procedure in parameter 107, *Automatic Motor Adaptation,* in this manual.
8. Press HAND START key to initiate operation in local control.

Operational Tests - HAND

1. Check motor rotation from drive. If incorrect, disconnect input power from drive and reverse two leads between drive and motor.
2. If a bypass is provided, check motor rotation in bypass mode. If incorrect, disconnect input power from drive and reverse two input power leads.
3. Accelerate motor quickly to full speed and verify operation.
4. Decelerate motor quickly to stop and verify operation.
5. Operate motor over entire speed range while closely checking for resonance.

Operational Tests - AUTO

1. Ensure that drive follows run/stop and safety interlock commands from system.
2. Ensure drive follows speed reference.

Final Adjustments

1. Use parameters 216 through 220 to reject any resonant points.
2. Lock out keypad functions, as required.

General Troubleshooting

1. Display Messages:
   - AUTO START—Drive has tripped off and is in process of automatically restarting.
   - TRIP—Drive has tripped off. Press RESET to start.
   - TRIP LOCKED—Drive has tripped off. Remove and apply power before restarting with RESET.
2. Refer to *Warnings and Alarms* section in this manual.
3. Check tightness of all connections and wires for proper location.
4. Measure input signals.
5. Check drive input and output for balanced voltage and current.

Programming

EXTEND MENU

Using the Extend Menu key, it is possible to access to all the parameters for the drive.

Description of Parameters

Parameters are grouped by function. The groups are:

Operation and Display	Parameters 001 through 017
Load and Motor	Parameters 100 through 118
References and Limits	Parameters 200 through 228
Input and Outputs	Parameters 300 through 328
Application Functions	Parameters 400 through 427
Serial Communication	Parameters 500 through 566
Service Functions	Parameters 600 through 631
Relay Card Functions	Parameters 700 through 711

The numbers shown in the square brackets ([ ]) after the parameter values are used in serial communications to choose the parameter value from the list. They are not shown on the local control panel when programming the drive locally.

Setup Configuration and Parameters Copy

The VFD has four independent parameter setups that can be programmed. Each setup acts independently in controlling the drive. Example applications would be programming different setups for day/night or summer/winter operation. Any of the four setups can be used.

The setup is selected in parameter 002, *Active Setup*, for programming and operation. Setups are changed manually by switching between active setups in parameter 002. It is also possible to change setups through digital inputs or serial communication by selecting *Multi-setup* in parameter 002 and providing an external signal.

The number of the active setup selected is shown on the keypad display under *Setup* in the second line of the display.

A short cut to programming more than one setup is possible by using parameter 003, *Setup Copy.* This enables copying one setup to another setup. After copying parameter settings from one setup, just those parameters unique to the other setups need be changed.

All setups can be transferred from one VFD to another by using the removable keypad. Parameter 004, *LCP Copy*, allows this function. First, upload all parameter values to the keypad. The keypad can then be removed and plugged into another drive where all parameter values can be downloaded. If motor or drive sizes differ, *Download Power-independent Parameters* can be selected in parameter 004 to omit downloading motor and current dependent data.

Operation and Display Parameters 000 through 017

This parameter group deals with the display, control keys and other general functions.

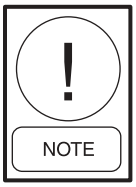
001 Language	(Language)
Value:	
★ English (ENGLISH)	[0]
German (DEUTSCH)	[1]
French (FRANCAIS)	[2]
Danish (DANSK)	[3]
Spanish (ESPAÑOL)	[4]
Italian (ITALIANO)	[5]
Swedish (SVENSKA)	[6]
Dutch (NEDERLANDS)	[7]
Portuguese (PORTUGUESA)	[8]
Finnish (SUOMI)	[9]

Function:

This parameter determines the language to be used on the display.

Description of choice:

Select the display language.



Choosing* Initialization *in parameter 620,* Operation Mode, *resets drive to read-only factory default values in parameter 002. This resets all special programming in setups 1 through 4 to factory settings only.

002 Active Setup	(ACTIVE SETUP)
Value:	
Factory Setup (FACTORY SETUP)	[0]
★ Setup 1 (SETUP 1)	[1]
Setup 2 (SETUP 2)	[2]
Setup 3 (SETUP 3)	[3]
Setup 4 (SETUP 4)	[4]
Multi-setup (MULTI SETUP)	[5]

Function:

This parameter defines the setup number that controls the drive. All parameters can be programmed in four individual parameter setups, *Setup 1, Setup 2, Setup 3* and *Setup 4*.

Factory Setup contains read-only parameter values preset at the factory. This data can be used as a default setup to reset parameters to a known state.

Setup 1 is programmed for supply fan operation.

Setup 2 is programmed for return fan operation.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Setup 3 is programmed for exhaust fan operation.

Setup 4 is not applicable to YPAL units.

Multi-setup is used if remote switching between different setups is required. Terminals 16, 17, 29, 32, 33 and the serial communication port can be used for switching between setups.

Description of choice:

Select the proper setup for the fan application the drive is controlling.

003 Copying of Setups	(Setup Copy)
Value:	
★ No copying (NO COPY)	[0]
Copy active Setup to Setup 1 (COPY TO SETUP 1)	[1]
Copy active Setup to Setup 2 (COPY TO SETUP 2)	[2]
Copy active Setup to Setup 3 (COPY TO SETUP 3)	[3]
Copy active Setup to Setup 4 (COPY TO SETUP 4)	[4]
Copy active Setup to all (COPY TO ALL)	[5]

Function:

A copy is made from the active setup selected in parameter 002, *Active Setup*, to the setup or setups selected in parameter 003, *Copying of Setups*.

Copying is only possible when drive is stopped.

Description of choice:

The copying starts when the required copying function has been selected and the OK key has been pressed.

The display indicates when copying is in progress.

004 LCP Copy	(LCP COPY)
Value:	
★ No copying (NO COPY)	[0]
Upload all parameters (UPLOAD ALL PARAMET.)	[1]
Download all parameters (DOWNLOAD ALL PARAM.)	[2]
Download power-independent parameters (DOWNLOAD SIZE INDEP.)	[3]

Function:

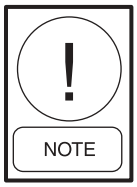
Parameter 004, *LCP Copy*, is used to copy all parameter setups to or from the Local Control Panel (LCP). This can be used to store a backup copy of all parameters in the LCP or to copy all setups from one drive to another.

Description of choice:

Select *Upload All Parameters* if all parameter values are to be copied from the drive to the LCP.

Select *Download All Parameters* if all parameter values are to be copied from the LCP to the drive on which the control panel has been mounted.

Select *Download Power-independent Parameters* if only the power-independent parameters are to be downloaded. This allows the parameters from one drive to be easily copied to another drive of a different size. Settings in parameters 102, 103, 104, 105, 106, 215, 221, and 222 are not downloaded using this function.



Copying is only possible when drive is stopped.

Setup of User-defined Readout

Parameter 005, *Maximum Value of User-defined Readout*, and Parameter 006, *Unit for User-defined Readout*, allow users to design their own readout which can be seen if the *User-defined Readout* has been selected as one of the displayed meters. The range is set in parameter 005, *Maximum Value of User-defined Readout* and the unit is determined in parameter 006, *Unit for User-defined Readout*. The choice of unit determines whether the relationship between the output frequency and the readout is a linear, square or cubed. Units representing rates (RPM, CFM, GPM, etc.) are linear. Units representing pressure (PSI, in. wg., etc.) are square. Units representing power (HP, kW, etc.) are cubed.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

005 Maximum Value of Custom Readout (CUSTOM READOUT)

Value:

0.01 - 999,999.99 ★100.000

Function:

This parameter determines the value that the user defined meter will display when the drive's output frequency is the value set in parameter 202, *Output Frequency High.*

Description of choice:

Set the required value for maximum output frequency.

006 Custom Readout (CUST. READ. UNIT)

Value:

	No unit	[0]	GPM	[21]
★	%	[1]	gal/s	[22]
	rpm	[2]	gal/min	[23]
	ppm	[3]	gal/h	[24]
	pulse/s	[4]	lb/s	[25]
	l/s	[5]	lb/min	[26]
	l/min	[6]	lb/h	[27]
	l/h	[7]	CFM	[28]
	kg/s	[8]	ft3/s	[29]
	kg/min	[9]	ft3/min	[30]
	kg/h	[10]	ft3/h	[31]
	m3/s	[11]	ft3/min	[32]
	m3/min	[12]	ft/s	[33]
	m3/h	[13]	in wg [1]	[34]
	m/s	[14]	ft wg [1]	[35]
	mbar [1]	[15]	PSI [1]	[36]
	bar [1]	[16]	lb/in [1]	[37]
	Pa [1]	[17]	HP [2]	[38]
	MPa [1]	[18]		
	MWG [1]	[19]		
	kW [2]	[20]		

[1] Squared units (pressure)

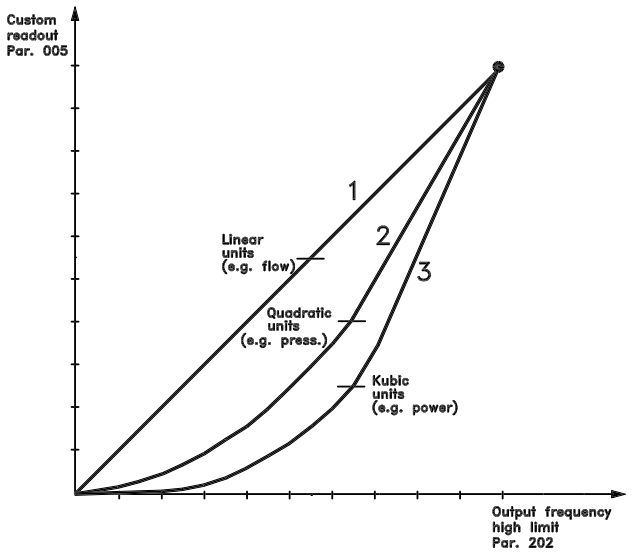
[2] Cubed units (power)

Function:

The value and the unit are shown in display mode whenever *Custom Readout* has been selected in one of parameters 007 through 010, *Display Readout.* If flow or speed units are selected, the relationship between readout and output frequency will be a linear one. If pressure units are selected, the ratio will be square. If power units are selected, the ratio will be cubed.

Description of choice:

Select the required unit for *Custom Readout.*



007 Large Readout (LARGE READOUT)

Value:

	None	[0]
	Reference [%] (REFERENCE [%])	[1]
	Reference [unit] (REFERENCE [UNIT])	[2]
★	Frequency [Hz] (FREQUENCY [HZ])	[3]
	Frequency [%] (FREQUENCY [%])	[4]
	Motor current [A] (MOTOR CURRENT [A])	[5]
	Power [kW] (POWER [KW])	[6]
	Power [HP] (POWER [HP])	[7]
	Output energy [kWh] (ENERGY [KWH])	[8]
	Hours run [Hours] (HOURS RUN [h])	[9]
	Custom readout [unit] (CUSTOM READ [UNITS])	[10]
	Setpoint 1 [unit] (SETPOINT 1 [UNITS])	[11]
	Setpoint 2 [unit] (SETPOINT 2 [UNITS])	[12]
	Feedback 1 (FEEDBACK 1 [UNITS])	[13]
	Feedback 2 (FEEDBACK 2 [UNITS])	[14]
	Feedback [unit] (FEEDBACK [UNITS])	[15]
	Motor voltage [V] (MOTOR VOLTAGE [V])	[16]
	DC link voltage [V] (DC VOLTAGE [V])	[17]
	Thermal motor load [%] (THERM.MOTOR LOAD [%])	[18]
	Thermal drive load [%] (THERM.DRIVE LOAD [%])	[19]
	Digital input [Binary code] (DIGITAL INPUT [BIN])	[20]
	Analog input 53 [V] (ANALOG INPUT 53 [V])	[21]
	Analog input 54 [V] (ANALOG INPUT 54 [V])	[22]
	Analog input 60 [mA] (ANALOG 60 [mA])	[23]
	Relay status [Binary code] (RELAY STATUS [BIN])	[24]
	Pulse reference [Hz] (PULSE REFERENCE [Hz])	[25]
	External reference [%] (EXT. REFERENCE [%])	[26]
	Heat sink temp. [°C] (HEATSINK TEMP [°C])	[27]
	Profibus fault [HEX] (COMM.OPTION WARN [HEX])	[28]
	Free program array [text] (FREE PROG. ARRAY)	[29]
	Status word (STATUS WORD [HEX])	[30]
	Control word (CONTROL WORD [HEX])	[31]
	Alarm word (ALARM WORD [HEX])	[32]

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Function:

This parameter allows a choice of the data value to be shown in the large display when power is applied to the drive. In Display Mode, the + and - keys change this display when the drive is in operation.

Description of choice:

None can only be selected in parameters 008 through 010, *Small Readout*, but not in parameter 007, *Large Readout.*

Reference [%] gives the total of all references as a percentage of parameter 205, *Maximum Reference.*

Reference [unit] gives the total of all references. This is displayed in Hz in open loop. In closed loop, the reference unit is selected in parameter 415, *Process Units.*

Frequency [Hz] gives the output frequency of the drive.

Frequency [%] is the output frequency as a percentage of maximum output frequency in parameter 202, *Output Frequency High Limit.*

Motor current [A] is the average phase current of the motor.

Power [kW] is the actual power, in kW, delivered to the motor.

Power [HP] is the actual power, in HP, delivered to the motor.

Output energy [kWh] is the energy delivered by the motor since the latest reset was made using parameter 618, *Reset of kWh Counter.*

Hours run [hours] is the number of hours that the motor has run since the latest reset was made using parameter 619, *Reset of Hours Run Counter.*

Custom readout [-] is a user defined value, calculated on the basis of the present output frequency, as well as the scaling in parameter 005, *Maximum Value of User-Defined Readout*, and the unit in parameter 006, *Custom Readout.*

Setpoint 1 [unit] is the setpoint value programmed in parameter 418, Setpoint 1. The unit is selected in parameter 415, *Process Units.*

Setpoint 2 [unit] is the setpoint value programmed in parameter 419, Setpoint 2. The unit is selected in parameter 415, *Process Units.*

Feedback 1 [unit] is the value of the feedback signal applied to Terminal 53. The unit is selected in parameter 415, *Process Units.*

Feedback 2 [unit] is the value of the feedback signal applied to Terminal 54. The unit is selected in parameter 415, *Process Units.*

Feedback [unit] is the total feedback signal using the unit scaling selected in parameter 413, Minimum Feedback; parameter 414 *Maximum Feedback*; parameter 415, *Process Units*; and parameter 417, *2 Feedback Calc.*

Motor voltage [V] is the voltage supplied to the motor.

DC link voltage [V] is the drive DC bus voltage.

Thermal load, motor [%] is the calculated thermal load of the motor. 100% is the cutout limit. See also parameter 117, *Motor Thermal Protection.*

Thermal drive load [%] is the calculated thermal load of the drive. 100% is the trip point.

Digital input [binary code] is the signal status from the 8 digital inputs (16, 17, 18, 19, 27, 29, 32 and 33). Terminal 16 corresponds to the bit at the far left. (0 = no signal, 1 = connected signal.)

Analog input 53 [V] is the voltage applied to terminal 53.

Analog input 54 [V] is the voltage applied to terminal 54.

Analog input 60 [mA] is the current applied to terminal 60.

Relay status [binary code] displays the open or closed position of relays 1 through 6 in binary code. Open is 0 and closed 1, read left to right (positions 7 and 8, displayed in parameter 007, are not used.)

Pulse reference [Hz] is the pulse frequency applied to terminal 17 or terminal 29.

External reference [%] is the sum of the external references as a percentage of parameter 205, *Maximum Reference.*

Heat sink temp. [°C] is the present heat sink temperature of the drive. The trip point is 90 ± 5°C for NEMA 1 units, 80 ± 5°C for NEMA 12.

Profibus fault [HEX] is enabled when the Profibus communication option is installed and the warnings in Profibus parameter 953 is active.

Free program array [text] displays the array of characters programmed in parameters 533, *Display Text Line 1* and 534, *Display Text Line 2* on lines 1 and 2 of the LCP.

Status word [HEX] displays the drive status word (see parameter 608, *Data Log*).

Control word [HEX] displays the drive control word (see parameter 609, *Data Log*).

Alarm word [HEX] displays the drive alarm word.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

008 Small Readout 1 (SMALL READOUT 1)

Value:

✯ Reference, % [1]

Function:

This parameter selects the meter shown on the left display on line 1. Showing three different meters on line 1 is recommended when setting up the PID. This allows tracking how the process reacts to a change of reference.

Description of choice:

See parameter 007, *Large Readout,* for values that may be selected.

009 Small Readout 2 (SMALL READOUT 2)

Value:

★ Motor current (A) [5]

Function:

This parameter selects the meter shown on the center display on line 1. Showing three different meters on line 1 is recommended when setting up the PID.

Description of choice:

See parameter 007, *Large Readout,* for values that may be selected.

010 Small Readout 3 (SMALL READOUT 3)

Value:

★ Power (HP) [7]

Function:

This parameter selects the meter shown on the right display on line 1. Showing three different meters on line 1 is recommended when setting up the PID.

Description of choice:

See parameter 007, *Large Readout,* for values that may be selected.

011 Unit of Local Reference (UNIT OF LOC REF)

Value:

Hz (HZ) [0]

★ % of output frequency range (%) (% OF FMAX) [1]

Function:

This parameter sets the unit that will be displayed in Display Mode IV when the drive's speed is being controlled locally.

Description of choice:

Choose the desired unit for local reference.

012 Hand Start on LCP (HAND START BUTTON)

Value:

Disable (DISABLE) [0]

★ Enable (ENABLE) [1]

Function:

This parameter allows disabling the Hand/Start key on the keypad.

Description of choice:

If *Disable* is selected in this parameter, the Hand/Start key will be disabled.

013 OFF/STOP on LCP (STOP BUTTON)

Value:

Disable (DISABLE) [0]

★ Enable (ENABLE) [1]

Function:

This parameter allows disabling the Off/Stop key on the keypad.

Description of choice:

If *Disable* is selected in this parameter, the Off/Stop key will be disabled.

If* Disable *is selected in parameter 013, the motor cannot be stopped by pressing the OFF/STOP key on the keypad. Use of the* Disable *option could result in injury or equiment or property damage.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

014 Auto Start on LCP (AUTO START BTTN)

Value

	Disable (DISABLE)	[0]
★	Enable (ENABLE)	[1]

Function:

This parameter allows disabling the Auto/Start key on the keypad.

Description of choice:

If *Disable* is selected in this parameter, the Auto/Start key will be disabled.

015 Reset on LCP (RESET BUTTON)

Value:

	Disable (DISABLE)	[0]
★	Enable (ENABLE)	[1]

Function:

This parameter allows disabling the Reset key on the keypad.

Description of choice:

If *Disable* is selected in this parameter, the Reset key will be inactive.

Do not disable* Reset on LCP *unless a remote reset is available through digital inputs and parameters 300 through 307.

016 Lock for Data Change (DATA CHANGE LOCK)

Value:

★	Not Locked (NOT LOCKED)	[0]
	Locked (LOCKED)	[1]

Function:

This parameter allows locking out parameter changes at the local control panel.

Description of choice:

If *Locked* is selected, data modifications in the parameters cannot be made. Parameter changes will be possible through serial communication.

Parameters 007 through 010, *Display Readout* can be changed at the local control panel.

The local control panel can also be locked or unlocked by a digital input controlled by parameters 300 through 307.

017 Operating State at Power Up (POWER UP ACTION)

Value:

★	Auto restart (AUTO RESTART)	[0]
	OFF/STOP (OFF/STOP)	[1]

Function:

Selects auto or manual restart when power is reapplied after an outage occurs to a running drive.

Description of choice:

Auto restart is selected if the drive is to resume operation after a power outage.

OFF/STOP is selected if the drive is to remain stopped after a power outage. To restart, press the Hand/Start or Auto/Start key at the keypad. If HAND START or AUTO START are disabled by parameters 012 and 014, the motor will not be able to restart if *OFF STOP* is selected in parameter 017.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Load and Motor Parameters 100 through 118

This parameter group controls output power and other output characteristics of the drive.

For correct operation, motor nameplate data must be entered into parameters 102 through 106 either through the Quick Menu or the Extended Menu. In addition, automatic motor adaptation, DC braking and motor thermal protection can be set by this parameter group.

100 Configuration (CONFIG. MODE)

Value:

★ Open loop (OPEN LOOP)	[0]
Closed loop (CLOSED LOOP)	[1]

Function:

This parameter is used for selecting closed loop or open loop operation.

Description of choice:

If *Open loop* is selected, speed control is changed directly by the speed reference signal. Any feedback signal applied to the drive will have no effect on the drive's speed.

If *Closed loop* is selected, the internal process regulator is available to accept feedback signal(s) to provide the desired speed regulation.

NOTE

It is important to set parameter 100,* Configuration*, properly when closed loop operation is required. When open loop is selected, parameters associated with setting up PID controller are not accessible.

101 Torque Characteristics (VT CHARACT)

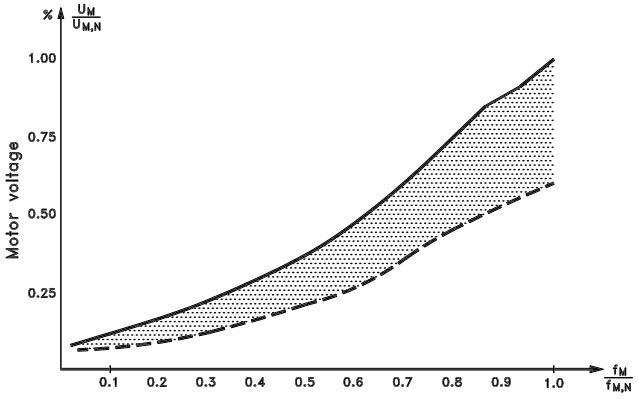
Value:

★ Automatic Energy Optimization (AEO FUNCTION)	[0]
Parallel motors (MULTIPLE MOTORS)	[1]

Function:

This parameter configures the drive for single or multiple motor operation.

The AEO function will automatically and continuously monitor the load and adjust the output voltage to maximize motor and drive efficiency and performance. After the motor reaches the set speed, the AEO function reduces the output voltage to the motor, if the load will allow. When the load is light, the voltage is reduced, as shown in the graph below. This lower voltage reduces motor heating and motor noise, and increases efficiency.



Description of choice:

Select *Automatic Energy Optimization* (AEO) for all single motor applications. When AEO has been selected, only one motor may be connected to the drive at a time.

Select *Parallel motors* when more than one motor is connected in parallel to the output. In this case, it is necessary to set a start voltage in parameter 108, *Start Voltage of Parallel Motors*.

NOTE

***To optimize AEO for use with motors having more than 4 poles, see parameter 118,* Motor Power Factor.**

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

It is very important that values set in parameters 102,* Motor Power, *through 106,* Rated Motor Speed, *correspond accurately to nameplate data of motor. Failure to enter motor nameplate data accurately could result in erratic or less than optimum equipment operation.

102 Motor Power		(MOTOR POWER)
Value:		
0.25 kW	(0.33 HP)	[25]
0.37 kW	(0.5 HP)	[37]
0.55 kW	(0.75 HP)	[55]
0.75 kW	(1 HP)	[75]
1.1 kW	(1.5 HP)	[110]
1.5 kW	(2 HP)	[150]
2.2 kW	(3 HP)	[220]
3 kW	--	[300]
4 kW	(5 HP)	[400]
5.5 kW	(7.5 HP)	[550]
7.5 kW	(10 HP)	[750]
11 kW	(15 HP)	[1100]
15 kW	(20 HP)	[1500]
18.5 kW	(25 HP)	[1850]
22 kW	(30 HP)	[2200]
30 kW	(40 HP)	[3000]
37 kW	(50 HP)	[3700]
45 kW	(60 HP)	[4500]
55 kW	(75 HP)	[5500]
75 kW	(100 HP)	[7500]
90 kW	(125 HP)	[9000]
110 kW	(150 HP)	[11000]
132 kW	(175 HP)	[13200]
160 kW	(200 HP)	[16000]
200 kW	(300 HP)	[20000]
250 kW	--	[25000]
300 kW	--	[30000]
315 kW	(350 HP)	[31500]
355 kW	(450 HP)	[35500]
400 kW	(500 HP)	[40000]
450 kW	(600 HP)	[50000]

★ Specific to motor

Function:

Set the power value that corresponds to the nameplate power of the motor. The default setting is the full rating of the drive.

Description of choice:

Select a value that equals the nameplate data on the motor. It is also possible to set any power within the range of the drive.

103 Motor Voltage	(MOTOR VOLTAGE)
Value:	
200 V	[200]
208 V	[208]
220 V	[220]
230 V	[230]
240 V	[240]
380 V	[380]
400 V	[400]
415 V	[415]
440 V	[440]
460 V	[460]
480 V	[480]
500 V	[500]
575 V	[575]

★ Depends on the unit

Function:

Set the rated motor voltage.

Description of choice:

Select a value that equals the nameplate data on the motor. This may be less than the input voltage. It is also possible to set any voltage within the range of the drive.

104 Motor Frequency	(MOTOR FREQUENCY)
Value:	
50 Hz (50 Hz)	[50]
★ 60 Hz (60 Hz)	[60]

Function:

This is where the rated motor frequency is selected. This is usually the frequency of the power line.

Description of choice:

Select the desired value. It is also possible to set any frequency within the range of the drive.

105 Motor Current	(MOTOR CURRENT)
Value:	
0.01 to drive rating	★ Set based on motor nameplate.

Function:

The rated motor current in amps is used for setting output current and providing motor thermal protection. It is important to set the motor current to the full load current rating (FLA) of the motor.

Description of choice:

Set a value that equals the nameplate data on the motor.

Failure to enter motor nameplate data accurately could result in less than optimum operation. Also, changing values in parameters 102 or 103 after motor current has been entered in parameter 105, may automatically change the value in parameter 105.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

106 Rated Motor Speed (MOTOR NOM. SPEED)

Value:

100 through 60000

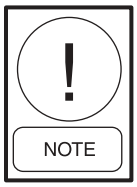
✯ Depends on parameter 102, *Motor Power*

Function:

This is where the value is set that corresponds to the rated motor speed shown on the motor nameplate.

Description of choice:

Choose a value that corresponds to the motor nameplate data.



Failure to enter motor nameplate data accurately could result in erratic or less than optimum equipment operation. Changing values in parameter 104,* Motor Frequency*, after rated motor speed has been entered in parameter 106, may automatically change the value in parameter 106.

107 Automatic Motor Adaptation, AMA (AUTO MOTOR ADAPT)

Value:

★	Optimization disable (NO AMA)	[0]
	Automatic adaptation (RUN AMA)	[1]
	Limited AMA (RUN LIMITED AMA)	[2]

Function:

Automatic Motor Adaptation (AMA) is an advanced procedure that measures electrical characteristics of the motor. This procedure does not cause the motor to run.

AMA optimizes the adjustment of the drive to the motor. This feature is particularly useful when the drive-to-motor cable length is long, and with nonstandard motors or high HP motors. Although it is not necessary to run AMA, it is highly recommended for optimum operation and increases the capability of the Automatic Energy Optimization function selectable in parameter 101, *Torque Characteristics*.

For the best adjustment of the drive, it is recommended to carry out AMA on a cold motor.

Repeated AMA operation may lead to motor heating that could result in an increase of stator resistance. This can reduce test accuracy. Run AMA only on a cool motor.

If an output LC-filter has been connected between the drive and the motor, select *Limited AMA*. If the complete AMA procedure is desired, remove the LC-filter, run *Automatic Adaptation* (RUN AMA), and reinstall the filter.

Some motors (such as motors with 6 or more poles) may be unable to run* Automatic Adaptation. Limited AMA *is a procedure which can be effective in such cases since results measure motor's stator and effects of cable length. Multiple motor applications cannot use AMA.

The following must be noted when either AMA function is used:

- Before running AMA, the correct nameplate data for the motor must be entered in parameters 102 through 106.
- Total automatic motor adaptation may take up to 10 minutes.
- Alarms and warnings will be shown in the display if faults occur during motor adaptation.
- AMA can only be carried out if the rated motor current of the motor is at least 35% of the rated output current of the drive.

Description of choice:

Select *Automatic Adaptation* if the drive is to carry out a complete automatic motor adaptation procedure.

Select *Limited AMA* if an LC-filter has been placed between the drive and the motor, for a motor with 6 or more poles, or if *Automatic Adaptation* was unsuccessful. Some drives may display *Automatic Adaptation with LC-filter* rather than *Limited AMA*. The functions are the same.

Procedure for Automatic Motor Adaptation:

1. Set motor parameters 102 through 106 according to motor nameplate data.
2. Connect 24 VDC from terminal 12, or from external source, to terminal 27.
3. Select either *Automatic Adaptation* or *Limited AMA* in parameter 107, *Automatic Motor Adaptation.*
4. Start drive by pressing Hand Start or connect terminal 18 (start) to terminal 12 and press Auto Start.

To stop automatic adaptation or limited AMA prior to completion:
Press OFF/STOP key.

After a normal sequence is complete, the display reads: AMA STOP
Press RESET key. Drive is now ready for operation.

RESET key must be pressed after AMA is completed to save results to drive.

If there is a fault, the display reads: ALARM 22

1. Check alarms section in this manual for possible causes of alarm.
2. Press RESET key to clear fault.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

If there is a warning, the display reads: WARNING (39 through 42)

1. Check warnings section in this manual for possible causes of warning.
2. Press CHANGE DATA key and select *Continue* if AMA is to continue despite warning, or press OFF/STOP key to stop AMA.

108 Start Voltage of Parallel Motors (MULTIM.START VOLT)

Value:

0.0 through parameter 103 *Motor Voltage* ✯ 0.0 V

Function:

This parameter sets the voltage at 0 Hz for all drives with two or more motors connected in parallel.

The start voltage represents a supplementary voltage input to the motor. Increasing the start voltage will increase the starting torque. A start voltage is especially useful for small motors (<5 HP) as they have a higher stator resistance than larger motors.

This function is only active if *Parallel Motors* has been selected in parameter 101, *Torque Characteristics*.

Description of choice:

To set the start voltage, monitor the motor current while starting the load and choose the starting voltage that gives the lowest starting current. Start with a small value and increase only as required for reliable starting.

109 Resonance Dampening (RESONANCE DAMP.)

Value:

0 to 500 % ★100 %

Function:

High-frequency resonances in the motor can be eliminated by adjusting this parameter.

Description of choice:

Adjust the dampening percentage for smoothest high speed operation.

110 High Breakaway Torque (HIGH START TORQ.)

Value:

0.0 to 0.5 sec. ★ OFF

Function:

The drive is able to breakaway high friction loads. This high starting torque, approximately 1.6 x rated torque is available for up to 0.5 seconds. The current level is limited by the protective circuits of the drive. OFF corresponds to 0.0 sec.

Description of choice:

Set the time for which high starting torque is desired.

111 Start Delay (START DELAY)

Value:

0.0 to 120.0 sec. ★ 0.0 sec.

Function:

This parameter allows a delayed start of the drive after the conditions for start have been fulfilled. After the start delay time has elapsed, the drive will start and ramp up to the commanded speed.

Description of choice:

Set the desired time before the drive will start.

112 Motor Preheat (MOTOR PREHEAT)

Value:

✯ Disable (DISABLE) [0]
Enable (ENABLE) [1]

Function:

The motor preheat function protects the motor from condensation by running a small DC current through the motor. Motor preheat is only active during stop when control voltage is applied to terminal 27.

Description of choice:

Select *Disable* if this function is not required. Select *Enable* to activate motor preheating. The amount of motor preheating is set in parameter 113.

Be sure to check settings in parameter 113 if parameter 112,* Motor Preheat, *is enabled. Do not apply any more current than required. Excessive current or preheating time may damage the motor.

113 Motor Preheat DC Current (PREHEAT DC-CURR.)

Value:

0 to 100 % ★ 50 %

The maximum value depends on the rated motor current.

Function:

The motor can be preheated when stopped by applying DC current to it. A holding torque can also be provided.

Description of choice:

The motor can be preheated by means of a DC current. At 0%, the function is inactive; at a value higher than 0%, a DC current will be supplied to the motor whenever it is stopped. A windmilling fan can be held by providing a holding toque by using this parameter.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

DC Braking

Applying DC current to the motor will brake the motor. Parameter 114, *DC Braking Current*, sets the DC braking current as a percentage of the rated motor current. Parameter 115, *DC Braking Time*, sets the amount of time that the DC current will be applied. Parameter 116, *DC Brake Cut-in Frequency*, sets the frequency at which DC braking begins when the motor decelerates during a stop.

If terminal 19 or 27 (parameters 303 or 304 *Digital Input)* has been programmed to *DC Braking Inverse* and shifts from logic '1' to logic '0', the DC braking will be activated immediately.

When the start signal on terminal 18 changes from logic '1' to logic '0', the DC braking will be activated when the output frequency becomes lower than the brake cut-in frequency.

If a DC brake current is set in parameter 114, the drive's switching frequency will be limited to 4 kHz during the braking.

A high braking current supplied for a long time will overheat the motor. Use only the DC braking current and time required. Excessive braking current may damage the motor.

Also, do not use DC braking function if inertia of driven load is more than 20 times inertia of motor. Excessive load inertia may damage the motor.

114 DC Braking Current (DC BRAKE CURRENT)

Value:

0 to 100% ★ 50 %

The maximum value depends on the rated motor current.

Function:

This parameter is used for setting the DC braking current that is applied:

1. When the DC brake frequency set in parameter 116 *DC Brake Cut-in Frequency* has been reached during a stop.
2. When DC brake inverse is active via terminal 19 or 27, or via the serial bus.

The DC braking current will be active for the duration of the DC braking time set in parameter 115 *DC Braking Time*.

Description of choice:

To be set as a percentage value of the rated motor current set in parameter 105 *Motor Current.*

100% DC braking current corresponds to the value set in parameter 105.

Most HVAC applications do not required braking or holding. It is suggested that parameter 114 remain set at 0 unless braking or holding torque is required.

115 DC Braking Time (DC BRAKE TIME)

Value:

0.0 to 60.0 sec. ✯ 10.0 sec.

Function:

This parameter sets the time that the DC braking is active.

Description of choice:

Set the desired time.

116 DC Brake Cut-in Frequency (DC BRAKE CUT-IN)

Value:

0.0 (OFF) to setting of parameter 202 ✯ OFF

Function:

This parameter is used for setting the frequency at which DC braking begins after a stop command is issued.

Description of choice:

Set the desired frequency for braking to begin upon deceleration.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

117 Motor Thermal Protection (MOT. THERM PROTEC)

Value:

	No protection (NO PROTECTION)	[0]
	Thermistor warning (THERMISTOR WARNING)	[1]
	Thermistor trip (THERMISTOR FAULT)	[2]
	ETR Warning 1 (ETR WARNING 1)	[3]
✯	ETR Trip 1 (ETR TRIP 1)	[4]
	ETR Warning 2 (ETR WARNING 2)	[5]
	ETR Trip 2 (ETR TRIP 2)	[6]
	ETR Warning 3 (ETR WARNING 3)	[7]
	ETR Trip 3 (ETR TRIP 3)	[8]
	ETR Warning 4 (ETR WARNING 4)	[9]
	ETR Trip 4 (ETR TRIP 4)	[10]

Function:

The drive is able to monitor the motor temperature in two different ways:

By a thermistor installed in the motor. The thermistor is connected to one of the analog input terminals (53 or 54).

Calculation of the thermal load by the Electronic Thermal Relay (ETR) is based on current, frequency and time. This is compared with the rated motor current and the rated motor frequency. The calculations take into account the reduced cooling of the motor at low speeds.

ETR Tip 1 through 4 and ETR Warning 1 through 4 correspond to the four drive setups. This enables the use of the ETR function to protect up to four different motors if a different setup is used for each different motor.

NOTE

If multiple setups are used, be sure to program complete motor data (parameters 102 through 106) and parameter 117 in each setup.

Description of choice:

Select *No protection* if no warning or trip is desired when the motor is overheated.

Select *Thermistor warning* if a warning is desired when the motor thermistor reaches its trip point.

Select *Thermistor trip* if a fault is desired when the motor thermistor reaches its trip point.

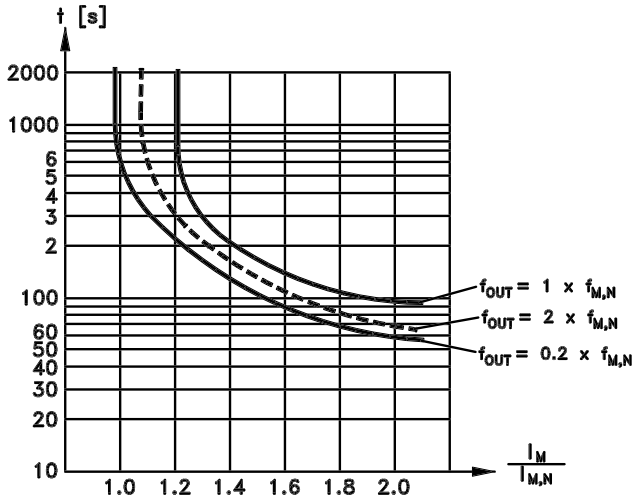
Select *ETR Warning 1 through 4*, if a warning is desired when the motor is overheated according to the ETR calculations.

The drive can also be programmed to give off a warning signal through one of the digital outputs.

Select *ETR Trip 1 through 4* if a fault is desired when the motor is overheated according to the ETR calculations.

Motor Thermal Protection

The motor temperature is calculated on the basis of motor current, output frequency and time. The graph shows the amount of time that the drive can provide a current level to the motor at the rated motor frequency, 20% of rated motor frequency and 200% of rated motor frequency.



118 Motor Power Factor (Cos ∅) (MOTOR PWR FACT)

Value:

0.50 - 0.99	✯ 0.75

Function:

Automatic Energy Optimization (AEO) (see parameter 101, *Torque Characteristics*) can be calibrated to work with motors with greater than 4 poles. Motors with 6, 8, and 12 poles have a lower power factor which restricts the energy saving capability of AEO. Calibrating AEO can optimize this function. The full load power factor will either be on the motor nameplate or available from the motor manufacturer.

Description of choice:

Enter the full load power factor value.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

References and Limits
Parameters 200 through 228

In this parameter group, the frequencies and references of the drive are set.

This parameter group includes:

- Setting of ramp times
- Choice of four preset references
- Setting four bypass frequencies
- Setting maximum current to motor
- Setting warning limits for current, frequency, reference and feedback

200 Output Frequency Range (FREQUENCY RANGE)

Value:

★	0 to 120 Hz (0 - 120 HZ)	[0]
	0 to 1000 Hz (0 - 1000 HZ)	[1]

Function:

Choose one of two maximum output frequency ranges.

Description of choice:

Select the output frequency range that includes the highest output frequency required for normal operation.

HVAC applications seldom require output frequency greater than 120 Hz. Check with York, motor manufacturer, or manufacturer of driven equipment before selecting 0 - 1000 Hz range.

201 Output Frequency Low Limit (MIN. FREQUENCY)

Value:

	0.0 to parameter 202	★ 25.0 Hz

Function:

Set the minimum speed at which the motor is to run.

Description of choice:

A value from 0.0 Hz to the *Output Frequency High Limit* frequency set in parameter 202 can be selected. The drive will not be able to run continuously at an output frequency below this value in any mode.

202 Output Frequency High Limit (MAX. FREQUENCY)

Value:

	Parameter 201 to parameter 200	★ 60 Hz

Function:

Set the highest speed at which the motor is to run.

***Output frequency of drive can never assume value higher than 1/10th of switching frequency. See parameter 407,* Switching Frequency.**

Description of choice:

Set a value between the low frequency limit, set in parameter 201, and the frequency range limit, set in parameter 200. The drive will not be able to run continuously at an output frequency above this value in any mode.

HVAC applications seldom require output frequency greater than 60 Hz. Check with York, motor manufacturer, or manufacturer of driven equipment before selecting a maximum frequency greater than 60 Hz.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Reference Handling

Reference handling is shown in the block diagram at the bottom of this page. The block diagram shows how a change in a parameter can effect the resulting reference.

Parameters 203 to 205, *Reference Handling, Minimum* and *Maximum Reference,* and parameter 210, *Reference Type,* define the way reference handling is carried out. These parameters are active both in closed loop and open loop operation.

In closed loop operation, the resulting reference is affected by parameters 418 and 419, *Setpoint 1* and *2,* as well as by remote references.

Remote references can be:

1) external references, including analog inputs 53, 54 and 60; pulse references through terminals 17 or 29 and references from serial communication
2) preset references

The resulting reference can be shown in the display as a percentage or as a selected unit of measure. The sum of the external references can be displayed in a percentage of the range between *Minimum Reference* to *Maximum Reference.* Select *External Reference, [%]* or the desired unit in parameters 007 through 010, *Display Readout,* to display the reference value.

It is possible to have both internal preset references and external references at the same time. In parameter 210, *Reference Type,* a choice is made of how the preset references are to be combined with the external references.

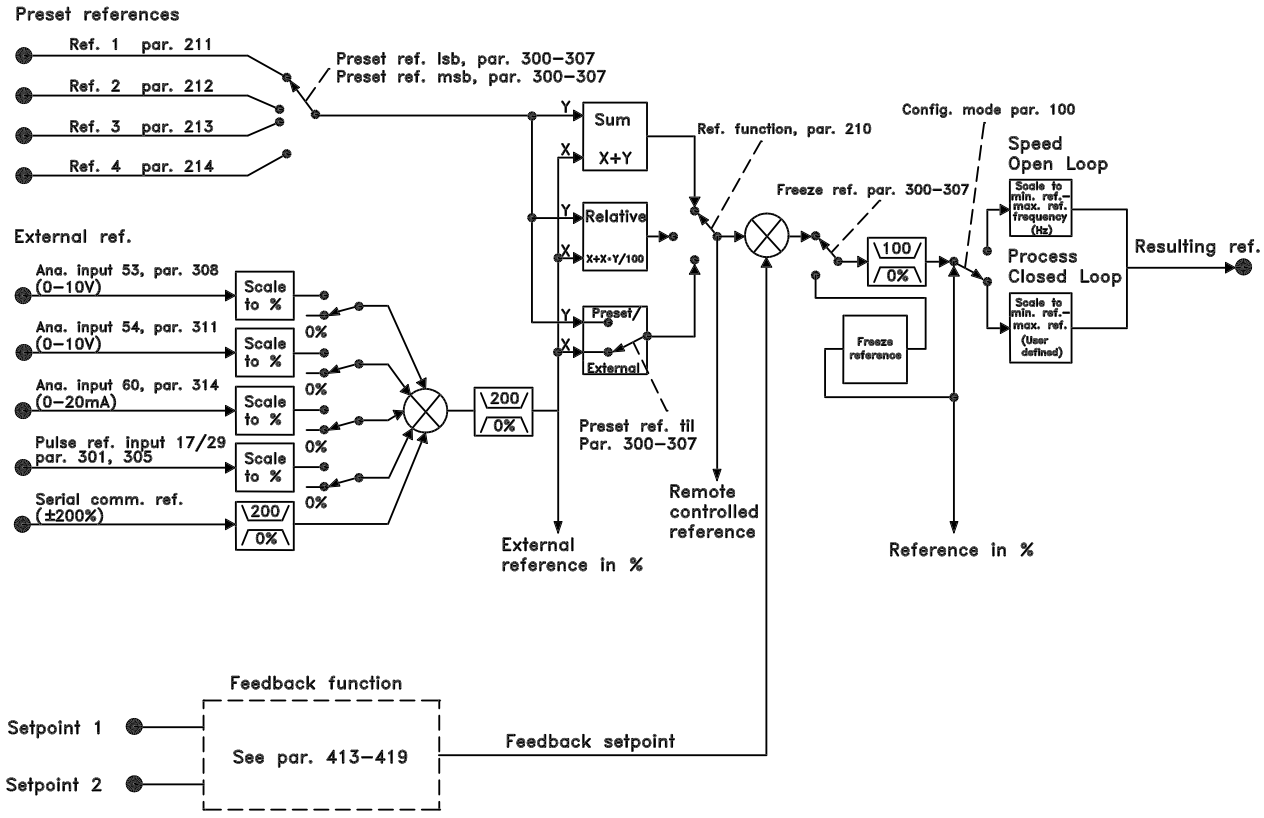
An independent local reference exists, where the resulting reference is set by means of the + and - keys. In all cases, the output frequency range is limited by parameter 201, *Output Frequency Low Limit,* and parameter 202, *Output Frequency High Limit*.

NOTE

***If local reference is active, drive is always in* Open Loop*, regardless of choice made in parameter 100,* Configuration.**

The unit of the local reference can be set either as Hz or as a percentage of the output frequency range. The unit is selected in parameter 011, *Unit of Local Reference*.

203 Reference Handling (REFERENCE SITE)	
Value:	
★ Hand/Auto linked reference (LINKED TO HAND/START)	[0]
Remote controlled reference (REMOTE)	[1]
Local reference (LOCAL)	[2]



★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Function:

This parameter chooses the active resulting reference. If *Hand/Auto linked reference* is selected, the resulting reference will depend on whether the drive is in Hand or Auto mode.

The table below shows which reference is active when *Hand/Auto linked reference*, *Remote reference* or *Local reference* has been selected. The Hand mode or Auto mode can be selected via the keypad or by a digital input set in parameters 300 through 307 *Digital Inputs.*

Reference Handling	Hand Mode	Auto Mode
Hand/Auto	Local ref. active	Remote ref. active
Remote	Remote ref. active	Remote ref. active
Local	Local ref. active	Local ref. active

Description of choice:

If *Hand/Auto linked reference* is chosen, the motor speed in Hand mode will be set by the local reference, while in Auto mode it is set by the remote references and any setpoints selected.

If *Remote reference* is selected, the motor speed will depend on remote references and any setpoints selected, regardless of whether Hand mode or Auto mode has been chosen.

If *Local reference* is selected, the motor speed will only depend on the local reference set via the control panel, regardless of whether Hand mode or Auto mode has been selected.

204 Minimum Reference (MIN. REFERENCE)

Value:

If parameter 100, *Configuration = Open loop,*
0.000Hz to parameter 205, *Maximum Reference.* ✯ 25.0 Hz

If parameter 100 *Configuration = Closed loop,*
parameter 413, *Minimum Feedback,* to
parameter 205, *Maximum Reference.* ✯ 0.000 Hz

Function:

The *Minimum Reference* sets the minimum value of the sum of all references. If *Closed loop* has been selected in parameter 100, *Configuration*, the minimum reference is limited by parameter 413, *Minimum Feedback*.

Minimum reference is ignored when the local reference is active. In this case, minimum reference is determined by parameter 201, *Minimum Frequency*.

The unit for the reference can be seen from the following table:

	Unit
Parameter 100 *Configuration = Open loop*	Hz
Parameter 100 *Configuration = Closed loop*	Par. 415

Description of choice:

Minimum Reference is the lowest reference value that can be set for the drive.

205 Maximum Reference (MAX. REFERENCE)

Value:

If parameter 100, *Configuration = Open loop,*
parameter 204, *Minimum Reference*,
to 1000.000 Hz ✯60.0 Hz

If parameter 100, *Configuration = Closed loop,*
parameter 204, *Minimum Reference*, to
parameter 414, *Maximum Feedback*. ✯60.000 Hz

Function:

The *Maximum Reference* sets the maximum value of the sum of all references. If *Closed loop* has been selected in parameter 100, *Configuration*, the maximum reference cannot be set above parameter 414, *Maximum Feedback.* The *Maximum Reference* is ignored when the local reference is active.

The reference unit can be determined from the following table:

	Unit
Parameter 100 *Configuration = Open loop*	Hz
Parameter 100 *Configuration = Closed loop*	Par. 415

Description of choice:

Maximum reference is the highest reference value that can be set for the drive.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

206 Ramp Up Time (RAMP UP TIME)

Value:

1 to 3600 seconds ★ 30.0 sec.

Function:

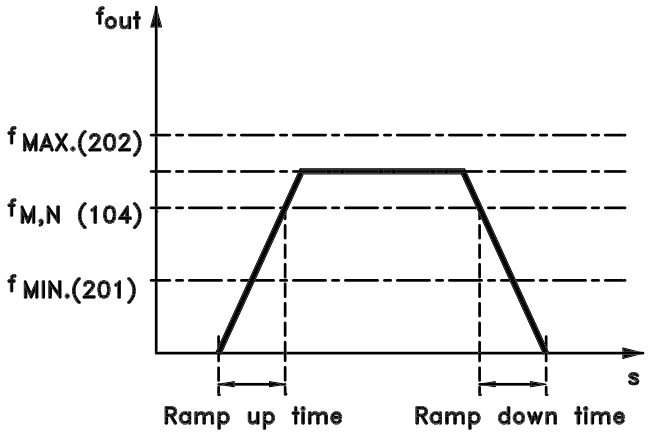
The ramp up time is the acceleration time from 0 Hz to the rated motor frequency set in parameter 104. It is assumed that the output current does not reach the current limit set in parameter 215. This determines the maximum acceleration rate for all modes of operation.

Description of choice:

Program the desired accel time. Too long of a ramp up time can cause sluggish drive operation. Too short of a ramp up time can cause the drive to go into current limit during acceleration or cause unacceptable torque pulses in the controlled system.

NOTE

For fan applications, factory setting of parameter 206 is 60 seconds. For pump applications, factory setting for parameter 206 is 10 seconds.



207 Ramp Down Time (RAMP DOWN TIME)

Value:

1 to 3600 seconds ★ 60 sec.

Function:

The ramp-down time is the deceleration time from the rated motor frequency set in parameter 104, *Motor Frequency*, to 0 Hz. This ramp-down time may be automatically extended to prevent an overvoltage trip if the load regenerates to the drive. This determines the maximum deceleration rate for all modes of operation.

Description of choice:

Program the desired decel time. Too long of a ramp down time can cause sluggish operation. Too short of a ramp down time can cause the drive to trip off due to high DC bus voltage or cause unacceptable torque pulses in the controlled system.

NOTE

Factory setting of parameter 207 for fan applications, is 60 seconds. For pump applications, factory setting for parameter 207 is 10 seconds.

208 Automatic Ramp Down (AUTO RAMPING)

Value:

	Disable (DISABLE)	[0]
★	Enable (ENABLE)	[1]

Function:

This function ensures that the drive does not trip during deceleration if the decel time set is too short. If, during deceleration, the DC bus voltage increases to the maximum value permitted, the drive automatically extends the ramp-down time.

NOTE

If auto ramp down is enabled, ramp time could be considerably longer than time set in parameter 207, **Ramp Down Time.**

Description of choice:

Program this function as *Enable* to avoid trips caused by too rapid a deceleration.

209 Jog Frequency (JOG FREQUENCY)

Value:

Parameter 201, *Output Frequency Low Limit,* to parameter 202 *Output Frequency High Limit* ★ 10 Hz

Function:

The jog frequency is the fixed output frequency at which the drive is running when the jog function is activated.

Jog can be activated via the digital inputs.

Description of choice:

Set the desired frequency.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Reference Type

The example below shows how the resulting reference is calculated when Preset references are used together with Sum and Relative references set in parameter 210, *Reference Type*. A formula for calculating the resulting reference is given under Calculation of Resulting Reference. See the drawing under Reference Handling.

Example:

The following parameters have been set:

Parameter 204 *Minimum Reference:*	10 Hz
Parameter 205 *Maximum Reference:*	60 Hz
Parameter 211 *Preset Reference:*	15%
Parameter 308 *Terminal 53, Analog Input:*	Reference
Parameter 309 *Terminal 53, Min. Scaling:*	0 V
Parameter 310 *Terminal 53, Max. Scaling:*	10 V

When parameter 210 *Reference Type* is set to Sum, one of the adjusted *Preset References*, parameters 211 through 214, will be added to the external references as a percentage of the reference range. If terminal 53 has an analog input voltage of 4 V, the resulting reference will be:

Parameter 210 *Reference type = Sum*

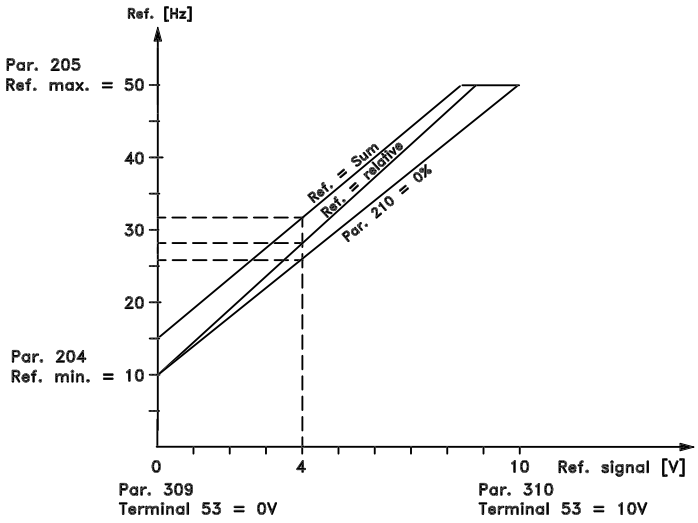
Parameter 204 *Minimum Reference*	= 10.0 Hz
Reference contribution at 4 V	= 16.0 Hz
Parameter 211 *Preset Reference*	= 6.0 Hz
Resulting reference	= 32.0 Hz

If parameter 210 *Reference Type* is set to *Relative*, one of the adjusted *Preset References* parameters 211 through 214 will be totaled as a percentage of the sum of the present external references. If terminal 53 has an analog input voltage of 4 V, the resulting reference will be:

Parameter 210 *Reference type = Relative*

Parameter 204 *Minimum Reference*	= 10.0 Hz
Reference contribution at 4 V	= 16.0 Hz
Parameter 211 *Preset Reference*	= 2.4 Hz
Resulting reference	= 28.4 Hz

The graph in the next column shows the resulting reference while the external reference changes from 0 to 10 V. Parameter 210, *Reference Type* has been programmed for *Sum* and *Relative*. Parameter 211, *Preset Reference 1,* is programmed for 0%.



210 Reference Type	(REF. FUNCTION)
Value:	
Sum (SUM)	[0]
Relative (RELATIVE)	[1]
★ External/preset (EXTERNAL/PRESET)	[2]

Function:

It is possible to define how the preset references are added to the other references. For this purpose, *Sum* or *Relative* is used. It is also possible, by using the *External/Preset* function, to select between the external references and a preset reference.

Description of choice:

If *Sum* is selected, one of the preset references (parameters 211 through 214, *Preset Reference)* is added to the other external references as a percentage of the reference range (minimum reference through maximum reference).

If *Relative* is selected, one of the adjusted preset references (parameters 211 through 214, *Preset Reference*) is added as a percentage of the total external reference.

If *External/Preset* is selected, it is possible to shift between the external references and the preset references using terminals 16, 17, 29, 32 or 33 (parameters 300, 301, 305, 306 or 307, *Digital Inputs*). Preset references are a percentage value of the reference range. External reference is the sum of the analog references, pulse references and any references from serial communication.

NOTE

If* Sum *or* Relative *is selected, one of preset references is always active. If preset references are not used, set value to 0%.

Also, see* Calculation of Resulting Reference *section in this manual for mathematic formula to calculate references.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

211	Preset Reference 1	(PRESET REF. 1)
212	Preset Reference 2	(PRESET REF. 2)
213	Preset Reference 3	(PRESET REF. 3)
214	Preset Reference 4	(PRESET REF. 4)

Value:

-100.00 % to +100.00 % ★ 0.00%
of the reference range or external reference

Function:

Four different preset references can be programmed in parameters 211 to 214, *Preset Reference*. The preset reference is stated as a percentage of the reference range or as a percentage of the other external references, depending upon the choice made in parameter 210, *Reference Type*.

The choice of preset references is made by activating terminals 16, 17, 29, 32 or 33, as shown in the table below.

Terminal 17/29/33 preset reference msb	Terminal 16/29/32 preset reference lsb	
0	0	Preset reference 1
0	1	Preset reference 2
1	0	Preset reference 3
1	1	Preset reference 4

Description of choice:

Set the required preset reference(s) that is/are to be used.

215	Current Limit	(CURRENT LIMIT)

Value:

0.1 to 1.1 x rated current ★ 1.1 x rated current

Function:

This is where the maximum output current is set. If the motor attempts to draw more than this amount of current, the drive will reduce its output frequency until the current is less than or equal to the current limit value.

The factory setting corresponds to the rated output current. If the current limit is to be used as motor protection, the rated motor current must be set. If the current limit is set within the range of 1.0 to 1.1 times the rated output current of the drive, the drive can only handle current greater than its rated output intermittently. After the load has been higher than rated output current limit, it must be reduced to a level that is lower than the rated current of the drive for a period of time.

Note that if the current limit is set to less than the maximum value of the drive, acceleration torque is reduced correspondingly.

Description of choice:

Set the required maximum output current.

When drive is in current limit and a stop command is issued by pressing the STOP key on LCP keypad, drive output is immediately cut off and motor will coast-to-stop.

216	Frequency Bypass, Bandwidth (FREQUENCY BYPASS B.W.)

Value:

0 (OFF) to 100 Hz ★ DISABLED

Function:

Mechanical resonance in the driven system sometimes makes it desirable to avoid operation at critical speeds.

These output frequencies can be programmed in parameters 217 through 220.

In this parameter, *Frequency Bypass, Bandwidth*, the width of the frequency to be bypassed is defined.

Description of choice:

The bypass bandwidth is equal to the programmed bandwidth frequency. This bandwidth will be centered around each bypass frequency.

217	Frequency Bypass 1	(BYPASS FREQ. 1)
218	Frequency Bypass 2	(BYPASS FREQ. 2)
219	Frequency Bypass 3	(BYPASS FREQ. 3)
220	Frequency Bypass 4	(BYPASS FREQ. 4)

Value:

0 to 120 or 1000 Hz ★ 120.0 Hz

The frequency range depends on the selection made in parameter 200, *Output Frequency Range*.

Function:

Some systems require that some output frequencies be avoided because of mechanical resonance problems in the system.

Description of choice:

Enter the frequencies to be avoided.

See also parameter 216, *Frequency Bypass, Bandwidth.*

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Warning Functions

The warning functions in parameters 221 through 228 are not active during ramp-up after a Start command, ramp down after a Stop command, or while stopped. The warning functions are activated when the output frequency has reached the resulting reference.

The signal outputs can be programmed to generate a warning signal via terminal 42 or 45 and via the relay outputs.

The reference limits in parameter 226, *Warning: High Reference* and parameter 227, *Warning: Low Reference* are only active when remote reference has been selected.

221 Warning: Low Current (WARN. LOW CURR)

Value:

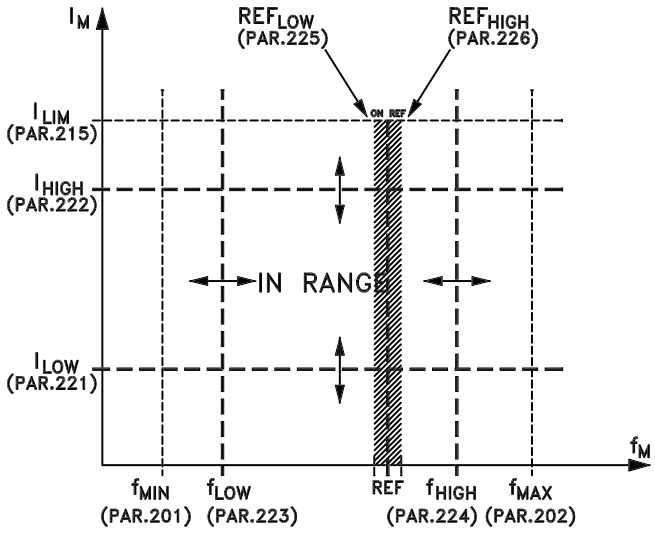
0.0 to parameter 222 *Warning: High current* ✯ 0.0 A

Function:

When the motor current is below the limit programmed in this parameter, the display shows a flashing CURRENT LOW, provided *Warning* has been selected in parameter 409, *Function in Case of No Load*. The drive will trip if parameter 409 has been selected as *Trip*. This can be used to indicate when a belt between the motor and the driven load is broken.

Description of choice:

The lower signal limit must be programmed within the normal working range of the drive.



222 Warning: High Current (WARN. HIGH CURR)

Value:

Parameter 221 to 1.1 x rated current ★ 1.1 x rated current

Function:

If the motor current is above the limit programmed in this parameter, the display shows a flashing CURRENT HIGH.

Description of choice:

The upper signal limit of the motor frequency must be programmed within the normal working range of the drive. See the drawing at parameter 221, *Warning: Low Current.*

223 Warning: Low Frequency (WARN. LOW FREQ)

Value:

0.0 to parameter 224 ★ 0.0 Hz

Function:

If the output frequency is below the limit programmed in this parameter, the display will show a flashing F OUT < FLOW.

Description of choice:

The lower signal limit of the motor frequency must be programmed within the normal working range of the drive. See drawing at parameter 221 *Warning: Low current.*

224 Warning: High Frequency (WARN. HIGH FREQ.)

Value:

Par. 200 *Output frequency range* = 0 to 120 Hz
parameter 223 - 120 Hz ✯ 120.0 Hz
Par. 200 *Output frequency range* = 0 to 1000 Hz
parameter 223 - 1000 Hz ✯ 120.0 Hz

Function:

If the output frequency is above the limit programmed in this parameter, the display will show a flashing F OUT > F HIGH

Description of choice:

The higher signal limit of the motor frequency must be programmed within the normal working range of the drive. See the drawing at parameter 221, *Warning: Low Current.*

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

225 Warning: Low Reference (WARN. LOW REF)

Value:

-999,999.999 - *High Reference* (par. 226) ★ -999,999.999 Hz

Function:

When the total remote reference is less than the limit programmed in this parameter, the display shows a flashing REF. < REF. LOW

The reference limits in parameter 226, *Warning: High Reference* and parameter 225, *Warning: Low Reference* are only active when remote reference has been selected.

In *Open Loop,* the unit for the reference is Hz, while in *Closed Loop* the unit is programmed in parameter 415, *Process Units.*

Description of choice:

When parameter 100, *Configuration,* has been programmed for *Open Loop*, the lower signal limit of the reference must be programmed within the normal working range of the drive. If parameter 100 is programmed as *Closed Loop*, Low Reference must be within the reference range programmed in parameters 204 and 205.

226 Warning: High Reference (WARN. HIGH REF)

Value:

Reference Low (par. 225) to 999,999.999 ★ 999,999.999 Hz

Function:

If the resulting reference is below the limit programmed in this parameter, the display flashes REF. > REF. HIGH.,

The reference limits in parameter 226 *Warning: High Reference* and parameter 225 *Warning: Low Reference* are only active when remote reference has been selected.

In *Open Loop,* the unit for the reference is Hz, while in *Closed Loop* the unit is programmed in parameter 415, *Process Units.*

Description of choice:

The high reference warning must be programmed within the normal working range of the drive, provided parameter 100 *Configuration* has been programmed for *Open Loop*. If parameter 100 has been programmed for *Closed Loop,* Reference High must be within the reference range programmed in parameters 204 and 205.

227 Warning: Low Feedback (WARN .LOW FDBK)

Value:

-999,999.999 to High Feedback (parameter 228)
★ -999,999.999

Function:

If the feedback signal is below the limit of Low Feedback programmed in this parameter, the display will flash FEEDBACK < FOB LOW.

The unit for feedback is programmed in parameter 415, *Process Units.*

Description of choice:

Set the desired value within the feedback range, parameter 413, *Minimum Feedback,* and parameter 414, *Maximum Feedback*.

228 Warning: High Feedback (WARN. HIGH FDBK)

Value:

Low Feedback (parameter 227) to 999,999.999
★999,999.999

Function:

If the feedback signal is above the limit programmed in this parameter, the display will show a flashing FEEDBACK > FOB HIGH.

The unit for feedback is programmed in parameter 415, *Process Units.*

Description of choice:

Set the required value within the feedback range, parameter 413, *Minimum Feedback,* and parameter 414, *Maximum Feedback*.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

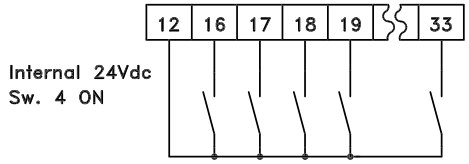
Inputs and Outputs
Parameters 300 through 328

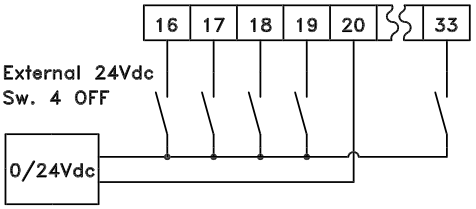
In this parameter group, the functions of the drive input and output terminals are defined. The digital inputs are through terminals 16, 17, 18, 19, 27, 32 and 33. Inputs are programmed by parameters 300 through 307. The table below shows the functions available for input.

Digital inputs require a signal of 0 or 24 VDC. A signal lower than 5 VDC is a logic '0', while a signal higher than 10 VDC is a logic '1'.

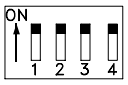
The terminals for the digital inputs can be connected to the internal 24 VDC supply through terminals 12 and 13, or an external 24 VDC supply can be connected.

The drawings at the right show one setup using the internal 24 VDC supply and one setup using an external 24 VDC supply.





Switch 4 is used for separating the common potential of the internal 24 VDC supply from the common potential of an external 24 VDC supply. Switch 4 is the DIP switch on the far right of the group of DIP switches located on the lower right of the control card, just above the control terminals.



When Switch 4 is in the OFF position, the external 24 VDC supply is galvanically isolated from the drive.

Digital Inputs	Terminal Number:	16	17	18	19	27	29	32	33
	Parameter:	300	301	302	303	304	305	306	307
Value:									
No function	(NO OPERATION)	[0]	★[0]	[0]	[0]		[0]	★[0]	★[0]
Reset	(RESET)	★[1]	[1]				[1]	[1]	[1]
Coasting stop, inverse	(COAST INVERSE)					[0]			
Reset and coasting stop, inverse	(RESET & COAST INVERSE)					[1]			
Start	(START)			★[1]					
Reversing	(REVERSE)				★[1]				
Reversing and start	(START REVERSE)				[2]				
DC-braking, inverse	(DC BRAKE INVERSE)				[3]	[2]			
Safety interlock	(SAFETY INTERLOCK)					★[3]			
Freeze reference	(FREEZE REFERENCE)	[2]	[2]				[2]	[2]	[2]
Freeze output	(FREEZE OUTPUT)	[3]	[3]				[3]	[3]	[3]
Selection of Setup, lsb	(SETUP SELECT LSB)	[4]					[4]	[4]	
Selection of Setup, msb	(SETUP SELECT MSB)		[4]				[5]		[4]
Preset reference, on	(PRESET REF. ON)	[5]	[5]				[6]	[5]	[5]
Preset reference, lsb	(PRESET REF. LSB)	[6]					[7]	[6]	
Preset reference, msb	(PRESET REF. MSB)		[6]				[8]		[6]
Speed down	(SPEED DOWN)		[7]				[9]		[7]
Speed up	(SPEED UP)	[7]					[10]	[7]	
Start enabled	(RUN PERMISSIVE)	[8]	[8]				[11]	[8]	[8]
Jog	(JOG)	[9]	[9]			★	[12]	[9]	[9]
Data change lock	(PROGRAMMING LOCK)	[10]	[10]				[13]	[10]	[10]
Pulse reference	(PULSE REFERENCE)		[11]				[14]		
Pulse feedback	(PULSE FEEDBACK)								[11]
Hand start	(HAND START)	[11]	[12]				[15]	[11]	[12]
Auto start	(AUTOSTART)	[12]	[13]				[16]	[12]	[13]

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Function:

In parameters 300 through 307, *Digital Inputs,* the functions of terminals 16 through 33 are selected.

These options are shown in the table on the previous page.

Description of choice:

No Function is selected if the drive is not to react to signals transmitted to the terminal.

Reset allows reset of the drive after a resettable fault. Not all faults can be reset without removing and reapplying the input power. Faults that require the removal of input power are called trip lock faults. See *Warnings and Alarms*.

Coasting Stop, Inverse is used to release the motor immediately by turning off the output transistors. The motor will coast freely to a stop. Inverse indicates a closed terminal sends the stop signal. Logic '0' implements coasting to a stop.

Reset and Coasting Stop, Inverse is used for activating coasting stop at the same time as reset. Inverse indicates a closed terminal sends the stop signal. Logic '0' implements coasting stop and reset.

DC Braking, Inverse is used for stopping the motor by energizing it with a DC voltage for a given time, as set by parameters 114 and 115. Inverse indicates a closed terminal sends the braking signal. Logic '0' implements DC braking. See the DC braking parameters.

Safety Interlock is the same as *Coasting Stop, Inverse*, except *Safety Interlock* generates an alarm message on the display when terminal 27 is logic '0'. The alarm message will also be active through digital outputs 42 and 45 and relay outputs 1 and 2, if programmed for *Safety Interlock*.

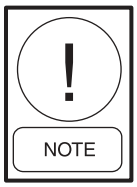
Start is selected for a remote Start/Stop command.
Logic '1' = Start. Logic '0' = Stop.

Reversing is used for changing the direction of rotation of the motor. Logic '0' is for forward. Logic '1' is for reverse. The drive can be safely reversed while it is driving the motor. The reversing signal only changes the direction of rotation, it does not activate the start function. It is not active in *Closed Loop* mode.

Reversing and Start is used for Start/Stop and reversing using the same signal. A start signal through terminal 18 starts the drive in the forward direction. If both terminal 18 and a reversing and start terminal are given a logic '1' at the same time, the drive will not start. It is not active in *Closed Loop*.

Freeze Reference freezes the present reference. The frozen reference can only be changed by means of *Speed Up* or *Speed Down*. The frozen reference is saved after a stop command and when power is removed.

Freeze Output freezes the present output frequency. The frozen output frequency can now only be changed by means of *Speed Up* or *Speed Down*.



If* Freeze Output *is active, the drive cannot be stopped via terminal 18.

To stop the drive when *Freeze Output* is active, one of the four methods listed below must be used.

- Turn off the *Freeze Output* function and perform a normal stop.
- Press the keypad Off/Stop key.
- Remove the control voltage to terminal 27.
- If terminal 19 is programmed in parameter 303 for *DC Brake Inverse*, remove the control voltage to it.

Selection of Setup, Lsb* and ***Selection of Setup, Msb**** enables digital selection of the four possible setups. To enable this, parameter 002 *Active Setup* must be set to *Multi Setup*.

	Setup, Msb	Setup, Lsb
Setup 1	0	0
Setup 2	0	1
Setup 3	1	0
Setup 4	1	1

*Lsb - Least significant bit. **Msb - Most significant bit.

Preset Reference, on is used for switching between remote controlled reference and preset reference. This assumes that *Remote/preset* has been selected in parameter 210, *Reference Type*. Logic '0' = remote controlled references active; logic '1' = one of the four preset references is active in accordance with the table below.

Preset Reference, Lsb and ***Preset reference, Msb*** enables a choice of one of the four preset references, in accordance with the table below.

	Preset ref. msb	Preset ref. lsb
Preset ref. 1	0	0
Preset ref. 2	0	1
Preset ref. 3	1	0
Preset ref. 4	1	1

Speed Up* and *Speed Down are selected if digital control of the up/down speed is desired. This function is only active if *Freeze Reference* or *Freeze Output* has been selected.

As long as there is a logic '1' on the terminal selected for *Speed Up*, the reference or the output frequency will increase by the *Ramp-up Time* set in parameter 206.

As long as there is a logic '1' on the terminal selected for *Speed Down*, the reference or the output frequency will decrease by the *Ramp-down Time* set in parameter 207.

Pulses (logic '1' minimum high for 3 ms and a minimum pause of 3 ms) will lead to a change of speed of 0.1% (reference) or 0.1 Hz (output frequency).

Example:

	Terminal (16)	Terminal (17)	Freeze ref./ Freeze output
No speed change	0	0	1
Speed down	0	1	1
Speed up	1	0	1
Speed down	1	1	1

The speed reference frozen through the control panel can be changed even if the drive has stopped. In addition, the frozen reference will be retained in memory after power interruption.

Run Permissive. *Run Permissive* is used to require a second "run permission" signal in addition to the normal run command, either in Hand or Auto mode. When a run command alone is given, the display will show RUN REQ., but the drive will not start. The drive can also indicate that a run has been requested through one of the transistorized or relay outputs. When, in addition to the run command, a logic '1' is applied to the *Run Permissive* terminal, the drive will run. If more than one terminal is programmed for *Run Permissive*, a logic '1' at any of these terminals will allow the drive to run.

Jog is used to start the drive and run it at the frequency set in parameter 209, *Jog Frequency*. Jog is active in both Hand and Auto mode.

Jog is not active if a stop command has been given through the keypad or terminal 27.

Data change lock is selected if changes to parameters are not to be made via the control panel. It is be possible to change parameters through the serial bus.

Pulse reference is selected if the frequency of a pulse train is to be used as a reference signal. 0 Hz corresponds to parameter 204, *Minimum Reference.* The frequency set in parameter 327, *Pulse Reference*, *Maximum Frequency* corresponds to parameter 205 *Maximum Reference*.

Pulse feedback is selected if the frequency of a pulse train is to be used as a feedback signal. Parameter 328, *Pulse Feedback, Maximum Frequency* is the pulse frequency that corresponds to maximum feedback.

Hand start is selected if an external signal is used to switch the drive to Hand mode. A logic '1' (*Hand Start* active) will start the motor. A logic '0' will stop the motor. The drive will then be in OFF/STOP mode, unless there is an active *Auto Start* signal from an external source. Programming one of the digital inputs for *Hand Start* will disable the LCP Hand Start and Auto Start keys.

With* Hand Start *active, digital inputs may cause drive to start at any time. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness with* Hand Start *active could result in death, serious injury, or equipment or property damage.

Auto start is selected if an external signal is sent to switch the drive to Auto mode. When a start signal is active on the control terminals or the serial communication port, the drive will start the motor. If *Auto Start* and *Hand Start* are active at the same time on the control terminals, *Auto Start* will have the higher priority. If *Auto Start* and *Hand Start* are not active, the motor will stop and the drive will then be in the OFF/STOP mode. Programming one of the digital inputs for *Auto Start* will disable the LCP Hand Start and Auto Start keys.

Analog Inputs

Two analog inputs for voltage signals, terminals 53 and 54, and an analog input for current, terminal 60, are provided for reference and feedback signals. A thermistor can be connected to the voltage inputs, terminals 53 or 54.

The two analog voltage inputs can be scaled over the range of 0 to 10 V DC. The current input can be scaled over the range of 0 to 20 mA.

The table below shows the possible analog input programming.

Parameter 317, *Time Out,* and Parameter 318, *Function After Time Out,* allow activation of a time-out function on all analog inputs. If the signal value of the reference or feedback signal connected to one of the analog input terminals drops below 50% of the minimum scaling, the function set in parameter 318, *Function After Time Out*, will be activated after the time-out set in parameter 317.

308 Terminal 53, Analog Input Voltage (AI [V] 53 FUNCT.)

Function:

This parameter is used to select the required function to be linked to terminal 53.

Description of choice:

No operation. Selected if the drive is not to react to signals connected to the terminal.

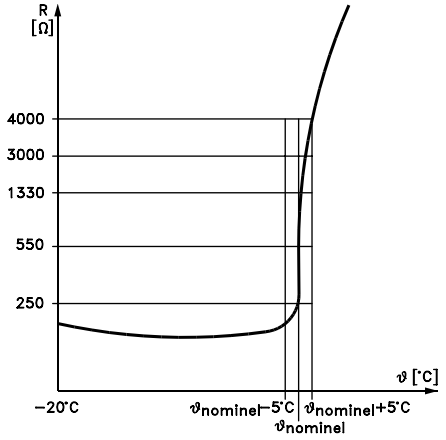
Reference. Selected to enable change of reference by means of an analog reference signal. If reference signals are connected to several inputs, these reference signals will be summed.

Feedback. If a feedback signal is connected, a voltage input may be connected to either terminal 53 or 54, or a current input conected to terminal 60. If a two zone PID control is used, the feedback signals must be voltage inputs and applied to terminals 53 and 54. See *Feedback Handling*.

Thermistor. Selected if a thermistor in the motor stops the drive in case of motor overtemperature. The cutout value is 3 kohm. A Klixon thermal switch may also be connected to this input. If parallel sensors are used, the thermistors/thermal switches can be connected in series. The drive will shut down when the total resistance exceeds 3 kohms.

When a thermistor is mounted in motor wiring, a breakdown of insulation between thermistor and motor can feed high voltage back to drive control terminals. To comply with protective extra-low voltage (PELV) grounding requirements, if applicable, thermistor must be mounted externally.

Parameter 117, *Motor Thermal Protection,* must be programmed for *Thermal Warning* or *Thermistor Trip*, and the thermistor must be inserted between terminal 53 or 54, *analog voltage input*, and terminal 50, *10 V supply*.



Analog Inputs	Terminal Number	53	54	60
	Parameter	308	311	314
Value:				
No operation	(NO OPERATION)	[0]	★[0]	★[0]
Reference	(REFERENCE	★[1]	[1]	[1]
Feedback	(FEEDBACK)	[2]	[2]	[2]
Thermistor	(THERMISTOR)	[3]	[3]	

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

309 Terminal 53, Minimum Scaling (AI 53 SCALE LOW)

Value:

0.0 to 10.0 V ★ 0.0 V

Function:

This parameter is used for setting the signal value that corresponds to the minimum reference or the minimum feedback, parameter 204, *Minimum Reference,* or parameter 413, *Minimum Feedback.* See *Reference Handling* or *Feedback Handling*.

Description of choice:

Set the required voltage value. For reasons of accuracy, voltage losses in long signal lines should be compensated for. If the time out functions in parameter 317, *Time Out,* and parameter 318, *Function After Time Out*, are to be used, the value must be set to > 1 V.

310 Terminal 53, Maximum Scaling (AI 53 SCALE HIGH)

Value:

0.0 to 10.0 V ★ 10.0 V

Function:

This parameter is used to set the signal value that corresponds to the maximum reference value or the maximum feedback, parameter 205, *Maximum Reference,* or parameter 414, *Maximum Feedback*. See *Reference Handling* or *Feedback Handling.*

Description of choice:

Set the required voltage value.

For reasons of accuracy, voltage losses in long signal lines should be compensated for.

311 Terminal 54, Analog Input Voltage (AI [V] 54 FUNCT.)

Value:

See the description of parameter 308. ★ No operation

Function:

This parameter selects the function of terminal 54.

The input signal is scaled by parameter 312, *Terminal 54, Minimum Scaling,* and by parameter 313, *Terminal 54, Maximum Scaling*.

Description of choice:

See description of parameter 308.

For reasons of accuracy, voltage losses in long signal lines should be compensated for.

312 Terminal 54, Minimum Scaling (AI 54 SCALE LOW)

Value:

0.0 to 10.0 V ★ 10.0 V

Function:

This parameter is used to set the signal value that corresponds to the minimum reference value or the minimum feedback, parameter 204, *Minimum Reference,* and parameter 413, *Minimum Feedback*. See *Reference Handling* or *Feedback Handling*.

Description of choice:

Set the required voltage value. For reasons of accuracy, voltage losses in long signal lines should be compensated for.

If the time out function is to be applied, parameter 317, *Time Out,* and parameter 318, *Function After Time Out*, the value must be set to > 1 V.

313 Terminal 54, Maximum Scaling (AI 54 SCALE HIGH)

Value:

0.0 to 10.0 V ★ 10.0 V

Function:

This parameter is used to set the signal value that corresponds to the maximum reference value or the maximum feedback, parameter 205, *Maximum Reference,* or parameter 414, *Maximum Feedback*. See *Reference Handling* or *Feedback Handling*.

Description of choice:

Set the required voltage value. For reasons of accuracy, voltage losses in long signal lines should be compensated for.

314 Terminal 60, Analog Input Current (AI [mA] 60 FUNCT.)

Value:

See description of parameter 308. ★ No operation

Function:

This parameter selects the function of terminal 60.

Scaling of the input signal is set by parameter 315, *Terminal 60, Minimum Scaling,* and by parameter 316, *Terminal 60, Maximum Scaling.*

Description of choice:

See description of parameter 308, *Terminal 53, Analog Input Voltage*.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

315 Terminal 60, Minimum Scaling (AI 60 SCALE LOW)

Value:

0.0 to 20.0 mA ★ 4.0 mA

Function:

This parameter determines the signal value that corresponds to the minimum reference or the minimum feedback, parameter 204 *Minimum Reference,* parameter 413, *Minimum Feedback*. See *Reference Handling* or *Feedback Handling*.

Description of choice:

Set the required current value.

If the time-out function is to be used, parameter 317, *Time Out,* and parameter 318, *Function After Time Out*, the value must be set to > 2 mA.

316 Terminal 60, Maximum Scaling (AI 60 SCALE HIGH)

Value:

0.0 to 20.0 mA ★ 20.0 mA

Function:

This parameter determines the signal value that corresponds to the maximum reference or maximum feedback, parameter 205, *Maximum Reference Value,* or parameter 414, *Maximum Feedback*. See *Reference Handling* or *Feedback Handling*.

Description of choice:

Set the desired current value.

317 Time Out (LIVE ZERO TIME)

Value:

1 to 99 sec. ★ 10 sec.

Function:

If the signal value of the reference or feedback signal connected to one of the input terminals 53, 54 or 60 drops to below 50% of the minimum scaling for a longer period than the Live Zero time, the function selected in parameter 318, *Function After Time Out,* will be activated.

This function will only be active if, in parameter 309 or 312, a value has been selected for *Terminals 53 and 54, Minimum Scaling,* that exceeds 1 V, or if, in parameter 315, *Terminal 60, Minimum Scaling*, a value has been selected that exceeds 2 mA.

Description of choice:

Set the desired time.

318 Function After Time Out (LIVE ZERO FUNCT.)

Value:

★	Off (NO FUNCTION)	[0]
	Freeze output frequency (FREEZE OUTPUT FREQ.)	[1]
	Stop (STOP)	[2]
	Jog (JOG FREQUENCY)	[3]
	Max. output frequency (MAX FREQUENCY)	[4]
	Stop and trip (STOP AND TRIP)	[5]

Function:

This is where to select the function to be activated after the end of the time-out period, parameter 317, *Time Out*.

If a time-out function occurs at the same time as a bus time-out function, parameter 510, *Bus Time Interval Function*, the time-out function in parameter 318 will be activated.

Description of choice:

The output frequency of the drive can:

- go to minimum (NO FUNCTION)
- be frozen at the present value (FREEZE OUTPUT FREQUENCY)
- stop (STOP)
- run at the jog frequency set in parameter 209 (JOG FREQUENCY)
- run at the maximum frequency set in parameter 202 (MAX. FREQUENCY)
- stop and send an alarm (STOP AND TRIP)

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Analog/Digital Outputs

The two analog/digital outputs available through terminals 42 and 45 can be programmed to show a status or an analog value such as frequency. The status signal is a 24 VDC output.

For the analog output, there is a choice of three types of output signal: 0 to 20 mA, 4 to 20 mA or 0 to 32000 pulses. The pulse rate is set by parameter 322, *Terminal 45, Output, Pulse Scaling*.

See the Electrical Installation, Control Terminals section of this manual for the ratings of these outputs.

Analog/Digital Outputs	Terminal Number:	42	45
	Parameter:	319	321
Value:			
No function (NO FUNCTION)		[0]	[0]
Drive ready (READY)		[1]	[1]
Standby (ENABLED & NO WARNING)		[2]	[2]
Running (RUNNING)		[3]	[3]
Running at ref. value (RUNNING AT REFERENCE)		[4]	[4]
Running, no warning (RUNNING NO WARNING)		[5]	[5]
Local reference active (DRIVE IN LOCAL REF.)		[6]	[6]
Remote controlled references active (DRIVE IN REMOTE REF.)		[7]	[7]
Alarm (ALARM)		[8]	[8]
Alarm or warning (ALARM OR WARNING)		[9]	[9]
No alarm (NO ALARM)		[10]	[10]
Current limit (CURRENT LIMIT)		[11]	[11]
Safety interlock (SAFETY INTERLOCK)		[12]	[12]
Start command active (START SIGNAL APPLIED)		[13]	[13]
Reversing (RUNNING IN REVERSE)		[14]	[14]
Thermal warning (THERMAL WARNING)		[15]	[15]
Hand mode active (DRIVE IN HAND MODE)		[16]	[16]
Auto mode active (DRIVE IN AUTO MODE)		[17]	[17]
Sleep mode (SLEEP MODE)		[18]	[18]
Output frequency lower than parameter 223 (F OUT < F LOW)		[19]	[19]
Output frequency higher than parameter 223 (F OUT > F HIGH)		[20]	[20]
Out of frequency range (FREQ. RANGE WARN.)		[21]	[21]
Output current lower than low current, parameter 221 (I OUT < I LOW)		[22]	[22]
Output current higher than high current, parameter 222 (I OUT > I HIGH)		[23]	[23]
Out of current range (CURRENT RANGE WARN)		[24]	[24]
Out of feedback range (FEEDBACK RANGE WARN.)		[25]	[25]
Out of reference range (REFERENCE RANGE WARN)		[26]	[26]
Relay 123 (RELAY 123)		[27]	[27]
Input phase loss (MAINS PHASE LOSS)		[28]	[28]
Output frequency, (OUT. FREQ. 0-20 mA)		[29]	[29]
Output frequency, (OUT. FREQ. 4-20 mA)		[30]	★ [30]
Output frequency, pulse (OUT. FREQ. PULSE)		[31]	[31]
External reference, (EXT. REF. 0-20 mA)		[32]	[32]
External reference, (EXTERNAL REF. 4-20 mA)		[33]	[33]
External reference, pulse (EXTERNAL REF. PULSE)		[34]	[34]
Feedback, (FEEDBACK 0-20 mA)		[35]	[35]
Feedback, (FEEDBACK 4-20 mA)		[36]	[36]
Feedback, pulse (FEEDBACK PULSE)		[37]	[37]
Output current, 0-20 mA (MOTOR CUR. 0-20mA)		[38]	[38]
Output current, 4-20 mA (MOTOR CUR. 4-20mA)	★	[39]	[39]
Output current, pulse (MOTOR CUR PULSE)		[40]	[40]
Output power, 0-20 mA (MOTOR POWER 0-20mA)		[41]	[41]
Output power, 4-20 mA (MOTOR POWER 4-20mA)		[42]	[42]
Output power, pulse (MOTOR POWER PULSE)		[43]	[43]
Controlled by serial bus: 0-20 mA (BUS CONTROL 0-20MA)		[44]	[44]
Controlled by serial bus: 4-20 mA (BUS CONTROL 4-20MA)		[45]	[45]
Controlled by serial bus: pulse (BUS CONTROL PULSE)		[46]	[46]

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Function:

These outputs can act both as digital and analog outputs. If used as a digital output, a 0 or 24 VDC signal is transmitted. If used as an analog output, either a 0 to 20 mA signal, a 4 to 20 mA signal, or a pulse sequence with a frequency of 0 to up to 32,000 Hz is transmitted.

Description of choice:

No function. Selected if this output is always to remain off.

Drive ready. The drive's control card receives a supply voltage and the drive is ready for operation.

Stand by. The drive is ready for operation, but no start command has been given. No warning.

Running. The drive is running or the drive is in the sleep mode.

Running at ref. value. The drive is at the speed commanded by the reference.

Running, no warning. The drive is running and there are no warnings.

Local reference active. The motor's speed is being controlled by the local reference through the keypad. This output will also be on if the drive is set up for local speed control but the jog function has been activated.

Remote references active. The motor's speed is being controlled by a remote reference or a preset speed.

Alarm. The drive has been stopped by an alarm.

Alarm or warning. An alarm or a warning exists in the drive.

No alarm. The drive has no alarm.

Current limit. The output current is greater than or equal to the value programmed in parameter 215, *Current Limit.* The speed of the drive is being limited to keep the current from increasing.

Safety interlock. Terminal 27 has been programmed for *Safety Interlock* in parameter 304, and no control voltage has been applied to it.

Start command active. The drive is either running or it has received a run command. This is commonly used in conjunction with the drive's run permissive control.

Reversing. The drive is running in the reverse direction.

Thermal warning. The temperature limit of either the motor, the drive, or a thermistor connected to an analog input has been exceeded.

Hand mode active. The drive is operating in the Hand run/stop mode.

Auto mode active. The drive is operating in the Auto run/stop mode.

Sleep mode. The drive is stopped because of Sleep Mode.

Output frequency lower than low frequency warning level. The output frequency is lower than the value set in parameter 223, *Warning: Low Frequency.*

Output frequency higher than high frequency warning level. The output frequency is higher than the value set in parameter 224, *Warning: High Frequency.*

Out of frequency range. The output frequency is outside the frequency range programmed in parameter 223, *Warning: Low Frequency,* and 224, *Warning: High Frequency.*

Output current lower than low current warning level. The output current is lower than the value set in parameter 221, *Warning: Low Current.* This can be used to indicate a broken belt.

Output current higher than high current warning level. The output current is higher than the value set in parameter 222, *Warning: High Current.*

Out of current range. The output current is outside the range programmed in parameter 221, *Warning: Low Current,* and parameter 222, *Warning: High Current.*

Out of feedback range. The feedback signal is outside the range programmed in parameter 227 *Warning: Low Feedback,* and 228 *Warning: High feedback.*

Out of reference range. The reference is outside the range programmed in parameter 225, *Warning: Low Reference,* and parameter 226, *Warning: High Reference.*

Relay 123. This function is only used when a Profibus option card is installed.

Input phase loss. An incoming power phase is missing.

Output frequency: 0 to 20 mA, 4 to 20 mA, and pulses. An output signal proportional to the output frequency in the range from 0 to *Output Frequency, High Limit,* set by parameter 202. Maximum pulse frequency is determined in parameters 320, *Terminal 42, Output Pulse Scaling*, and 322, *Terminal 45, Output Pulse Scaling*.

External reference: 0 to 20 mA, 4 to 20 mA, and pulses. An output signal proportional to the resulting reference value in the range from *Minimum Reference* to *Maximum Reference,* set by parameters 204 and 205. Maximum pulse frequency is determined in parameters 320, *Terminal 42, Output Pulse Scaling*, and 322, *Terminal 45, Output Pulse Scaling*.

Feedback Minimum to Feedback Maximum: 0 to 20 mA, 4 to 20 mA, and pulses. An output signal proportional to the reference value in the range from *Minimum Feedback* to *Maximum Feedback,* set by parameters 413 and 414. Maximum pulse frequency is determined in parameters 320, *Terminal 42, Output Pulse Scaling*, and 322, *Terminal 45, Output Pulse Scaling*.

Output Current: to 20 mA, 4 to 20 mA, and pulses. An output signal proportional to the output current in the range from 0 to the maximum drive output current. Maximum pulse frequency is determined in parameters 320, *Terminal 42, Output Pulse Scaling*, and 322, *Terminal 45, Output Pulse Scaling*.

Output power: 0 to 20 mA, 4 to 20 mA, and pulses. Generates an output signal proportional to the present output power. 20 mA corresponds to the value set by parameter 102, *Motor Power.* Maximum pulse frequency is determined in parameters 320, *Terminal 42, Output Pulse Scaling*, and 322, *Terminal 45, Output Pulse Scaling*.

Bus Control: 0 to 20 mA, 4 to 20 mA, and pulses. Generates a proportional output signal provided over a serial communication bus. The serial bus value for output terminal 42 is written to parameter 364 and the serial bus value for output terminal 45 is written to parameter 365. Maximum pulse frequency is determined in parameters 320, *Terminal 42, Output Pulse Scaling*, and 322, *Terminal 45, Output Pulse Scaling*.

319 Terminal 42, Output (AO 42 FUNCTION)

Value:

★ MOTOR CUR. 4-20 mA

See the description of analog/digital outputs.

Function:

This output can function both as a digital and an analog output. When used as a digital output, it generates a 24 V (max. 40 mA) signal. For the analog outputs, there is a choice of 0 to 20 mA, 4 to 20 mA or a pulse sequence.

Description of choice:

See the description of analog/digital outputs.

320 Terminal 42, Output Pulse Scaling (AO 42 PULS SCALE)

Value:

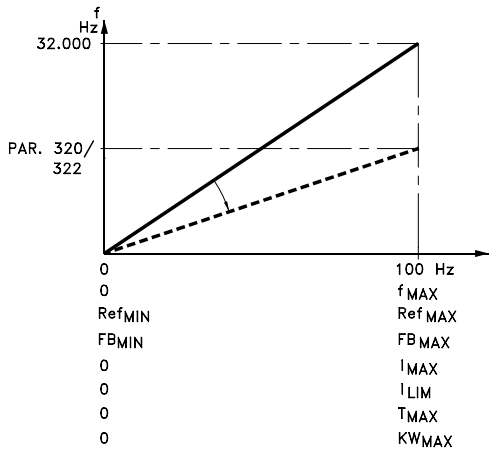
1 to 32000 Hz ★ 5000 Hz

Function:

This parameter allows scaling of the pulse output signal.

Description of choice:

Set the desired value for the maximum pulse frequency.



Pulse Scaling

321 Terminal 45, Output (AO 45 FUNCTION)

Value:

★ OUT. FREQ. 4 - 20 mA

See the description of analog/digital outputs.

Function:

This output can function both as a digital and an analog output. When used as a digital output, it generates a 24 V (max. 40 mA) signal. For the analog outputs, there is a choice of 0 to 20 mA, 4 to 20 mA or a pulse sequence.

Description of choice:

See the description of analog/digital outputs.

322 Terminal 45, Output Pulse Scaling (AO 45 PULS SCALE)

Value:

1 to 32000 Hz ★ 5000 Hz

Function:

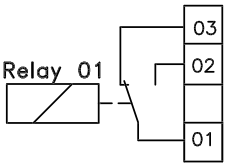
This parameter allows scaling of the pulse output signal.

Description of choice:

Set the desired value for the maximum pulse frequency.

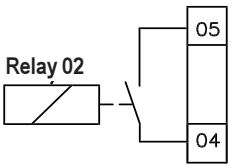
★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Relay Outputs



Relay 1:
1 - 3 normally closed, 1 - 2 normally open
Maximum: 240 VAC/DC, 2 A
Minimum: 24 VAC, 100 mA;
24 VDC, 10 mA

The high voltage relay connections are located near the input power and motor terminals.



Relay 2:
4 - 5 normally open
Maximum: 30 VAC, 1 A,
42.5 VDC, 1 A

The low voltage relay terminals are located on the control wiring terminal strips.

Relay outputs	Relay Number:	1	2
	Parameter:	323	326
Value:			
No function (NO FUNCTION)		[0]	[0]
Drive ready (READY)		[1]	[1]
Waiting for start (ENABLED & NO WARNING)		[2]	[2]
Running (RUNNING)		[3]	★ [3]
Running at reference value (RUNNING AT REFERENCE)		[4]	[4]
Running, no warning (RUNNING NO WARNING)		[5]	[5]
Local reference active (DRIVE IN LOCAL REF)		[6]	[6]
Remote controlled references active (DRIVE IN REMOTE REF.)		[7]	[7]
Alarm (ALARM)		[8]	[8]
Alarm or warning (ALARM OR WARNING)		[9]	[9]
No alarm (NO ALARM)		[10]	[10]
Current limit (CURRENT LIMIT)		[11]	[11]
Safety interlock (SAFETY INTERLOCK)		[12]	[12]
Start command active (START SIGNAL APPLIED)		[13]	[13]
Running in reverse (RUNNING IN REVERSE)		[14]	[14]
Thermal warning (THERMAL WARNING)		[15]	[15]
Hand mode active (DRIVE IN HAND MODE)		[16]	[16]
Auto mode active (DRIVE IN AUTO MODE)		[17]	[17]
Sleep mode active (SLEEP MODE)		[18]	[18]
Output frequency lower than low frequency, parameter 223 (F OUT < F LOW)		[19]	[19]
Output frequency higher than high frequency, parameter 224 (F OUT > F HIGH)		★[20]	[20]
Out of frequency range (FREQ RANGE WARN.)		[21]	[21]
Output current lower than low current, parameter 221 (I OUT < I LOW)		[22]	[22]
Output current higher than high current, parameter 222 (I OUT > I HIGH)		[23]	[23]
Out of current range (CURRENT RANGE WARN.)		[24]	[24]
Out of feedback range (FEEDBACK RANGE WARN.)		[25]	[25]
Out of reference range (REFERENCE RANGE WARN.)		[26]	[26]
Relay 123 (RELAY 123)		[27]	[27]
Input phase loss (MAINS PHASE LOSS)		[28]	[28]
Control word bit 11/12 (CONTROL WORD 11/12)		[29]	[29]

Function:

Relay outputs 1 and 2 can be used to give the present status or a warning. See the description of options in Analog/Digital Outputs.

Control word bit 11/12 [29]. Relay 1 and relay 2 can be activated through serial communication. Bit 11 activates relay 1 and bit 12 activates relay 2.

If parameter 556, *Bus Time Interval Function,* becomes active, relay 1 and relay 2 will cut out if they are activated through serial communication.

Description of choice:

Select the output relay function.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

323 Relay 1, Output Function
(RELAY1 FUNCTION)

Function:

★ NO ALARM

Relay 1 is a form C relay that can be used for status indications and warnings. The relay is activated when the programmed condition occurs.

Time delays for relay 1 are programmed in parameter 324, *Relay 1, ON Delay,* and parameter 325, *Relay 1, OFF Delay*.

Description of choice:

See data choice and connections under Relay Outputs.

324 Relay 1, ON Delay
(RELAY1 ON DELAY)

Value:

0 to 600 sec. ★ 60 sec.

Function:

This parameter determines the time delay before the relay activates.

Description of choice:

Enter the desired value.

325 Relay 1, OFF Delay
(RELAY1 OFF DELAY)

Value:

0 to 600 sec. ★ 60 sec.

Function:

This parameter determines the time delay before the relay deactivates.

Description of choice:

Enter the desired value.

326 Relay 2, Output Function
(RELAY2 FUNCTION)

Value:

See the functions of relay 1. ★ RUNNING

Function:

Relay 2 is a form A relay that can be used for status indications and warnings. The relay is activated when the programmed condition occurs.

Description of choice:

See data choice and connections under Relay Outputs.

327 Pulse Reference, Maximum Frequency
(PULSE REF. MAX)

Value:

100 to 65,000 Hz at terminal 29 ★ 5,000 Hz
100 to 5,000 Hz at terminal 17

Function:

This parameter is used to set the pulse value that corresponds to the maximum reference, parameter 205, *Maximum Reference.*

The pulse reference signal can be connected to terminal 17 or 29.

Description of choice:

Set the required maximum pulse reference.

328 Pulse Feedback, Maximum Frequency
(PULSE FDBK MAX.)

Value:

100 to 65,000 Hz at terminal 33 ★ 25,000 Hz

Function:

This parameter is used to set the pulse value that corresponds to the maximum feedback value. The pulse feedback signal is connected to terminal 33.

Description of choice:

Set the desired feedback value.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Application Functions
Parameters 400 through 427

Special functions of the drive are set up in this parameter group. This includes the proportional, integral, derivative controller (PID) and setting the sleep mode function.

Additionally, this parameter group includes:
- Reset function
- Flying start
- Interference reduction
- Loss of load
- Carrier frequency
- Selection of process units

400 Reset Function (RESET FUNCTION)

Value:

	Manual reset (MANUAL RESET)	[0]
	Automatic reset x 1 (AUTOMATIC X 1)	[1]
	Automatic reset x 2 (AUTOMATIC X 2)	[2]
	Automatic reset x 3 (AUTOMATIC X 3)	[3]
	Automatic reset x 4 (AUTOMATIC X 4)	[4]
	Automatic reset x 5 (AUTOMATIC X 5)	[5]
	Automatic reset x 10 (AUTOMATIC X 10)	[6]
	Automatic reset x 15 (AUTOMATIC X 15)	[7]
	Automatic reset x 20 (AUTOMATIC X 20)	[8]
★	Infinite automatic reset (INFINITE AUTOMATIC)	[9]

Function:

This parameter allows a choice of manual or automatic reset after a fault trip. There is also a choice of the number of times the unit will attempt to restart. The time between each attempt is set in parameter 401, *Automatic Restart Time*.

Description of choice:

If *Manual Reset* is selected, the Reset key must be pressed or a digital input given to reset the drive.

If auto reset after a fault trip is desired, select one of the Automatic reset choices.

With any automatic reset active, digital inputs may cause drive to start at any time. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness with automatic reset active could result in death, serious injury, or equipment or property damage.

401 Automatic Restart Time (AUTORESTART TIME)

Value:

0 to 600 seconds	★ 10 sec.

Function:

This parameter sets the automatic reset time delay until each reset is attempted. One of the automatic resets must be selected in parameter 400, *Reset Function*.

Description of choice:

Set the desired time before each restart attempt.

When parameter 402,* Flying Start*, is enabled, motor may turn forward and reverse a few revolutions even with motor stopped. In highly dynamic pumping processes, it is recommended to disable* Flying Start *function. Using* Flying Start *in highly dynamic pumping processes could result in injury or equiment or property damage.

402 Flying Start (FLYING START)

Value:

	Disable (DISABLE)	[0]
★	Enable (ENABLE)	[1]
	DC brake and start (DC BRAKE AND START)	[3]

Function:

This function makes it possible for the drive to 'catch' a rotating motor when the drive is started. The drive will sense the speed of rotation and direction of rotation of the motor and synchronize with it.

This function is active whenever a start command is present.

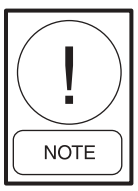
For the drive to catch the spinning motor, the motor speed must be lower than the maximum frequency set in parameter 202.

Description of choice:

Select *Disable* if this function is not required.

Select *Enable* if the drive is to 'catch' and control a rotating motor.

Select *DC brake and start* if the drive is to brake the motor by means of the DC brake first, and then start. Ensure that parameters 114 through 116, *DC Braking,* are set appropriately. Select *DC brake and start* if the motor may be externally driven at a significant speed in the reverse direction.



For fan applications, factory setting for* Flying Start *is Enable. For pump applications, factory setting for* Flying Start *is Disable.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Sleep Mode

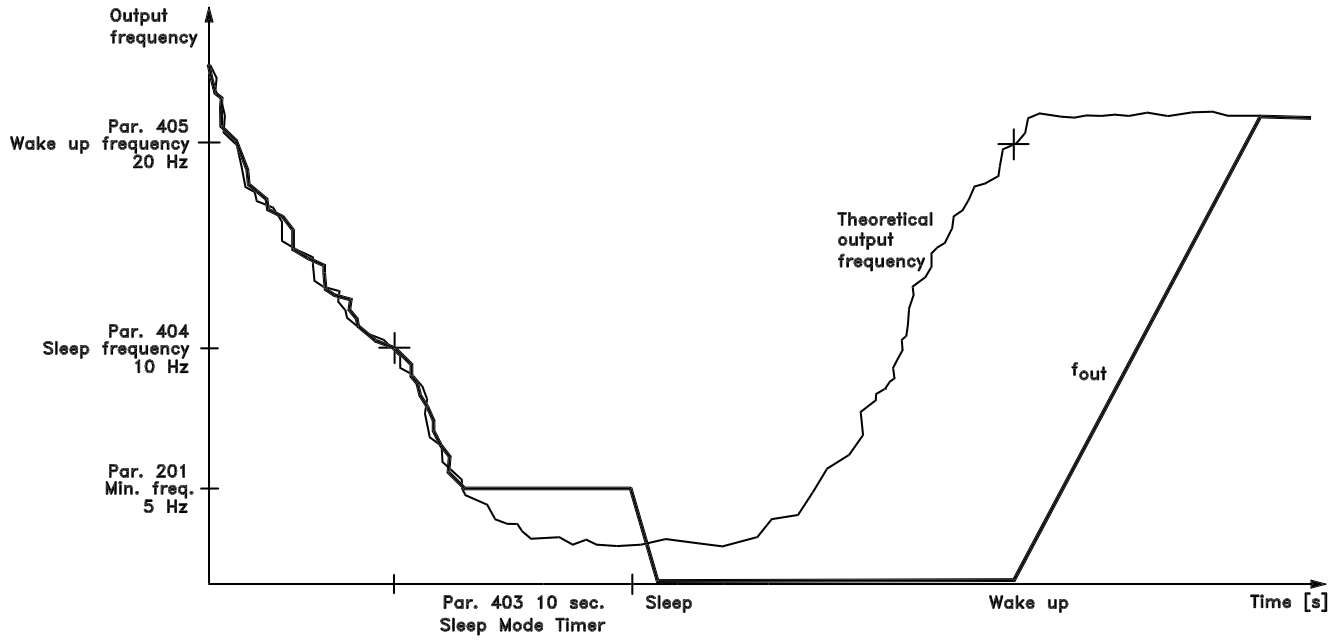
Sleep mode makes it possible to stop the drive when the system demand drops below a preset level. When the demand increases to a higher preset level, the drive will restart. A significant amount of energy can be saved using sleep mode. Unlike a set-back time clock, the drive is always available to run when the demand reaches the preset "wake up" level. Sleep mode operates in both *Open Loop* and *Closed Loop*.

Activate sleep mode in parameter 403, *Sleep Mode Timer*. In this parameter, set how long the output frequency must be lower than the sleep frequency set in parameter 404, *Sleep Frequency,* before sleep mode activates. After the set time, the drive will ramp down the motor to a stop, as controlled by parameter 207, *Ramp Down Time*. If the output frequency needed to meet the system demand rises above the sleep frequency during the timed period, the drive will simply ramp up to the demanded frequency.

When the sleep mode timer expires and the drive is stopped in sleep mode, a theoretical output frequency is calculated based upon the reference signal. When the theoretical output frequency rises above the frequency set in parameter 405, *Wake-up Frequency*, the drive will restart the motor and ramp up to the commanded reference.

For closed loop operation, it may be useful to "over satisfy" the system before putting the drive into sleep mode. The boost setpoint parameter provides for this. After the sleep mode timer expires, the drive will reset the set point based on the value in parameter 406, *Boost Setpoint*. Once this new setpoint is satisfied, the drive enters sleep mode. A setting of 100% in parameter 406, *Boost Setpoint,* indicates no setpoint boost. Boost setpoint is only active in *Closed Loop*, selected in parameter 100, *Configuration.*

Sleep mode is not active if *Local Reference* is selected in parameter 203, *Reference Handling*, or if the *Jog* function activates via digital inputs.



Sleep Mode Frequency Response

In Sleep Mode, a start signal via digital inputs may cause drive to start at any time. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness in Sleep Mode could result in death, serious injury, or equipment or property damage.

403 Sleep Mode Timer (SLEEP MODE TIMER)

Value:

0 to 300 seconds (OFF) ★ OFF

Function:

This parameter enables the drive to stop the motor if the load on the system is minimal. The timer starts when the output frequency drops below the frequency set in parameter 404, *Sleep Frequency*. When the time set has passed, the drive will stop. The drive will restart when the theoretical output frequency exceeds the frequency set in parameter 405, *Wake-up Frequency*.

Description of choice:

Select OFF if this function is not wanted.

Set the amount of time that the drive must run at or below the sleep frequency before it stops and "goes to sleep."

404 Sleep Frequency (SLEEP FREQUENCY)

Value:

0.0 to parameter 405, *Wake-up Frequency* ★ 0.0 Hz

Function:

When the output frequency falls below this set value, the timer set in parameter 403, *Sleep Mode Timer*, will start. The drive's speed will follow the reference signal until the timer times out.

Description of choice:

Choose the output frequency at which the drive will activate the sleep mode timer. It is generally best to set SLEEP FREQUENCY equal to the minimum frequency set in parameter 201, *Output Frequency Low Limit* and parameter 204, *Minimum Reference.* This is because the sleep mode isn't active until after the drive output frequency equals the sleep frequency. If the sleep frequency is less than the minimums, the sleep mode cannot activate.

405 Wake-up Frequency (WAKEUP FREQUENCY)

Value:

Parameter 404 to parameter 202, *Maximum Frequency* ★ 60 Hz

Function:

When the theoretical output frequency exceeds the preset value, the drive restarts the motor.

Description of choice:

Set the required frequency.

406 Boost Setpoint (BOOST SETPOINT)

Value:

0 to 200 % ★ 100%

Function:

This function can only be used if *Closed Loop* has been selected in parameter 100, *Configuration.*

In some systems, it may advantageous to increase the set point of the system before the drive stops the motor. This extends the time that the drive will be stopped and reduces cycling of the motor.

Description of choice:

Set the required *Boost Setpoint* as a percentage of the resulting reference under normal operation. 100% corresponds to the boost.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

407 Switching Frequency (SWITCHING FREQ.)

Value:

Depends on the current rating of the unit.

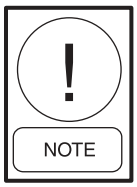
Function:

The value of this parameter determines the maximum switching frequency of the inverter. If *Fixed Switching Frequency* has been selected in parameter 408, *Interference Reduction Method,* this will be the fixed inverter switching frequency. Changing the switching frequency may reduce audible noise from the motor. The output frequency of the drive can never be a greater than 1/10 of the switching frequency.

Description of choice:

When the motor is running, the switching frequency may be adjusted by parameter 407, *Switching Frequency,* until the sound level is as low as possible.

Switching frequencies higher than 4.5 kHz will result in automatic derating of the maximum continuous output current of the drive. The derate is linear from 4.5 kHz to the maximum switching frequency of the drive. At maximum switching frequency, the continuous output current from the drive will be limited to 60% of the rated current. To avoid possible problems at high load when using a high switching frequency, it may be desirable to select Automatic Switching Frequency Modulation in parameter 408, below.



Switching frequencies higher than 4.5 kHz automatically derate maximum continuous output of drive.

408 Interference Reduction Method (NOISE REDUCTION)

Value:

★	ASFM (ASFM)	[0]
	Fixed switching freq. (FIXED SWITCHING FREQ.)	[1]
	LC filter fitted (LC-FILTER CONNECTED)	[2]

Function:

Used to select different methods for reducing the amount of audible noise from the motor.

Description of choice:

ASFM (Automatic Switching Frequency Modulation) uses the maximum switching frequency possible while providing the output required by the load. The load is automatically monitored and the switching frequency set accordingly. The maximum switching frequency is set in parameter 407, *Switching Frequency*.

Fixed Switching Frequency makes it possible to set a fixed switching frequency. The switching frequency is set in parameter 407, *Switching Frequency.*

LC-filter fitted is to be used if an LC filter is installed between the drive and the motor. This prevents excessive heating of the LC filter.

409 Function in Case of No Load (FUNCT. LOW CURR.)

Value:

	Trip (TRIP)	[0]
★	Warning (WARNING)	[1]

Function:

This parameter can be used for monitoring the V-belt of a fan or other power transmission component to make sure it has not broken. This function is activated when the output current goes below the current level set in parameter 221, *Warning: Low Current*. This function is not active during a start until the drive has reached the speed reference. It is also not active while the drive is stopped or while it is decelerating to a stop.

Description of choice:

In the case of a *Trip*, the drive will stop the motor if the output current drops below the value set in parameter 221.

If *Warning* is selected, the drive will give a warning if the output current drops below the value set in parameter 221.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

410 Function at Input Phase Loss (MAINS IMBALANCE)

Value:

Trip (TRIP)	★ [0]
Autoderate & Warning (AUTODERATE & WARNING)	[1]
Warning (WARNING)	[2]

Function:

This determines the action of the drive when one of the incoming power phases is lost. Some action is required to control the level of ripple voltage on the DC bus to avoid damage to the DC bus capacitors.

Description of choice:

At *Trip*, the drive stops the motor within a few seconds (depending on drive size).

If *Autoderate & Warning* is selected, the drive will export a warning and reduce the output current to 30% of maximum current to maintain operation.

If* Warning *is selected, life expectancy of the drive could be reduced if input phase loss persists. Select* Warning *only when input phase loss is known to be temporary.

At *Warning*, only a warning will be exported when an input phase loss occurs, but in severe cases, other extreme conditions might result in a trip.

Drive display will show MAINS PHASE LOSS.

For drives with software version 2.0 or later, select *Autoderate & Warning.* Set parameter 412, *Trip Delay Overcurrent*, to OFF.

At phase loss, the cooling fan of NEMA 12 drives cannot be powered. To avoid overheating, an external power supply can be connected. Contact York for further information. Failure to provide fan cooling may result in equipment damage.

411 Function at Drive Overtemperature (FUNCT. OVERTEMP)

Value:

Trip (TRIP)	★ [0]
Autoderate & Warning (AUTODERATE & WARNING)	[1]

Function:

Select the function to be activated when the drive is exposed to an overtemperature condition.

Description of choice:

At *Trip*, the drive stops the motor and exports an alarm.

At *Autoderate & Warning*, the drive first reduces the switching frequency to minimize internal loss. If the overtemperature condition persists, the drive reduces the output current until the heat sink temperature stabilizes. A warning is issued when the function is active.

For drives with software version 2.0 or later, select *Autoderate & Warning.* Set parameter 412, *Trip Delay Overcurrent*, to OFF.

412 Trip Delay Overcurrent (OVERLOAD DELAY)

Value:

OFF or 0 to 60 sec.	★ 60 sec.

Function:

When the output current has reached the current limit set in parameter 215, *Current Limit*, and remains there for the time selected in this parameter, the drive will trip.

Description of choice:

Select how long the drive will run in current limit before it trips.

✯ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Feedback Signals in Open Loop

In some drives, feedback signals and feedback parameters are only used in closed loop operation. In the VFD, the feedback signals are also active in open loop operation. Although they don't effect the speed of the drive, they can be displayed on the drive's meters. Parameters 227 and 228 can set high and low limits for the feedback signals, which can activate warnings.

For open or closed loop operation, the feedback signal is scaled in parameters 413 and 414 *Minimum* and *Maximum Feedbac*k, and the unit displayed is chosen in parameter 415, *Process Units*.

413 Minimum Feedback
(MIN. FEEDBACK)

Value:

-999,999.999 to *Maximum Feedback*, Parameter 414 ★ 0.000

Function:

Parameters 413 *Minimum Feedback* and 414 *Maximum Feedback,* are used to scale the feedback signal.

Description of choice:

Set the value to be shown on the display when the feedback signal is at its minimum value.

414 Maximum Feedback
(MAX. FEEDBACK)

Value:

Minimum Feedback to 999,999.999 ★ 100.000

Function:

See the description of parameter 413, *Minimum Feedback*.

Description of choice:

Set the value to be shown on the display when the feedback signal is at its maximum value.

415 Units Relating to Closed Loop
(REF. / FDBK. UNIT)

Value:

No unit	[0]	°C	[21]
★%	[1]	GPM	[22]
rpm	[2]	gal/s	[23]
ppm	[3]	gal/min	[24]
pulse/s	[4]	gal/h	[25]
l/s	[5]	lb/s	[26]
l/min	[6]	lb/min	[27]
l/h	[7]	lb/h	[28]
kg/s	[8]	CFM	[29]
kg/min	[9]	ft^3/s	[30]
kg/h	[10]	ft^3/min	[31]
m^3/s	[11]	ft^3/h	[32]
m^3/min	[12]	ft/s	[33]
m^3/h	[13]	in wg	[34]
m/s	[14]	ft wg	[35]
mbar	[15]	PSI	[36]
bar	[16]	lb/in^2	[37]
Pa	[17]	HP	[38]
kPa	[18]	°F	[39]
m wg	[19]		
kW	[20]		

Function:

Selects the unit shown on the feedback display.

The selected unit is used if *Reference [unit]* or *Feedback [unit]* has been selected in one of the parameters 007 through 010, as well as in the Display Mode. It will be the unit for *Minimum/Maximum Feedback*. In *Closed Loop*, the unit is also used as the unit for *Minimum/Maximum Reference* and *Minimum/Maximum Feedback*, as well as *Setpoint 1* and *Setpoint 2*.

Description of choice:

Select the unit for the reference/feedback signal.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

PID for Process Regulation

The built-in proportional, integral, derivative (PID) controller in the drive maintains a constant condition (pressure, temperature, flow, etc.) in the system. It adjusts motor speed based upon a reference and/or setpoint and the feedback signal. The PID controller is activated by setting parameter 100, *Configuration*, to *Closed loop*.

A transmitter supplies the PID controller with a feedback signal from the process to indicate its current state. The type of feedback signal in use depends upon the type of process.

This means that deviations that occur between the reference/setpoint and the actual process state are sensed. Such deviations are compensated for by the PID regulator by adjusting the output frequency as required by the difference (or error) between the reference/setpoint and the feedback signal.

The PID controller in the drive has been designed for use in HVAC applications and to perform a number of specialized functions. Previously, it was necessary for a building management system to handle these special functions by installing extra modules to program the system.

With the VFD, there is no need for extra modules to be installed. Only the reference and/or setpoint and a selected feedback signal need to be programmed. An advanced feature of the VFD is the drive's ability to accept two feedback signals, making two-zone regulation possible.

Voltage drop in long control cables can be compensated for by using the scaling parameters for the analog inputs.

Feedback

The feedback signal must be connected to the drive according to the table below, depending on the type of feedback signal and the settings of the associated parameters listed.

Feedback type	Terminal	Parameters
Pulse	33	307
Voltage	53 or 54	308, 309, 310 or 311, 312, 313
Current	60	314, 315, 316
Bus feedback 1*	68 and 69	537
Bus feedback 2*	68 and 69	538

* The bus feedbacks can only be set by serial communication.

If two analog feedback signals are to be used, they both must be voltage signals.

The *Minimum Feedback* and *Maximum Feedback*, parameters 413 and 414, must be set for the feedback signals. The type of process unit for the signals is selected in parameter 415, *Process Units*.

Reference (Setpoint)

In parameter 205, *Maximum Reference,* the maximum value of the sum of all reference signals is set.

The *Minimum Reference*, set in parameter 204, indicates the smallest value that the resulting reference can assume.

The reference range cannot exceed the feedback range.

If multiple *Preset References* are required, use multiple setups or set them in parameters 211 to 214 *Preset Reference*. See *Reference Handling*.

If a current signal is used as a feedback signal, voltage can be used as an analog reference. Use the table below to decide which terminal to use and which parameters to program.

Reference type	Terminal	Parameters
Pulse	17 or 29	301 or 305
Voltage	53 or 54	308, 309, 310 or 311, 312, 313
Current	60	314, 315, 316
Preset reference		211, 212, 213, 214
Setpoints		418, 419
Bus reference *	68 and 69	

* The bus reference can only be set by serial communication.

Terminals that are not used should be set to *No function*.

Inverse Regulation

Normal regulation means that the motor speed increases when the reference/setpoint is higher than the feedback signal. Inverse regulation means that the motor speed decreases when the reference/setpoint is higher than the feedback signal. If there is a need for inverse regulation, inverse must be programmed in parameter 420, *PID Normal/Inverse Control.*

Anti-windup

The process controller is factory set with an active anti-windup function. This function ensures that when either a frequency limit or a current limit is reached, the integrator will be reset to zero. If the frequency limit or current limit is cleared, the integrator will turn on again. This function can be disabled in parameter 421, *PID Anti-windup*.

Start-up Conditions

In some applications, the optimum setting of the process regulator takes a long time to reach. In such cases, a start-up frequency can be entered in parameter 422, *PID Start-up Frequency*. The drive will ramp directly to this frequency before PID control begins. This avoids control by deviation between the reference/setpoint and the actual state of the process during acceleration. It also avoids overshoot of the process requirement during acceleration due to lag in the feedback signal.

Differentiator Gain Limit

The differentiation control reacts to the rate of change of the error between the setpoint and the feedback signal. This is seldom needed for HVAC applications. If the differentiation function becomes too dominant, the differentiation factor can be limited. This is done in parameter 426, *PID Differentiator Gain Limit*.

Lowpass Filter

Noise on the feedback signal can be reduced by using the built-in lowpass filter. Set a suitable lowpass filter time constant. This time constant determines the cutoff frequency of the filter.

If the lowpass filter has been set to 0.1s, the cut-off frequency will be 10 RAD/sec., corresponding to (10/2 x π) = 1.6 Hz. This means that any noise on the feedback signal whose frequency is greater than 1.6 Hz will be filtered out. Choose a suitable time constant in parameter 427, *PID Lowpass Filter Time*.

Optimization of the Process Regulator

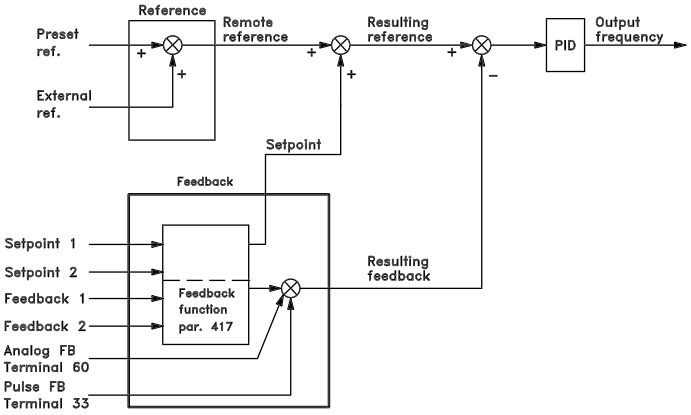
The basic settings have now been made; all that remains to be done is to optimize the proportional gain, the integration time and, if needed, the differentiation time. These are set by parameters 423, 424 and 425. In most processes, this can be done by following the guidelines below.

1. Start the motor.
2. Set parameter 423, *PID Proportional Gain,* to 0.3 and increase it until the feedback signal becomes unstable. Then reduce the value until the feedback signal has stabilized. Now lower the proportional gain by about half (40% to 60%).
3. Set parameter 424, *PID Integration Time,* to 20 seconds and reduce the value until the feedback signal becomes unstable. Increase the integration time until the feedback signal stabilizes. Now increase the integration time from 15% to 50%.
4. Parameter 425, *PID Differentiation Time,* is only used in very fast-acting systems and should be left off for most HVAC applications. When it is used, the typical value is 1/4th the value set in parameter 424, *PID Integration Time*. The differentiator should only be used when the setting of the proportional gain and the integration time have been fully optimized.

Starting and stopping the drive will produce the necessary error signal in the process to set the PID.

PID Overview

The block diagram below shows reference and setpoint in relation to the feedback signal.



As can be seen, the remote reference is added to Setpoint 1 or Setpoint 2. The setpoint that is active depends on the value of parameter 417, *Feedback Function*.

Feedback Handling

Handling of the feedback signal(s) can be seen from the block diagram on the next page. The block diagram shows how and by which parameters the feedback handling is affected.

Feedback signals can be voltage, current, pulse and bus feedback signals. In two zone feedback systems, both feedback signals must be voltage signals (terminals 53 and 54). Please note that *Feedback 1* consists of bus feedback 1, (parameter 537) added to the feedback signal value of terminal 53. *Feedback 2* consists of bus feedback 2, (parameter 538) added to the feedback signal value of terminal 54.

In addition, the drive has an internal calculator capable of converting a pressure signal into a “linear flow” feedback signal. This function is activated in parameter 416, *Feedback Conversion.*

The parameters for feedback handling are active both in closed and open loop modes. In open loop, the feedback signal can be displayed on one of the drive’s meters and the drive can produce warnings if the feedback signal is beyond the range set in parameters 227, *Warning: Low Feedback* and 228, *Warning: High Feedback*.

Feedback Handling (continued)

During closed loop operation, there are three ways to use the PID controller and setpoint and feedback signals:

1 setpoint and 1 feedback
1 setpoint and 2 feedbacks
2 setpoints and 2 feedbacks

1 Setpoint and 1 Feedback

In HVAC applications it is often possible to place a pressure or temperature sensor at the farthest significant load and measure actual pressure or temperature in the system. In these cases, the drive's PID controller can respond to system changes, as programmed. When only one setpoint and one feedback signal are used, the drive responds to the feedback signal to match the programmed setpoint in parameter 418, *Setpoint 1.* (If a remote reference is used, it will be added to the setpoint.)

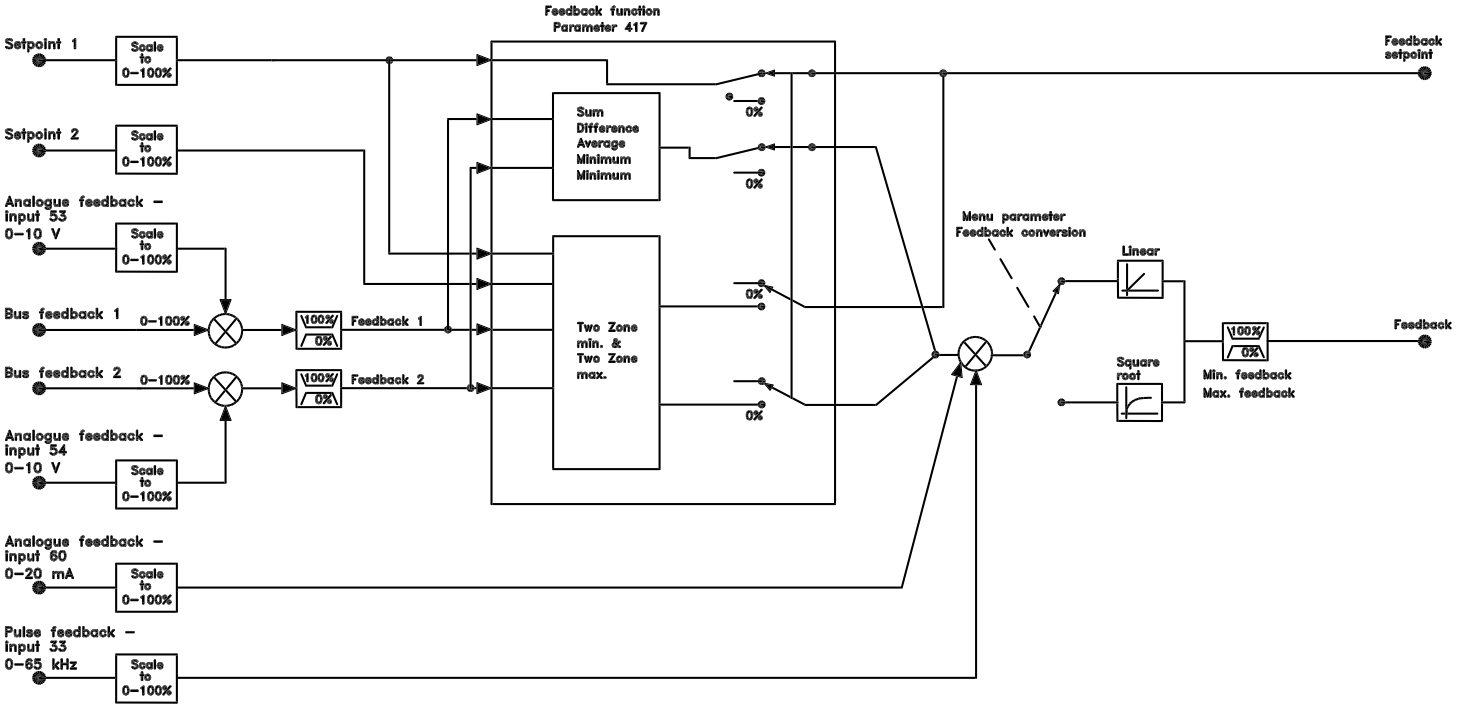
1 Setpoint and 2 Feedbacks

Depending on the feedback function selected in parameter 417, *Feedback Function*, the two feedback signals will be compared to the setpoint. A description of the individual feedback functions is given in parameter 417. As above, parameter 418, *Setpoint 1,* will be added to the remote reference, if a remote reference is used.

2 Setpoints and 2 Feedbacks

Whenever two critical zones do not have the same setpoint value, two feedback with two setpoint control is required. Many pumping systems require the monitoring and control of two loads that differ in size and pressure drop. Or this can be effective when controlling different temperature zones in cooling or heating applications. Parameter 418, *Setpoint 1*, is the setpoint for zone 1. Feedback for zone 1 is the feedback signal at terminal 53. Parameter 419, *Setpoint 2*, is the setpoint for zone 2 and terminal 54 for feedback 2. Bus Feedback 1 and 2 (parameters 535 and 536) are added to their respective feedback signals, when serial bus data is added to the zone control.

Parameter 417, *Feedback Function*, selects whether the drive will attempt to have both feedback signals meet the minimum (2 zone min.) or maximum (2 zone max.) to their respective setpoints.



416 Feedback Conversion (FEEDBACK CONV.)

Value:

★	Linear (LINEAR)	[0]
	Square root (SQUARE ROOT)	[1]

Function:

In this parameter, a function is selected which converts a feedback signal from the process to a feedback value that equals the square root of the connected signal.

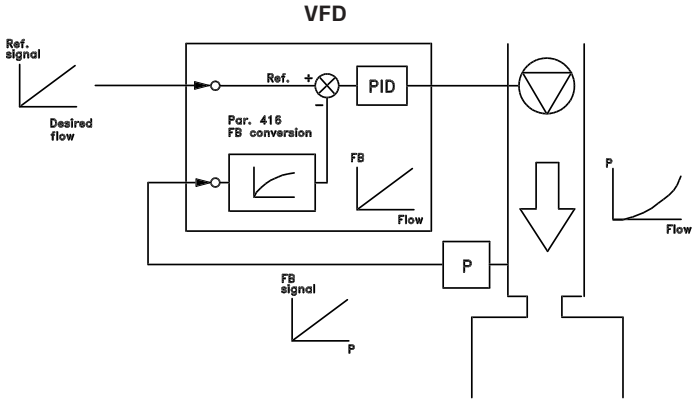
This can be used where regulation of a flow is required and the feedback is from a pressure sensor (flow is proportional to the square root of pressure). This conversion makes it possible to set the reference in such a way that there is a linear connection between the reference and the flow required. See diagram below.

Feedback conversion should not be used if two-zone regulation has been selected in parameter 417, *Feedback Function*.

Description:

If *Linear* is selected, the feedback signal and the feedback value will be proportional.

If *Square root* is selected, the drive first takes the square root of the feedback signal.



417 Feedback Function (2 FEEDBACK, CALC.)

Value:

	Minimum (MINIMUM)	[0]
★	Maximum (MAXIMUM)	[1]
	Sum (SUM)	[2]
	Difference (DIFFERENCE)	[3]
	Average (AVERAGE)	[4]
	Two-zone minimum (2 ZONE MIN)	[5]
	Two-zone maximum (2 ZONE MAX)	[6]
	Feedback 1 only (FEEDBACK 1 ONLY)	[7]
	Feedback 2 only (FEEDBACK 2 ONLY)	[8]

Function:

This parameter determines the calculation method for two feedback signals. Terminals 53 and 54 are both read in selections [0] through [6]. In each case, if only one feedback signal is received, a zero value will be calculated for the inactive terminal. To read feedback from only one of the two terminals, use *Feedback 1 Only* (terminal 53) or *Feedback 2 Only* (terminal 54) to exclude the inactive terminal.

Feedback 1 = Sum of parameter 535, *Bus Feedback 1,* (if present) and the feedback signal value of terminal 53.

Feedback 2 = Sum of parameter 536, *Bus Feedback 2,* (if present) and the feedback signal value of terminal 54.

Description of choice:

If *Minimum* is selected, the drive will compare *Feedback 1* with *Feedback 2* and regulate on the basis of the lower feedback value.

If *Maximum* is selected, the drive will compare *Feedback 1* with *Feedback 2* and regulate on the basis of the higher feedback value.

If *Sum* is selected, the drive will total *Feedback 1* with *Feedback 2*.

If *Difference* is selected, the drive will subtract *Feedback 1* from *Feedback 2*.

If *Average* is selected, the drive will calculate the average of *Feedback 1* and *Feedback 2*.

If *2-zone Minimum* is selected, the drive will calculate the difference between *Setpoint 1* and *Feedback 1* as well as *Setpoint 2* and *Feedback 2*. The drive will regulate its output speed based on the larger difference. A positive difference, (a setpoint higher than the feedback), is always larger than a negative difference.

If *2-zone Maximum* is selected, the drive will calculate the difference between *Setpoint 1* and *Feedback 1* as well as *Setpoint 2* and *Feedback 2*. After the calculation, the drive will use the smaller difference. A negative difference (a setpoint lower than the feedback) is always smaller than a positive difference.

If *Feedback 1 Only* is selected, terminal 53 is read as the feedback signal and terminal 54 ignored. *Feedback 1* is compared to *Setpoint 1* for drive control.

If *Feedback 2 Only* is selected, terminal 54 is read as the feedback signal and terminal 53 ignored. *Feedback 2* is compared to *Setpoint 2* for drive control.

Value of parameter 418*, Setpoint 1, *is added to any remote reference when* Minimum, Maximum, Sum, Difference *or* Average *is selected.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

418 Setpoint 1 (SETPOINT 1)

Value:

Feedback Minimum to Feedback Maximum	★ 0.000

Function:

Setpoint 1 is used to provide the setpoint reference for PID control with one feedback signal. It is also used for the setpoint for zone one in two-setpoint PID control. External and preset references may be added to its value.

In open loop, *Setpoint 1* should be set to 0 to prevent parameter 417, *Feedback Function,* from affecting the reference.

See description of parameter 417, *Feedback Function*.

Description of choice:

Set the desired value within the programmed minimum and maximum. The process unit is selected in parameter 415, *Process Units*.

419 Setpoint 2 (SETPOINT 2)

Value:

Feedback minimum to Feedback maximum	★ 0.000

Function:

Setpoint 2 is used to provide the setpoint reference for zone two in two-zone PID. In open loop, *Setpoint 2* should be set to 0, to prevent parameter 417, *Feedback Function,* from affecting the reference.

See description of parameter 417.

Description of choice:

Set the required value. The process unit is selected in parameter 415, *Process Units*.

420 PID Normal/Inverse Control (PID NOR/INV. CTRL)

Value:

★	Normal (NORMAL)	[0]
	Inverse (INVERSE)	[1]

Function:

This determines how the drive's PID controller responds to an error between the setpoint and feedback.

Used in *Closed Loop*, (parameter 100).

Description of choice:

Select *normal* when the drive is to reduce the output frequency as the feedback signal increases.

Select *inverse* when the drive is to increase the output frequency as the feedback signal increases.

421 PID Anti-windup (PID ANTI WINDUP)

Value:

	Off (DISABLE)	[0]
★	On (ENABLE)	[1]

Function:

It is possible to choose whether the PID controller integrator is to continue to sum the error signal when it is not possible to increase or decrease the output frequency to correct the error.

Used in *Closed Loop*, parameter 100.

Description of choice:

The factory setting is *On*, which means that the error integrator is cleared if either the current limit, the voltage limit or the maximum or minimum frequency has been reached. The integrator will not function again until regulation is possible. Select *Off* if the integrator is to continue integrating even if it is not possible to correct the error.

422 PID Start-up Frequency (PID START VALUE)

Value:

Minimum frequency to maximum frequency (set by parameters 201 and 202)	★ 0.0 Hz

Function:

Each time the drive is given a start command, the start-up frequency is the speed the drive accelerates to before PID control is activated. The drive will follow the acceleration ramp when a start signal is received as if in open loop. When the programmed start-up frequency is reached, it will change to closed loop operation.

Used in *Closed Loop*, parameter 100.

Description of choice:

Set the required start frequency. For software versions prior to 2.0, do not set this frequency between 0.1 and 7.7 Hz.

If drive is running in current limit before desired start frequency is obtained, PID control will not be activated. To avoid this, start frequency must be low enough to ensure drive does not go into current limit. This can be done during operation.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

423 PID Proportional Gain (PID PROP. GAIN)

Value:

0.00 to 10.00 ★ 0.30

Function:

The proportional gain determines how fast the system responds to a change in feedback.

Used in *Closed Loop*, parameter 100.

Description of choice:

Quick regulation is obtained by a high gain, but, if the gain is too high, the process may become unstable. See Optimization of the Process Regulator for information on proper adjustment.

424 PID Integral Time (PID INTEGR.TIME)

Value:

0.01 to 9999.00 sec. (OFF) ★ OFF

Function:

The integrator adds the error signal over time and uses this to correct the speed of the drive.

The integral time is the time needed by the integrator to have the same effect as the proportional gain.

Used in *Closed Loop* parameter 100.

Description of choice:

Fast regulation is obtained by setting a short integration time. However, if this time is too short, the process will overcorrect and become unstable. See Optimization of the Process Regulator for information on proper adjustment.

425 PID Differentiation Time (PID DIFF. TIME)

Value:

0.00 (OFF) to 10.00 sec. ★ OFF

Function:

The differentiator responds to the rate of change of the error signal.

The quicker the error changes, the greater the response from the differentiator.

Used in *Closed Loop*, parameter 100.

Description of choice:

Fast regulation can be obtained by means of a long differentiation time. If this time is too long, the process may overshoot. The differentiator is generally set of OFF in HVAC applications. See Optimization of the Process Regulator for information on proper adjustment.

426 PID Differentiator Gain Limit (PID DIFF. GAIN)

Value:

5.0 to 50.0 ★ 5.0

Function:

When the differentiator is used, fast changes in the error can sometimes cause unstable operation. In these cases it may be useful to limit the contribution of the differentiator.

Used in *Closed Loop,* parameter 100.

Description of choice:

A lower limit will improve stability, but will reduce the effect of the differential.

427 PID Lowpass Filter Time (PID FILTER TIME)

Value:

0.01 to 10.00 ★ 0.01

Function:

Noise on the feedback signal can be reduced by the lowpass filter.

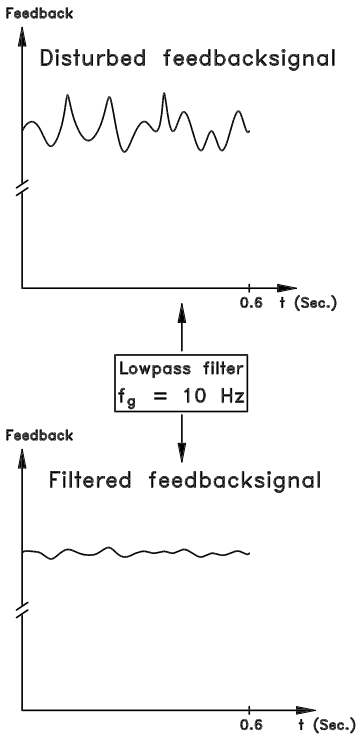
Used in *Closed Loop*, parameter 100.

Description of choice:

Select the desired time constant (t).

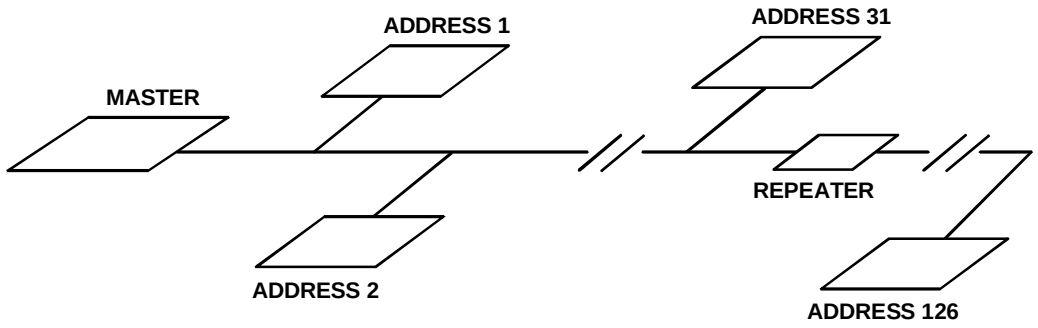
The cut off frequency equals ½πt. For example, if a time constant of 0.1 s is programmed, the cut off frequency for the lowpass filter will be 1/[2π (.1)] = 1.6 Hz.

The PID controller will then only respond to changes in the feedback signal whose frequency is less than 1.6 Hz.



★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Serial Communication for FC Protocol



Protocols

All VFDs have an RS-485 port which allows controlling the drive by one of four different serial communication protocols. The protocols, which can be selected in parameter 500, *Protocol*, are:

- Johnson Controls Metasys® N2
- Siemens Apogee® FLN
- Modbus RTU
- VFD FC protocol (internal firmware)

To select a particular protocol, set parameter 500, *Protocol* to the desired setting.

For further information on operating the drive through Metasys N2, Apogee FLN, or Modbus RTU communications, request the Operator's Manual from York.

Packet Communication

Control and Reply Packets

The packet communication in a master/slave system is controlled by the master. The drives are the slaves. A maximum of 31 VFDs can be connected to one master unless a repeater is used. If a repeater is used, a maximum of 126 drives can be connected to one master.

The master continuously sends packets addressed to the slaves and awaits reply packets from them. The response time of the slaves is a maximum of 50 ms.

Only a slave that has received a faultless packet addressed to that slave will respond by sending a reply packet.

Broadcast

When a master sends a packet to all slaves connected to the bus at the same time, it is called a broadcast. In broadcast communication, if the packet has been correctly received, the slaves do not send reply packets to the master.

Serial Communication Parameters 500 through 571

This parameter group sets up the drive for serial communication.

There is a choice of four protocols: FC (internal protocol), Johnson Controls Metasys N2, Siemens ApogeeFLN, and Modbus RTU. In order to use serial communication to control the drive, address and baud rate must always be set. In addition to controlling the drive, operational data from the drive including reference, feedback, motor temperature and others can be read through serial communication.

500 Protocol (PROTOCOL)

Value:

★	FC protocol (FC PROTOCOL)	[0]
	Metasys N2 (METASYS N2)	[1]
	Siemens Apogee FLN (FLN)	[2]
	Modbus RTU (MODBUS)	[3]

Function:

There is a choice of four different serial communication protocols.

Description of choice:

Select the required control word protocol.

501 Address (ADDRESS)

Value:

Parameter 500 *Protocol* = *FC protocol*	
0 through 126	★1
Parameter 500 *Protocol* = *Metasys N2*	
1 through 255	1
Parameter 500 *Protocol* = *FLN*	
0 through 98	1
Parameter 500 *Protocol* = *Modbus RTU*	
0 through 247	1

Function:

In this parameter it is possible to allocate an address in a serial communication network to each drive.

Description of choice:

The individual drive must be given a unique address. If the number of drives exceeds 31, a repeater must be used. Parameter 501, *Address,* cannot be chosen via serial communication but is set via the keypad.

502 Baud Rate (BAUDRATE)

Value:

	300 Baud (300 BAUD)	[0]
	600 Baud (600 BAUD)	[1]
	1200 Baud (1200 BAUD)	[2]
	2400 Baud (2400 BAUD)	[3]
	4800 Baud (4800 BAUD)	[4]
★	9600 Baud (9600 BAUD)	[5]

Function:

In this parameter, the speed at which data is transmitted via serial communication is programmed. Baud rate is defined as the number of bits transmitted per second.

Description of choice:

The transmission speed of the drive must be set at a value that corresponds to the transmission speed of the master. Parameter 502, *Baud Rate,* cannot be selected through serial communication; it must be set by the keypad. The data transmission time itself, which is determined by the baud rate selected, is only part of the total communication time.

503 Coasting Stop (COASTING)

Value:

	Digital input (DIGITAL INPUT)	[0]
	Serial communication (SERIAL PORT)	[1]
	Logic and (LOGIC AND)	[2]
★	Logic or (LOGIC OR)	[3]

Function:

In parameters 503 through 508, a choice can be made to control the drive via the digital inputs and/or by serial communication.

If *Digital input* is selected, the command can only be carried out through digital input.

If *Serial communication* is selected, the command can only be carried out through serial communication.

If *Logic and* is selected, the command must be by both serial communication and a digital input.

If *Logic or* is selected, the command can be made by either digital or serial communication.

Description of choice:

The tables below show whether the motor is running or coasting when *Digital Input*, *Serial Communication*, *Logic and* or *Logic or* has been selected.

Terminal 27 and bit 03 of control word are active when logic 0 is selected.

Digital Input			*Serial Communication*		
Term. 27	Serial Comm.	Function	Term. 27	Serial Comm.	Function
0	0	Coasting	0	0	Coasting
0	1	Coasting	0	1	Motor run
1	0	Motor run	1	0	Coasting
1	1	Motor run	1	1	Motor run

Logic and			*Logic or*		
Term. 27	Serial Comm.	Function	Term. 27	Serial Comm.	Function
0	0	Coasting	0	0	Coasting
0	1	Motor run	0	1	Coasting
1	0	Motor run	1	0	Coasting
1	1	Motor run	1	1	Motor run

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

504 DC Brake (DC BRAKE)

Value:

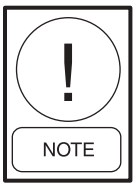
	Digital input (DIGITAL INPUT)	[0]
	Serial communication (SERIAL PORT)	[1]
	Logic and (LOGIC AND)	[2]
★	Logic or (LOGIC OR)	[3]

Function:

See the functional description under parameter 503, *Coasting Stop*.

Description of choice:

The table below shows when the motor is running and is DC-braking when *Digital input*, *Serial communication*, *Logic and* or *Logic or* has been selected.



DC braking inverse, through terminals 19 and 27, and bit 03 of the control word, is active when logic 0 is selected.

Digital Input			*Serial Communication*		
Term. 19/27	**Serial Comm.**	**Function**	**Term. 19/27**	**Serial Comm.**	**Function**
0	0	DC brake	0	0	DC brake
0	1	DC brake	0	1	Motor run
1	0	Motor run	1	0	DC brake
1	1	Motor run	1	1	Motor run

Logic and			*Logic or*		
Term. 19/27	**Serial Comm.**	**Function**	**Term. 19/27**	**Serial Comm.**	**Function**
0	0	DC brake	0	0	DC brake
0	1	Motor run	0	1	DC brake
1	0	Motor run	1	0	DC brake
1	1	Motor run	1	1	Motor run

505 Start (START)

Value:

	Digital input (DIGITAL INPUT)	[0]
	Serial communication (SERIAL PORT)	[1]
	Logic and (LOGIC AND)	[2]
★	Logic or (LOGIC OR)	[3]

Function:

See the functional description under parameter 503, *Coasting Stop*.

Description of choice:

The table below shows when the motor has stopped and gives the situations in which the drive has a start command when *Digital input*, *Serial communication*, *Logic and* or *Logic or* has been selected.

Digital Input			*Serial Communication*		
Term. 18	**Serial Comm.**	**Function**	**Term. 18**	**Serial Comm.**	**Function**
0	0	Stop	0	0	Stop
0	1	Stop	0	1	Start
1	0	Start	1	0	Stop
1	1	Start	1	1	Stop

Logic and			*Logic or*		
Term. 18	**Serial Comm.**	**Function**	**Term. 18**	**Serial Comm.**	**Function**
0	0	Stop	0	0	Stop
0	1	Stop	0	1	Start
1	0	Stop	1	0	Start
1	1	Start	1	1	Start

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

506 Reversing (REVERSING)

Value:

★	Digital input (DIGITAL INPUT)	[0]
	Serial communication (SERIAL PORT)	[1]
	Logic and (LOGIC AND)	[2]
	Logic or (LOGIC OR)	[3]

Function:

See the functional description under parameter, 503 *Coasting Stop*.

Description of choice:

The table below shows when the motor is running forward and reverse when *Digital input*, *Serial communication*, *Logic and* or *Logic or* has been selected.

Digital Input			*Serial Communication*		
Term. 19	**Serial Comm.**	**Function**	**Term. 19**	**Serial Comm.**	**Function**
0	0	Forward	0	0	Forward
0	1	Forward	0	1	Forward
1	0	Reverse	1	0	Forward
1	1	Reverse	1	1	Reverse

Logic and			*Logic or*		
Term. 19	**Serial Comm.**	**Function**	**Term. 19**	**Serial Comm.**	**Function**
0	0	Forward	0	0	Forward
0	1	Forward	0	1	Reverse
1	0	Forward	1	0	Reverse
1	1	Start	1	1	Reverse

507 Selection of Setup (SELECTING OF SETUP)

508 Selection of Preset Reference (SELECTING OF SPEED)

Value:

	Digital input (DIGITAL INPUT)	[0]
	Serial communication (SERIAL PORT)	[1]
	Logic and (LOGIC AND)	[2]
★	Logic or (LOGIC OR)	[3]

Function:

See the functional description for parameters 507 and 508 under parameter 503, *Coasting Stop*.

Description of choice:

The table below shows the Setup (parameter 002 *Active Setup*) that has been selected via *Digital input*, *Serial communication*, *Logic and* or *Logic or*. The table also shows the preset reference (parameters 211 through 214, *Preset reference*) that has been selected via *Digital input*, *Serial communication*, *Logic and* or *Logic or*.

Digital Input				
Bus Msb	**Bus Lsb**	**Setup/Preset Msb**	**Setup/Preset Lsb**	**Setup No. Preset Ref. No.**
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	1
0	1	0	1	2
0	1	1	0	3
0	1	1	1	4
1	0	0	0	1
1	0	0	1	2
1	0	1	0	3
1	0	1	1	3
1	1	0	0	1
1	1	0	1	2
1	1	1	0	3
1	1	1	1	4

Serial Communication				
Bus Msb	**Bus Lsb**	**Setup/Preset Msb**	**Setup/Preset Lsb**	**Setup No. Preset Ref. No.**
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	2
0	1	0	1	2
0	1	1	0	2
0	1	1	1	2
1	0	0	0	3
1	0	0	1	3
1	0	1	0	3
1	0	1	1	3
1	1	0	0	4
1	1	0	1	4
1	1	1	0	4
1	1	1	1	4

Logic and				
Bus Msb	**Bus Lsb**	**Setup/Preset Msb**	**Setup/Preset Lsb**	**Setup No. Preset Ref. No.**
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	2
0	1	1	0	1
0	1	1	1	2
1	0	0	0	1
1	0	0	1	1
1	0	1	0	3
1	0	1	1	3
1	1	0	0	1
1	1	0	1	2
1	1	1	0	3
1	1	1	1	4

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Logic or				
Bus Msb	**Bus Lsb**	**Setup/Preset Msb**	**Setup/Preset Lsb**	**Setup No. Preset Ref. No.**
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
0	0	1	1	4
0	1	0	0	2
0	1	0	1	4
0	1	1	0	2
0	1	1	1	3
1	0	0	0	3
1	0	0	1	4
1	0	1	0	3
1	0	1	1	4
1	1	0	0	4
1	1	0	1	4
1	1	1	0	4
1	1	1	1	4

509 through 532, 537 Data Read-out

Value:

Parameter No.	Description	Display Text	Unit	Updating Interval
509	Reference %	(REFERENCE %)	%	80 msec.
510	Reference [unit]	(REFERENCE [UNIT])	Hz, rpm	80 msec.
511	Feedback [unit]	(FEEDBACK)	Par. 415	80 msec.
512	Frequency [Hz]	(FREQUENCY)	Hz	80 msec.
513	User-defined readout	(CUSTOM READOUT)	Hz x scaling	80 msec.
514	Motor current [A]	(CURRENT)	Amp	80 msec.
515	Power [kW]	(POWER KW)	kW	80 msec.
516	Power [HP]	(POWER HP)	HP	80 msec.
517	Motor voltage [V]	(MOTOR VOLT)	VAC	80 msec.
518	DC link voltage [V]	(DC LINK VOLTAGE)	VDC	80 msec.
519	Thermal load, motor [%]	(MOTOR TEMPERATURE)	%	80 msec.
520	Thermal load, drive [%]	(TEMPERATURE)	%	80 msec.
521	Digital input	(DIGITAL INPUT)	Binary	80 msec.
522	Terminal 53, analog input [V]	(TERMINAL 53, ANALOG INPUT)	Volt	20 msec.
523	Terminal 54, analog input [V]	(TERMINAL 54, ANALOG INPUT)	Volt	20 msec.
524	Terminal 60, analog input [mA]	(TERMINAL 60, ANALOG INPUT)	mA	20 msec.
525	Pulse reference [Hz]	(PULSE REFERENCE)	Hz	20 msec.
526	External reference [%]	(EXTERNAL REFERENCE)	%	20 msec.
527	Status word	(STATUS WORD HEX)	Hex	20 msec.
528	Heat sink temperature [°C]	(HEAT SINK TEMP.)	°C	1.2 sec.
529	Alarm word	(ALARM WORD, HEX)	Hex	20 msec.
530	Control word	(CONTROL WORD, HEX)	Hex	2 msec.
531	Warning word	(WARNING WORD)	Hex	20 msec.
532	Extended status word	(STATUS WORD)	Hex	20 msec.
*****	*****	*****	*****	*****
537	Relay status	(RELAY STATUS)	Binary	20 msec.

Function:

These parameters are read-only through the serial communication port. To display drive functions on the drive display, see parameters 007 through 010, *Display Readout.*

Description of choice:

Reference [%], parameter 509 gives a percentage for the resulting reference in the range from *Minimum Reference* to *Maximum Reference.* See also Reference Handling.

Reference [unit], parameter 510 gives the resulting reference by means of the unit Hz in *Open Loop*, parameter 100. In *Closed Loop*, the reference unit is selected in parameter 415, *Units with Closed Loop*.

Feedback [unit], parameter 511, gives the resulting feedback value by means of the unit/scaling selected in parameters 413, 414 and 415. See also Feedback Handling.

Frequency [Hz], parameter 512, gives the output frequency of the drive.

User Defined Read Out, parameter 513, gives a user defined value calculated on the basis of the present output frequency and unit, as well as the scaling in selected in parameter 005, *Maximum Value of User Defined Read Out*. The unit is selected in parameter 006, *Unit for User Defined Read Out.*

Motor Current [A], parameter 514, gives the motor current in A.

Power [kW], parameter 515, gives the present power provided to the motor in kW.

Power [HP], parameter 516, gives the present power provided to the motor in HP.

Motor Voltage [V], parameter 517, gives the voltage fed to the motor.

DC Link Voltage [V], parameter 518, gives the intermediate circuit voltage of the drive.

Thermal Load, Motor [%], parameter 519, gives the calculated/ estimated thermal load on the motor. 100% is the trip point. See also parameter 117, *Motor Thermal Protection.*

Thermal Protection, Drive [%], parameter 520, gives the calculated/ estimated thermal load on the drive. 100% is the trip point.

Digital Input, parameter 521, gives the signal status of the 8 inputs (16, 17, 18, 19, 27, 29, 32 and 33). Input 16 corresponds to the bit to the extreme left. 0 = no signal, 1 = signal connected.

Terminal 53, Analog Input [V], parameter 522, gives the voltage value of the signal on terminal 53.

Terminal 54, Analog Input [V], parameter 523, gives the voltage value of the signal on terminal 54.

Terminal 60, Analog Input [mA], parameter 524, gives the current value of the signal on terminal 60.

Pulse Reference [Hz], parameter 525, gives a pulse frequency in Hz connected to one of the terminals 17 and 29.

External Reference [%], parameter 526, gives the sum of external references as a percentage (sum of analog/pulse/serial communication) in the range from *minimum reference* to *maximum reference.*

Status Word, parameter 527, gives the present status word of the drive in hex.

Heat Sink Temperature [°C], parameter 528, gives the present heat sink temperature of the drive.

Alarm Word, parameter 529, gives a hex code for the alarm on the drive.

Control Word, parameter 530, gives the present control word of the drive in hex.

Warning Word, parameter 531, indicates in hex warnings from the drive.

Extended Status Word, parameter 532, indicates in hex code whether there is a warning from the drive.

Relay Status, parameter 537, indicates in binary code the status of relays 1 through 6.

533 Display Text Line 1
(DISPL. TEXT LINE 1)

Value:

Max. 20 characters ★ OFF

Function:

Text up to 20 characters may be displayed on line 1 (top line) of the LCP display. Parameter 007, *Large Readout*, must be set for *Free Program Array*. Line 1 custom text is only visible in auto mode.

Description of choice:

See *Programming Custom Display Text.*

534 Display Text Line 2
(DISPL. TEXT LINE 2)

Value:

Max. 8 characters ★ OFF

Function:

Text up to 8 characters may be displayed on line 2 (large text display) of the LCP display. Parameter 007, *Large Readout*, must be set for *Free Program Array*. Line 2 custom text is visible in display modes I and II (see *Display Modes*).

Description of choice:

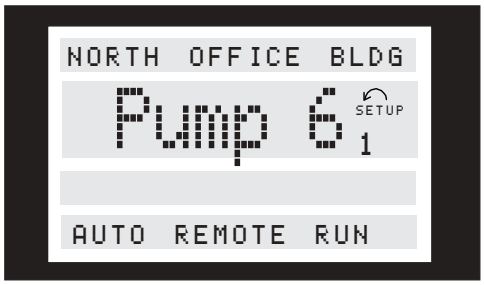
See *Programming Custom Display Text.*

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Programming Custom Display Text

Enter custom text in lines 1 (top line) or 2 (large display) of the LCP keypad display in accordance with the following procedure.

1. Select parameter 533, *Display Text Line 1* or 534, *Display Text Line 2*.
2. Press CHANGE DATA key on keypad.
3. Use left or right arrows on keypad to position cursor.
4. Use [+] or [-] arrows to scroll through character options.
5. Press [OK] key to accept changes or [CANCEL] key to cancel.
6. Select *Free Program Array* in parameter 007, *Large read-out*, to activate custom text readout.



The available characters are:
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Ø Å Ä Ö Ü
É Ì Ù è . / - ( ) 0 1 2 3 4 5 6 7 8 9 *"space"*

To erase a character that has been entered, replace it with *"space."*

535 Bus Feedback 1
(BUS FEEDBACK1)

Value:

0 through 16384 decimal (0 through 4000 Hex)	★ 0

Function:

Via the serial communication port, this parameter allows writing of a bus feedback value which will then form part of the feedback handling. *Bus Feedback 1* will be added to any feedback value registered on terminal 53.

Description of choice:

Write the required bus feedback value via serial communication.

536 Bus Feedback 2
(BUS FEEDBACK 2)

Value:

0 through 16384 decimal (0 through 4000 Hex)	★ 0

Function:

Via serial communication, a bus feedback value can be written in this parameter that will become part of the feedback handling system. *Bus Feedback 2* will be added to any feedback value on terminal 54.

Description of choice:

Write the required bus feedback value via the serial communication.

537 Relay Status
(RELAY STATUS)

Value:

binary (0 = open, 1 = closed)	★ 0

Description of choice:

See *Data Read-out* for parameters 509 through 532, 537 on previous page for relay status description.

NOTE

Parameters 555, *Bus Time Interval,* and 556, *Bus Time Interval Function,* are only active when *FC Protocol* has been selected in parameter 500, *Protocol.*

555 Bus Time Interval
(BUS TIME INTERVAL)

Value:

1 to 99 sec.	★ 60 sec.

Function:

In this parameter, the maximum time allowed between the receipt of two packets in a row is set. If this time is exceeded, the serial communication is assumed to have stopped and the choice made in parameter 556, *Bus Time Interval Function,* will be carried out.

Description of choice:

Set the required time.

556 Bus Time Interval Function
(BUS TIME INTERVAL FUNCTION)

Value:

★	Off (NO FUNCTION)	[0]
	Freeze output (FREEZE OUTPUT)	[1]
	Stop (STOP)	[2]
	Jogging (JOG FREQUENCY)	[3]
	Max. output frequency (MAX FREQUENCY)	[4]
	Stop and trip (STOP AND TRIP)	[5]

Function:

In this parameter, the required reaction from the drive is selected when the time set in parameter 555, *Bus Time Interval,* has been exceeded.

Description of choice:

The output frequency of the drive can be frozen at the present value, frozen as selected in parameter 211, *Preset Reference 1*, frozen as selected in parameter 202, *Maximum Output Frequency*, or stop and show a fault.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

560 N2 override release time (N2 OVER.REL.TIME)

Value:

1 - 65533 sec.	★ OFF

Function

The maximum time is set between the receipt of two N2 messages. If the time is exceeded, serial communication is assumed stopped. All N2 points which are overridden will be released in the following order:

1. Analog outputs
2. Binary outputs
3. Internal floating points
4. Internal integer points
5. Internal byte points

N2 point addresses are released in numerical order beginning with 1 (or 0).

Description of choice:

Set the required time.

565 FLN bus time interval (FLN TIME INTER.)

Value:

1 - 65534 sec.	★ 60 sec.

Function

The maximum time is set between the receipt of two FLN messages. If the time is exceeded, serial communication is assumed stopped and the required reaction is set in parameter 566, *FLN Bus Time Interval Function.*

Description of choice:

Set the required time.

566 FLN bus time interval function (FLN TIME FUNCT.)

Value:

★	Off (NO FUNCTION)	[0]
	Freeze output (FREEZE OUTPUT)	[1]
	Stop (STOP)	[2]
	Jogging (JOG FREQUENCY)	[3]
	Max. output frequency (MAX.SPEED)	[4]
	Stop and trip (STOP AND TRIP)	[5]

Function

The required reaction from the adjustable frequency drive is selected when the time set in parameter 565, *FLN Bus Time Interval*, has been exceeded.

Description of choice:

The output frequency of the adjustable frequency drive can be frozen at the present value at any given time, frozen at parameter 211, *Preset Reference 1*, frozen at parameter 202, *Max. Output Frequency*, or stop output and show a fault.

570 Modbus parity and message framing (M.BUS PAR./FRAME)

Value:

	Even parity (EVEN / 1 STOPBIT)	[0]
	Odd parity (ODD / 1 STOPBIT)	[1]
★	No parity (NO PARITY / 1 STOPBIT)	[2]

Function

This parameter sets the drive Modbus RTU interface to communicate properly with a master controller. The parity (even, odd, or no parity) must be set to match the setting of the master controller. Even and odd parity is sometimes used to allow error checking of a transmitted word.

Description of choice

Because Modbus RTU uses the more efficient CRC (cyclic redundancy check) method for checking for errors, parity checking is seldom used in Modbus RTU networks. Set the drive parity to match the master controller, if appropriate.

571 Modbus communication timeout (M.BUS COM.TIME.)

Value:

10 ms to 2000 ms	★ 100 ms

Function

This parameter determines the maximum time that the drive will wait between characters sent by the Modbus RTU master controller. When the time expires, the drive assumes it has received the entire message.

Description of choice

Generally, the value of 100 ms is sufficient for Modbus RTU networks, although some Modbus RTU networks may operate with a timeout value as short as 35 ms. If the value is set too short, the drive may miss part of the message. Since the CRC check will be invalid, the drive will ignore the message. The resulting retransmission of messages will slow network communications. A value set too long will cause the drive to wait longer than necessary to determine that the message is complete. This delays response time and could cause the master controller to timeout or slow the network.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

Warning Words, Extended Status Word and Alarm Word

Warning Word, Extended Status Word and Alarm Word are shown in hex format on the display. If there is more than one warning or alarm, the sum of the warnings or alarms will be shown.

The descriptions of the Extended Status Words, Warning Words and Alarm Words can be read out via the serial bus in parameters 531, *Warning Word;* 532, *Extended Status Word;* and 529, *Alarm Word.*

Bit	Alarm Word (Parameter 529)
00	Unknown fault
01	Trip locked
02	AMA fault
03	HPFB fault
04	RS-485 timeout
05	Short circuit
06	SMPS fault
07	Ground fault
08	Overcurrent
09	Current limit
10	Motor thermistor
11	Motor thermal
12	Inverter thermal
13	Undervoltage
14	Overvoltage
15	Input phase loss
16	Live zero fault
17	Heat sink overtemperature
18	Motor phase W missing
19	Motor phase V missing
20	Motor phase U missing
21	Profibus communication fault
22	Inverter fault
23	Output current low
24	External fault
25	Reserved
26	Reserved
27	Reserved
28	Reserved

Bit	Warning Word (Parameter 531)
00	Reference high
01	Control card fault
02	Power card fault
03	HPFB bus timeout
04	RS-485 timeout
05	Overcurrent
06	Current limit
07	Motor thermistor
08	Motor overtemperature
09	Inverter overtemperature
10	Undervoltage
11	Overvoltage
12	Voltage warning low
13	Voltage warning high
14	Input phase fault
15	Live zero fault
16	Under 10 Volt (terminal 50)
17	Reference low
18	Feedback high
19	Feedback low
20	Output current high
21	Out of frequency range66666
22	Profibus communication fault
23	Output current low
24	Output frequency high
25	Output frequency low
26	AMA - motor too small
27	AMA - motor too big
28	AMA - check par. 102, 103, or 105
29	AMA - check par. 102, 104, or 106
30	Reserved
31	Reserved

Bit	Extended Status Word (Paramater 532)
00	Autoramping
01	Start delay
02	Sleep boost active
03	Sleep mode active
04	Automatic motor adaptation completed
05	Automatic motor adaptation running
06	Reverse start (not for TR1)
07	Normal ramping
08	Reversing
09	At reference
10	Running
11	Local reference = 0, Remote = 1
12	OFF = 1
13	Hand = 1, Auto = 0
14	Run request
15	No run permission
16	Freeze output frequency
17	Freeze output blocked
18	Jogging
19	No jog permission
20	Stand by
21	Stopped
22	DC braking stop
23	Drive ready
24	Relay 123 active (Profibus only)
25	Drive ready
26	Control ready
27	Start prevented
28	Profibus OFF3 active
29	Reserved

Service Functions
Parameters 600 through 631

600-605 Operating Data Value:

Value:

Parameter Number	Description Operating Data:	Display Text	Unit	Range
600	Operating Hours	(OPERATING HOURS)	Hours	0 through 130,000.0
601	Hours Run	(RUNNING HOURS)	Hours	0 through 130,000.0
602	kWh Counter	(KWH COUNTER)	kWh	-
603	Number of Power-ups	(POWER UPS)	Occurences	0 through 9999
604	Number of Overtemp Trips	(OVER TEMPS)	Occurences	0 through 9999
605	Number of Overvoltage Trips	(OVER VOLTS)	Occurences	0 through 9999

This parameter group contains functions useful for troubleshooting the drive including operating data, data log and fault log.

It also has information on the nameplate data of the drive.

Function:

These parameters can be read out through the serial communication port as well as on the control panel display.

Description of choice:

Parameter 600, *Operating Hours*

Shows the number of hours the drive has had power applied. The value is saved every hour and when the power is removed. This value cannot be reset.

Parameter 601, *Hours Run*

Shows the number of hours the drive has powered the motor. This parameter can be reset in parameter 619, *Reset of Hours Run Counter*. The value is saved every hour and when the power is removed.

Parameter 602, *kWh Counter*

Shows the output power of the drive. The calculation is based on the mean value in kWh over one hour. This value can be reset using parameter 618, *Reset of kWh Counter*.

Parameter 603 *Number of Power Ups.*

Shows the number of times power has been applied to the drive.

Parameter 604, *Number of Overtemperature Trips*

Shows the number of overtemperature trips from the heatsink temperature sensor on the drive.

Parameter 605, *Number of Overvoltage Trips*

Shows the number of overvoltage trips from the sensor of DC link voltage of the drive. The count is only taken when Alarm 7 *Overvoltage* is activated.

606 - 614 Data Log

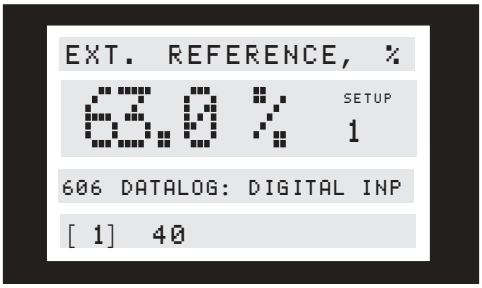
Value:

Parameter no.	Description Data log:	Display Text	Unit	Range
606	Digital Input	(LOG: DIGITAL INP)	Decimal	0 through 255
607	Control Word	(LOG: BUS COMMAND)	Decimal	0 through 65535
608	Status Word	(LOG: BUS STAT WD)	Decimal	0 through 65535
609	Reference	(LOG: REFERENCE)	%	0 through 100
610	Feedback	(LOG: FEEDBACK)	Par. 414	-999,999.999 through 999,999.999
611	Output Frequency	(LOG: MOTOR FREQ.)	Hz	0.0 through 999.9
612	Output Voltage	(LOG: MOTOR VOLT)	Volt	50 through 1000
613	Output Current	(LOG: MOTOR CURR.)	Amp	0.0 through 999.9
614	DC Link Voltage	(LOG: DC LINK VOLT)	Volt	0.0 through 999.9

Function:

With these parameters, it is possible to see up to twenty saved values, or data logs. Data log [1] is the most recent and [20] the oldest log. When a start command has been given, a new entry to the data log is made every 160 ms. If there is a trip or if the drive is stopped, the 20 latest data log entries will be saved and the values will be visible in the display. This is useful to view the operation of the drive just before a trip. These values will be lost if power is removed from the drive.

The drawing below shows a display. The data log number is shown in the square brackets at the left of the forth line of the display.



Data logs [1] through [20] can be read by first pressing CHANGE DATA, followed by the + and - keys to change data log numbers.

Parameters 606 through 614, *Data Log,* can also be read out via the serial communication port.

Description of choice:

Parameter 606 *Data Log: Digital Input*:

This is where the latest log data is shown in decimal code, representing the status of the digital inputs. Translated into binary code, terminal 16 corresponds to the bit to the extreme left and to decimal code 128. Terminal 33 corresponds to the bit to the extreme right and to decimal code 1.

The table can be used for converting a decimal number into a binary code. For example, digital 40 corresponds to binary 00101000. The nearest smaller decimal number is 32, corresponding to a signal on terminal 18. 40-32 = 8, corresponds to the signal on terminal 27.

Terminal	16	17	18	19	27	29	32	33
Decimal number	128	64	32	16	8	4	2	1

Parameter 607 *Data Log: Control Word*:
This is where the latest log data is given in decimal code for the control word of the drive. The control word can only be changed via serial communication. The control word is read as a decimal number which is to be converted into hex. See the control word profile under the section *Serial communications.*

Parameter 608, *Data Log: Status Word*:
This gives the latest log data in decimal code for the status word. The status word is read as a decimal number which is to be converted into hex. See the status word profile under the section *Serial communication*.

Parameter 609, *Data Log: Reference*:
This gives the latest log data for the resulting reference.

Parameter 610, *Data Log: Feedback*:
This gives the latest log data for the feedback signal.

Parameter 611, *Data Log: Output Frequency*:
This gives the latest log data for the output frequency.

Parameter 612, *Data Log: Output Voltage*:
This gives the latest log data for the output voltage.

Parameter 613, *Data Log: Output Current*:
This gives the latest log data for the output current.

Parameter 614, *Data Log: DC Link Voltage*:
This gives the latest log data for the intermediate circuit voltage.

615 Fault Log: Error Code
(F. LOG: ERROR CODE)

Value:

[Index 1-10]	Error Code: 0 - 99

Function:

This parameter makes it possible to see the reason why a fault trip occurs. Ten log values, indicated as [1] through [10] are stored.

The lowest log number [1] contains the most recently saved data value; the highest log number [10] contains the oldest data value.

If there is a fault trip, it is possible to see its cause, the time and possibly the values or output current or output voltage. See the section on Warnings and Alarms for a table explaining the error codes.

Description of choice:

The fault log is only reset after manual initialization.

616 Fault Log: Time
(F. LOG: TIME)

Value:

[Index 1-10]	Hours: 0 - 130,000.0

Function:

This parameter makes it possible to see the total number of hours run in connection with the 10 most recent fault trips. Ten log values, indicated as [1] through [10] are stored.

The lowest log number [1] contains the most recently saved data value: the highest log number [10] contains the oldest data value.

Description of choice:

The fault log is only reset after manual initialization.

617 Fault Log: Value
(F. LOG: VALUE)

Value:

[Index 1 - 10]	Value: 0 - 9999

Function:

This parameter makes it possible to see the value at which a fault trip occurred. The unit of the value depends on the alarm active in parameter 615, *Fault Log: Error Code*.

Description of choice:

The fault log is only reset after manual initialization.

618 Reset of kWh Counter
(RESET KWH COUNT)

Value:

★	No reset (DO NOT RESET)	[0]
	Reset (RESET COUNTER)	[1]

Function:

Reset to zero of parameter 602, *kWh Counter.*

Description of choice:

If *Reset* has been selected and the OK key is pressed, the kWh counter of the drive is reset.

619 Reset of Hours Run Counter
(RESET RUN. HOUR)

Value:

★	No reset (DO NOT RESET)	[0]
	Reset (RESET COUNTER)	[1]

Function:

Reset to zero of parameter 601, *Hours Run*.

Description of choice:

If *Reset* has been selected and the OK key is pressed, parameter 601 *Hours-run* is reset to zero.

620 Operating Mode
(OPERATION MODE)

Value:

★	Normal function (NORMAL OPERATION)	[0]
	Function with deactivated inverter (OPER. W/INVERT.DISAB)	[1]
	Control card test (CONTROL CARD TEST)	[2]
	Initialization (INITIALIZE)	[3]

Function:

In addition to its normal function, this parameter can be used for two different tests.

It is possible to reset to the default factory settings for all Setups, except parameters 500, *Address*; 501 *Baud Rate*; 600-605, *Operating Data;* and 615-617, *Fault Log*.

Description of choice:

Normal function is used for normal operation of the motor.

Function with deactivated inverter is selected to operate the control card using its control signals without running the motor.

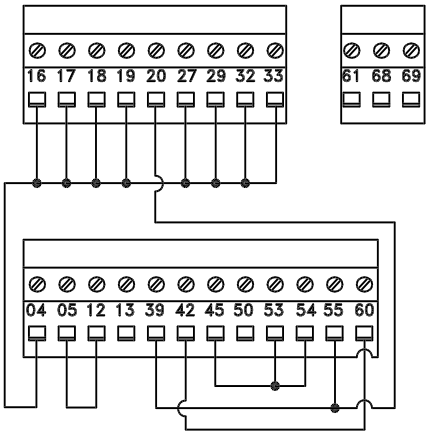
Control card test is used to test the analog and digital inputs, analog and digital outputs, relay output and the power supplies of the control card.

★ Indicates factory default setting. Numbers in brackets [ ] represent selection as displayed on the serial bus.

A test connector with the connections shown below is required for this test.

Set test connector set up as follows:

1. Connect 4, 16, 17, 18, 19, 27, 29, 32 and 33.
2. Connect 5 and 12.
3. Connect 39, 20 and 55.
4. Connect 42 and 60.
5. Connect 45, 53 and 54



Test the control card in accordance with the following procedure:

1. Select *Control Card Test*.
2. Remove input power and wait for light in display to go out.
3. Insert test connector described above.
4. Reconnect input power.
5. Press OK key. (Test cannot run without control panel in place.)
6. Drive automatically tests control card.
7. Remove test connector and press OK key when drive displays "TEST COMPLETED."
8. Parameter 620, *Operating Mode,* is automatically set to *Normal Function*.

If the control card test fails, the drive will display "TEST FAILED." Replace the control card.

Initialization is selected to reset the drive to its factory default settings without resetting parameters 501 *Address*, 502 *Baud Rate*; 600-605, *Operating Data;* and 615-617, *Fault Log*.

NOTE

***Choosing* Initialization *resets drive to standard default values. Any special application programming performed at the factory, during start-up, or thereafter, will be lost. As a backup, upload drive settings into local control panel (LCP) of drive keypad as described in parameter 004,* LCP Copy.**

Initialization the drive to factory default settings in accordance with the following procedures:

1. Select *Initialization*.
2. Press OK key.
3. Remove input power and wait for light in display to go out.
4. Connect input power.
5. Initialization of all parameters will be carried out in all Setups with exception of parameters 501, *Address*; 502, *Baud Rate*; 600-605, *Operating Data;* and 615-617, *Fault Log*.

621 - 631 Nameplate

Value:

Parameter Number	Description Nameplate:	Display text
621	Unit Type	(DRIVE TYPE)
622	Power Component	(POWER SECTION)
623	Ordering No.	(ORDERING NO)
624	Software Version No.	(SOFTWARE VERSION)
625	Control Panel Identification No.	(LCP ID NO.)
626	Database Identification No.	(PARAM DB ID)
627	Power Component Identification No.	(POWER UNIT DB ID)
628	Application Option Type	(APPLIC. OPTION)
629	Application Option Ordering No.	(APPLIC. ORDER NO)
630	Communication Option Type	(COM. OPTION)
631	Communication Option Ordering No.	(COM. ORDER NO)

Function:

Identification information for the drive can be read from parameters 621 through 631, *Nameplate* via the display or the serial communication port.

Description of choice:

Parameter 621, *Nameplate: Unit Type*:
Unit type gives the unit size and input voltage.

Parameter 622*, Nameplate: Power Component*:
This gives the type of power card installed in the drive.

Parameter 623, *Nameplate: Ordering Number:*
This gives the ordering number for the specific drive. Because this number does not specify any special options or programming that was provided with the drive, it is better to refer to the serial number printed on the York nameplate when contacting the factory about the drive.

Parameter 624, *Nameplate: Software Version Number:*
This gives the present software version number of the drive.

Parameter 625, *Nameplate: LCP Identification Number:*
This gives the identification number of the keypad (LCP) of the unit.

Parameter 626, *Nameplate: Database identification Number:*
This gives the identification number of the software's database.

Parameter 627, *Nameplate: Power Component Identification Number:*
This gives the identification number of the database of the drive.

Parameter 628, *Nameplate: Application Option Type:*
This gives the type of application options fitted to the basic drive.

Parameter 629, *Nameplate: Application Option Ordering Number:*
This gives the ordering number for the application option of the basic drive. Because this number does not specify any special options or programming that was provided with the drive, it is better to refer to the serial number printed on the York nameplate when contacting the factory about the drive.

Parameter 630, *Nameplate: Communication Option Type:*
This gives the type of communication option card installed in the drive, if any.

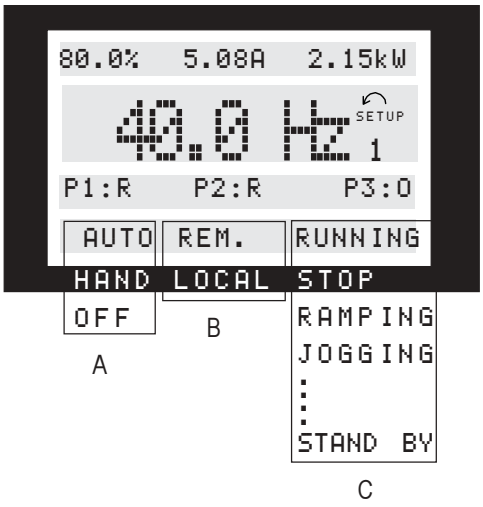
Parameter 631, *Nameplate: Communication Option Ordering Number:*
This gives the ordering number for the communication option.

Status Messages

Status messages are generated automatically and appear in the fourth (bottom) line of the display as shown.

A. The first part of the status line indicates the CONTROL POINT of the drive.
B. The center part of the status line indicates the REFERENCE LOCATION.
C. The last part of the status line gives the present DRIVE STATUS.

The table below defines the status massage display words.



DISPLAY WORD	DESCRIPTION
CONTROL POINT	
AUTO	The drive is in Auto mode, which means that Run/Stop control is carried out via the control terminals and/or serial communication.
HAND	The drive is in Hand mode, which means that Run/Stop control is carried out via the keys on the keypad
OFF	OFF/STOP is activated either by means of the keypad, or by the digital inputs *Hand Start* and *Auto Start,* both being a logic '0.'
REFERENCE LOCATION	
REM.	If REMOTE has been selected, the reference is set via the control terminals or via serial communication.
LOCAL	If LOCAL has been selected, the reference is set via the [+] and [-] keys on the keypad.
DRIVE STATUS	
RUNNING	The motor speed now corresponds to the resulting reference.
RAMPING	The output frequency is changing.
AUTO RAMP	Parameter 208, *Automatic Ramp*, is enabled. The drive is attempting to avoid a trip from overvoltage by extending its decel ramp time.
SLEEP.BST	The boost function in parameter 406, *Boost Setpoint,* is enabled. This function can only be enabled in *Closed Loop* operation.
SLEEP	 ***When in Sleep mode, motor may restart at any time without warning. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness could result in death, serious injury, or equipment and property damage.*** The energy saving function in parameter 403, *Sleep Mode Timer,* is enabled. This status message shows that at present the motor has been stopped by sleep mode. It can restart automatically.
START DEL	 ***When in Start Delay mode, motor may restart at any time without warning. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness could result in death, serious injury, or equipment and property damage.*** A start delay time has been programmed in parameter 111, *Start Delay*. When the delay has passed, the drive will start and ramp up to the reference frequency.

DISPLAY WORD	DESCRIPTION
RUN REQ.	 ***When in Run Request mode, motor may restart at any time without warning. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness could result in death, serious injury, or equipment and property damage.*** A start command has been given, but the motor will not be started until a *Run Permission* signal is received via a digital input.
JOG	Jog has been enabled via a digital input or via serial communication.
JOG REQ.	 ***When in Jog mode, motor may restart at any time without warning. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness could result in death, serious injury, or equipment and property damage.*** A start command has been given, but the motor will remain stopped until a *Run Permission* signal is received via a digital input.
FRZ.OUT	The output frequency has been frozen.
FRZ.REQ	 ***When in Freeze Request mode, motor may restart at any time without warning. The drive, motor, and any driven equipment must be in operational readiness. Failure to be in operational readiness could result in death, serious injury, or equipment and property damage.*** A start command has been given, but the motor will remain stopped until a *Run Permission* signal is received via a digital input.
START F/R	*Reversing and start* on terminal 19, parameter 303, *Digital Inputs*, and *Start* on terminal 18, parameter 302, *Digital Inputs,* are enabled at the same time. The motor will remain stopped until one of the signals becomes a logic '0.'
AMA RUN	Automatic motor adaptation has been enabled in parameter 107, *Automatic Motor Adaptation, AMA*.
AMA STOP	Automatic motor adaptation has been completed. The drive is now ready for operation after the *Reset* signal has been given. Note that the motor will start after the drive has received the *Reset* signal.
STANDBY	The drive is able to start the motor when a start command is received.
STOP	The motor has been stopped via a stop signal from serial communication.
DC STOP	The DC brake has been enabled in parameters 114 through 116.
UN.READY	The drive is ready for operation, but terminal 27 is a logic '0' and/or a *Coasting Command* has been received via the serial communication.
CTR.READY	This status is only active when a Profibus option card is installed.
NOT READY	The drive is not ready for operation, because of a trip or because OFF1, OFF2 or OFF3 is a logic '0.'
START IN.	This status will only be displayed if, in parameter 599, *Profidrive* [1] has been selected and OFF2 or OFF3 is a logic '0.'
XXXX	The microprocessor of the control has stopped and the drive is not operating. The cause may be noise on the power line, motor leads or control wires.

Warnings and Alarms

The table below lists the drive fault messages and indicates whether a warning, alarm, or trip-lock occurs. Wherever an "X" is placed under both warning and alarm, this means that a warning precedes the alarm. An alarm always precedes, or simultaneously accompanies, a trip-lock.

A trip causes the drive to suspend operation by cutting off power to the motor. A trip-lock requires that input power to the drive must be removed, the cause of the fault corrected, and the input power restored in order to reset the drive.

A trip can be reset in any one of the following ways:

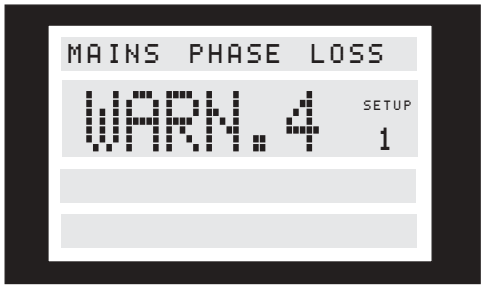
1) Manual reset by pressing the RESET key on the keypad
2) A digital input through a digital input terminal
3) Serial communication command
4) Automatic reset

Automatic or manual reset may be selected in parameter 400, *Reset Function.* Auto reset will not restore a trip-lock. The number of reset attempts may be selected or infinite, which allows continuous attempts. A timer between attempts can be set in parameter 401.

No.	Description	Warning	Alarm	Trip Locked
1	Under 10 Volts (10 VOLT LOW)	X		
2	Live zero fault (LIVE ZERO ERROR)	X	X	
4	Mains phase imbalance (MAINS IMBALANCE)	X	X	X
5	Voltage warning high (DC LINK VOLTAGE HIGH)	X		
6	Voltage warning low (DC LINK VOLTAGE LOW)	X		
7	Overvoltage (DC LINK OVERVOLT)	X	X	
8	Undervoltage (DC LINK UNDERVOLT)	X	X	
9	Inverter overloaded (INVERTER TIME)	X	X	
10	Motor overloaded (MOTOR TIME)	X	X	
11	Motor thermistor (MOTOR THERMISTOR)	X	X	
12	Current limit (CURRENT LIMIT)	X	X	
13	Overcurrent (OVERCURRENT)		X	X
14	Ground fault (EARTH FAULT)		X	X
15	Switch mode fault (SWITCH MODE FAULT)		X	X
16	Short circuit (CURR.SHORT CIRCUIT)		X	X
17	Serial communication timeout (STD BUSTIMEOUT)	X	X	
18	HP field bus timeout (HPFB TIMEOUT)	X	X	
19	Fault in EEPROM on power card (EE ERROR POWER)	X		
20	Fault in EEPROM on control card (EE ERROR CONTROL)	X		
22	Auto motor adaptation fault (AMA FAULT)		X	
29	Heat-sink temperature too high (HEAT SINK OVERTEMP.)		X	X
30	Motor phase U missing (MISSING MOT.PHASE U)		X	
31	Motor phase V missing (MISSING MOT.PHASE V)		X	
32	Motor phase W missing (MISSING MOT.PHASE W)		X	
34	HPFB communication fault (HPFB COMM. FAULT)	X	X	
35	Out of frequency range (OUT FREQ RNG/ROT LIM)	X		
37	Inverter fault (GATE DRIVE FAULT)		X	X
39	Check parameters 104 and 106 (CHECK P.104 & P.106)	X		
40	Check parameters 103 and 105 (CHECK P.103 & P.106)	X		
41	Motor too large (MOTOR TOO BIG)	X		
42	Motor too small (MOTOR TOO SMALL)	X		
60	Safety stop (EXTERNAL FAULT)		X	
61	Output frequency low (FOUT < FLOW)	X		
62	Output frequency high (FOUT > FHIGH)	X		
63	Output current low (I MOTOR < I LOW)	X	X	
64	Output current high (I MOTOR > I HIGH)	X		
65	Feedback low (FEEDBACK < FDB LOW)	X		
66	Feedback high (FEEDBACK > FDB HIGH)	X		
67	Reference low (REF. < REF. LOW)	X		
68	Reference high (REF. > REF. HIGH)	X		
69	Temperature auto derate (TEMP.AUTO DERATE)	X		
99	Unknown fault (UNKNOWN ALARM)		X	X

Warnings

A warning will flash in line 2, while an explanation is given in line 1.



Alarms

If an alarm is given, the present alarm number will be shown in line 2. Lines 1 and 3 of the display will offer an explanation.

WARNING 1
10 VOLT LOW
The 10 V voltage from terminal 50 on the control card is below 10 V.

Remove some of the load from terminal 50, as the 10 volts supply is overloaded. Maximum load is 17 mA, minimum resistance is 590 Ω.

WARNING/ALARM 2
LIVE ZERO ERROR
The current or voltage signal on terminal 53, 54 or 60 is below 50% of the value preset in parameters 309, 312 and 315 *Terminal, Minimum Scaling.*

WARNING/ALARM 4
MAINS IMBALANCE
Phase missing on the input power. Check the supply voltage to the drive.

WARNING 5
DC LINK VOLTAGE HIGH
The intermediate DC circuit voltage is higher than *Voltage Warning High*, see table below. The drive is still controlling the motor.

WARNING 6
DC LINK VOLTAGE LOW
The intermediate DC circuit voltage is lower than *Voltage Warning Low*, see table below. The drive is still controlling the motor.

WARNING/ALARM 7
DC LINK OVERVOLT
If the intermediate circuit voltage (DC) is higher than the *Overvoltage Limit* of the drive (see table below), the drive will trip after a fixed period. The length of this period depends upon the unit.

WARNING/ALARM 8
Undervoltage (DC LINK UNDERVOLT)
If the intermediate circuit voltage (DC) drops below the *Undervoltage Limit* of the inverter, the drive will trip after a fixed period. The length of the period depends upon the unit.

The voltage will be stated in the display. Check whether the supply voltage matches the drive rating.

WARNING/ALARM 9
INVERTER TIME
The electronic thermal inverter protection reports that the drive is about to trip because of an overload. The counter for electronic thermal inverter protection gives a warning at 98% and trips at 100% showing an alarm. The drive cannot be reset until the counter drops below 90%. Activate ASFM (Automatic Switching Frequency Modulation) in parameter 408, *Interference Reduction Method*, or reduce the carrier frequency in parameter 407, *Switching Frequency.*

Alarm/Warning Limits:

Drive	208 to 230 volt		380 to 460 volt		550 to 600 volt	
	VDC	VAC	VDC	VAC	VDC	VAC
Undervoltage alarm	211	151	402	289	557	413
Voltage warning, low	222	159	423	304	613	443
Voltage warning, high	384	276	777	530	943	667
Overvoltage alarm	425	305	798	550	975	689

WARNING/ALARM 10
MOTOR TIME
According to the electronic thermal protection, the motor is overheated. Parameter 117, *Motor Thermal Protection,* allows a choice of whether the drive is to give a warning or an alarm when the *Motor Thermal Projection* reaches 100%. The fault is that the motor is overloaded to more than 100% of the preset rated motor current for too long. Check that the motor parameters 102 through 106 have been set correctly.

WARNING/ALARM 11
MOTOR THERMISTOR
The thermistor or the thermistor connection has been disconnected. Parameter 117, *Motor Thermal Protection,* allows a choice of whether the drive is to give a warning or an alarm. Check that the thermistor has been correctly connected between terminal 53 or 54 (analog voltage input) and terminal 50 (+10 V supply).

WARNING/ALARM 12
CURRENT LIMIT
The current is higher than the value in parameter 215, *Current Limit*, and the drive trips after the time set in parameter 412, *Trip Delay Overcurrent,* has passed. Run AMA on a cold motor in parameter 107, *Automatic Motor Adaptation*.

WARNING/ALARM 13
OVER CURRENT
The inverter peak current limit, approximately 200% of the rated current, has been exceeded. The warning will last approximately 1 or 2 seconds, and then the drive will trip and signal an alarm.

Turn off the drive and check for free rotation of the motor shaft and other causes of the overload. Run AMA on a cold motor in parameter 107, *Automatic Motor Adaptation*.

ALARM 14
EARTH FAULT
There is current leakage from the output phases to ground, either in the leads between the drive and the motor or in the motor itself.

Remove power to the drive and correct the ground fault.

ALARM 15
SWITCH MODE FAULT
Fault in the switch mode power supply (internal ±15 V supply).

Contact the York service department.

ALARM 16
CURR. SHORT CIRCUIT
There is a short circuit in the output from the drive.

Remove power to the drive and correct the short circuit.

WARNING/ALARM 17
STD BUSTIMEOUT
There is no serial communication with the drive.

This warning will only be enabled if parameter 510, *Bus Time Interval Function,* has been set to a value different from OFF.

If parameter 510, *Bus Time Interval Function,* has been set to *Stop and Trip* [5], the drive will first give off an alarm, then ramp down and finally trip while giving an alarm. It is possible to increase parameter 509, *Bus Time Interval*.

WARNING/ALARM 18
HPFB TIMEOUT
There is no serial communication with the communication option card in the drive.

The warning will only be enabled if parameter 804, *Bus Time Interval Function,* has been set to anything but OFF. If parameter 804, *Bus Time Interval Function,* has been set to *Stop and Trip,* the drive will first give an alarm, then ramp down and finally trip while giving an alarm.

Parameter 803, *Bus Time Interval* could possibly be increased. Parameter 803 is only available when a communication option card is installed in the drive.

WARNING 19
EE ERROR POWER
There is a fault on the power card EEPROM. The drive will continue to function, but is likely to fail at the next power-up. Contact the York service department.

WARNING 20
EE ERROR CONTROL
There is a fault in the EEPROM on the control card. The drive will continue to function, but is likely to fail at the next power-up. Contact the York service department.

ALARM 22
AMA FAULT
A fault has been found during automatic motor adaptation (AMA). The text shown in the display indicates a fault message.

AMA can only be carried out if there are no alarms during the AMA process.

CHECK 103, 105
Parameter 103 or 105 has a wrong setting. Correct the setting and repeat AMA.

LOW P 105
The motor is too small for AMA to be carried out. If AMA is to be enabled, the rated motor current, parameter 105, must be higher than 35% of the rated output current of the drive.

ASYMMETRICAL IMPEDANCE
AMA has detected an asymmetrical impedance in the motor connected to the system. The motor could be defective.

MOTOR TOO BIG
The motor connected to the system is too big for AMA to be carried out. The setting in parameter 102 does not match the motor used.

MOTOR TOO SMALL
The motor connected to the system is too small for AMA to be carried out. The setting in parameter 102 does not match the motor used.

TIME OUT
AMA fails because of noisy measuring signals. Retry until AMA is successfully completed. Please note that repeated AMA runs may heat the motor to a level where the stator resistance is increased.

INTERRUPTED BY USER
AMA has been interrupted by the user.

INTERNAL FAULT
An internal fault has occurred in the drive. Contact York service department.

LIMIT VALUE FAULT
The parameter values found for the motor are outside the acceptable range within which the drive is able to work.

MOTOR ROTATES
The motor shaft is rotating. Make sure that the load is not able to make the motor shaft rotate while the AMA is being performed. Then start AMA all over.

ALARM 29
HEAT SINK OVER TEMP.
The heatsink temperature became too high. For NEMA 1 drives, the limit is 90°C. For NEMA 12 drives, the limit is 80°C. The tolerance is ±5°C. The fault cannot be reset until the temperature of the heatsink has fallen below 60°C.

The fault could be due to the following:
- Ambient temperature too high
- Air obstructed
- Cooling fan(s) not operating
- Motor leads too long
- Too high a switching frequency

ALARM 30
MISSING MOT.PHASE U
Motor phase U, as indicated by the letters on the output terminal block, is missing or has a high impedance.

Remove power to the drive and check motor phase U.

ALARM 31
MISSING MOT.PHASE V
Motor phase V, as indicated by the letters on the output terminal block is missing or has a high impedance.

Remove power to the drive and check motor phase V.

ALARM 32
MISSING MOT.PHASE W
Motor phase W, as indicated by the letters on the output terminal block is missing or has a high impedance.

Remove power to the drive and check motor phase W.

WARNING/ALARM 34
HPFB COMM. FAULT
The serial communication on the communication option card is not working.

WARNING 35
OUT FREQ RNG/ROT LIM
This warning will occur if the output frequency has reached its *Output Frequency Low Limit* , parameter 201, or *Output Frequency High Limit,* parameter 202. If the drive is in *Closed Loop*, parameter 100, the warning will show in the display.

ALARM 37
GATE DRIVE FAULT
An output IGBT or the power card is defective. Contact the York service department.

Auto Optimization Warnings 39 through 42
Automatic motor adaptation has stopped, because some parameters have probably been improperly set, or the motor used in too large or small for AMA to be carried out.

A choice must be made by pressing CHANGE DATA and choosing 'Continue' + OK or 'Stop' + OK.

If parameters need to be changed, select 'Stop', change the parameters and run AMA again.

WARNING 39
CHECK PAR. 104, 106
Parameters 104, *Motor Frequency*, or 106, *Rated Motor Speed*, have probably not been set correctly. Correct the setting and run AMA again.

WARNING 40
CHECK PAR. 103, 105
Parameter 103 *Motor Voltage,* or 105 *Motor Current,* has not been set correctly. Correct the setting and run AMA again.

WARNING 41
MOTOR TOO BIG
The motor used is probably too large for AMA to be carried out. The setting in parameter 102 *Motor Power,* may not match the motor. Check the motor and select 'Continue' or [STOP].

WARNING 42
MOTOR TOO SMALL
The motor used is probably too small for AMA to be carried out. The setting in parameter 102 *Motor Power,* may not match the motor. Check the motor and select 'Continue' or [STOP].

ALARM 60
EXTERNAL FAULT
Terminal 27, parameter 304, *Digital Inputs*, has been programmed for a *Safety Interlock* and is a logic '0'.

WARNING 61
FOUT < FLOW
The output frequency is lower than parameter 223, *Warning: Low Frequency.*

WARNING 62
FOUT > FHIGH
The output frequency is higher than parameter 224, *Warning: High Frequency*.

WARNING/ALARM 63
I MOTOR < I LOW
The output current is lower than parameter 221, *Warning: Low Current.* Select the required function in parameter 409, *Function in Case of No Load*.

WARNING 64
I MOTOR > I HIGH
The output current is higher than parameter 222, *Warning: High Current*.

WARNING 65
FEEDBACK < FDB LOW
The resulting feedback value is lower than parameter 227, *Warning: Low Feedback*.

WARNING 66
FEEDBACK > FDB HIGH
The resulting feedback value is higher than parameter 228, *Warning: High Feedback*.

WARNING 67
REF. < REF LOW
The remote controlled reference is lower than parameter 225, *Warning: Low Reference*.

WARNING 68
REF. > REF HIGH
The remote controlled reference is higher than parameter 226, *Warning: High Reference*.

WARNING 69
TEMP.AUTO DERATE
The heat sink temperature has exceeded the maximum value and the auto derating function in parameter 411, *Function at Over Temp*, is active.

WARNING 99
UNKNOWN ALARM
An unknown fault has occurred which the software is not able to handle. Contact York service department.

Calculation of Resulting Reference

The calculation made below gives the resulting reference when parameter 210, *Reference Type,* is programmed for *Sum* and *Relative*, respectively. In *Open Loop*, parameters 418 and 419, *Setpoints 1* and *2,* should be set to 0. If they are not set to 0, parameter 417, *Feedback Function,* will affect the reference.

External reference is the sum of references from terminals 53, 54, 60 and serial communication. The sum of these can never exceed parameter 205, *Maximum Reference*.

External reference can be calculated as follows:

$$\text{Ext. ref.} = \frac{(\text{Par. 205 } \textit{Max. ref.} - \text{Par. 204 } \textit{Min. ref.}) \times \text{Ana. signal } \textit{Term. 53 [V]}}{\text{Par. 310 } \textit{Term. 53 Max. scaling} - \text{Par. 309 } \textit{Term. 53 Min. scaling}} + \frac{(\text{Par. 205 } \textit{Max. ref.} - \text{Par. 204 } \textit{Min. ref.}) \times \text{Ana. signal } \textit{Term. 54 [V]}}{\text{Par. 313 } \textit{Term. 54 Max. scaling} - \text{Par. 312 } \textit{Term. 54 Min. scaling}} +$$

$$\frac{(\text{Par. 205 } \textit{Max. ref.} - \text{Par. 204 } \textit{Min. ref.}) \times \text{Par. 314 } \textit{Term. 60 [mA]}}{\text{Par. 316 } \textit{Term. 60 Max. scaling} - \text{Par. 315 } \textit{Term. 60 Min. scaling}} + \frac{\text{serial com. reference} \times (\text{Par. 205 } \textit{Max. ref.} - \text{Par. 204 } \textit{Min. ref.})}{16384\ (4000\ \text{Hex})}$$

Parameter 210, *Reference Type,* is programmed = *Sum*

$$\text{Res. ref.} = \frac{(\text{Par. 205 } \textit{Max. ref.} - \text{Par. 204 } \textit{Min. ref.}) \times \text{Par. 211-214 } \textit{Preset ref.}}{100} + \text{External ref.} + \text{Par. 204 } \textit{Min. ref.} + \text{Feedback setpoint}$$

Parameter 210, *Reference Type,* is programmed = *Relative*

$$\text{Res. ref.} = \frac{\text{External reference} \times \text{Par. 211-214 } \textit{Preset ref.}}{100} + \text{Par. 204 } \textit{Min. ref.} + \text{Feedback setpoint}$$

Factory Settings

The VFD has four internal setups. Setup 1 is programmed for supply fan parameter settings. Setup 2 is programmed for return fan parameter settings. Setup 3 is programmed for exhaust fan parameter settings. The active setup can be selected in parameter 002, *Active Setup*. The following tables list the programmed factory and default settings for each fan type.

Choosing* Initialization *in parameter 620,* Operation Mode*, resets drive to read-only factory default values. This resets all special programming in setups 1 through 4 to factory settings only.

0... Operation and Display

No.	*Parameter Description*	*Factory*	*Supply Fan Setup 1*	*Return Fan Setup 2*	*Exhaust Fan Setup 3*
001	**Language**	ENGLISH	ENGLISH	ENGLISH	ENGLISH
002	**Active Setup**	FACTORY	SETUP 1	SETUP 2	SETUP 3
003	**Copying of Setups**	NO COPY	NO COPY	NO COPY	NO COPY
004	**LCP Copy**	NO COPY	NO COPY	NO COPY	NO COPY
005	**Max Value of User-defined Readout**	100.000	100.000	100.000	100.000
006	**Unit for User-defined Readout**	%	%	%	%
007	**Big Display Readout**	FREQUENCY, %	FREQUENCY, Hz	FREQUENCY, Hz	FREQUENCY, Hz
008	**Small Display Readout 1.1**	REFERENCE, %	REFERENCE, %	REFERENCE, %	SETPOINT 1
009	**Small Display Readout 1.2**	MTR CURRENT, A	MTR CURRENT, A	MTR CURRENT, A	FEEDBACK 1
010	**Small Display Readout 1.3**	POWER, HP	POWER, HP	POWER, HP	MTR CURRENT, A
011	**Unit of Local Reference**	% OF FREQ. MAX.	% OF FREQ. MAX.	% OF FREQ. MAX.	% OF FREQ. MAX.
012	**Hand Start on LCP**	ENABLE	ENABLE	ENABLE	ENABLE
013	**OFF/STOP on LCP**	ENABLE	ENABLE	ENABLE	ENABLE
014	**Auto Start on LCP**	ENABLE	ENABLE	ENABLE	ENABLE
015	**Reset on LCP**	ENABLE	ENABLE	ENABLE	ENABLE
016	**Lock for Data Change**	NOT LOCKED	NOT LOCKED	NOT LOCKED	NOT LOCKED
017	**Operating State at Power Up**	AUTO RESTART	AUTO RESTART	AUTO RESTART	AUTO RESTART

NOTE: Parameters 003 and 004 cannot be changed while the drive is running.

1... Load and Motor

No.	*Parameter Description*	*Factory*	*Supply Fan Setup 1*	*Return Fan Setup 2*	*Exhaust Fan Setup 3*
100	**Configuration**	OPEN LOOP	OPEN LOOP	OPEN LOOP	CLOSED LOOP
101	**Torque Characteristics**	AEO FUNCTION	AEO FUNCTION	AEO FUNCTION	MULTIPLE MTRS
102	**Motor Power**	*SPECIFIC TO MOTOR*			
103	**Motor Voltage**	*SPECIFIC TO MOTOR*			
104	**Motor Frequency**	60 Hz	60 Hz	60 Hz	60 Hz
105	**Motor Current**	*SPECIFIC TO MOTOR*			
106	**Rated Motor Speed**	*SPECIFIC TO MOTOR*			
107	**Automatic Motor Adaptation, AMA**	NO AMA	NO AMA	NO AMA	NO AMA
108	**Start Voltage of Parallel Motors**	0.0 V	0.0 V	0.0 V	0.0 V
109	**Resonance Dampening**	100%	100%	100%	100%
110	**High Breakaway Torque**	OFF	OFF	OFF	OFF
111	**Start Delay**	000.0 s	000.0 s	000.0 s	000.0 s
112	**Motor Preheater**	DISABLE	DISABLE	DISABLE	DISABLE
113	**Motor Preheater DC Current**	50%	50%	50%	50%
114	**DC Braking Current**	50%	50%	50%	50%
115	**DC Braking Time**	10.0 s	10.0 s	10.0 s	10.0 s
116	**DC Brake Cut-in Frequency**	OFF	OFF	OFF	OFF
117	**Motor Thermal Protection**	ETR TRIP 1	ETR TRIP 1	ETR TRIP 2	ETR TRIP 3
118	**Motor Power Factor (Cos Ø)**	0.75	0.75	0.75	0.75

NOTE: Parameters 100 - 107 and 118 cannot be changed while the drive is running.

2... References and Limits

No.	*Parameter Description*	*Factory*	*Supply Fan Setup 1*	*Return Fan Setup 2*	*Exhaust Fan Setup 3*
200	**Output Frequency Range**	120 Hz	120 Hz	120 Hz	120 Hz
201	**Output Frequency Low Limit**	0.0 Hz	25.0 Hz	6.0 Hz	25.0 Hz
202	**Output Frequency High Limit**	60 Hz	60.0 Hz	60.0 Hz	60.0 Hz
203	**Reference Handling**	LINKED TO HAND/AUTO	LINKED TO HAND/AUTO	LINKED TO HAND/AUTO	LINKED TO HAND/AUTO
204	**Minimum Reference**	0.0 Hz	25.0 Hz	6.0 Hz	-0.1 in wg
205	**Maximum Reference**	60.0 Hz	60.0 Hz	60.0 Hz	-0.3 in wg
206	**Ramp-up Time**	60 sec.	30 sec.	60 sec.	15 sec.
207	**Ramp-down Time**	60 sec.	60 sec.	60 sec	30 sec.
208	**Automatic Ramp-up/down**	ENABLE	ENABLE	ENABLE	ENABLE
209	**Jog Frequency**	10.0 Hz	10.0 Hz	10.0 Hz	10.0 Hz
210	**Reference Type**	EXTERNAL PRESET	EXTERNAL PRESET	EXTERNAL PRESET	EXTERNAL PRESET
211	**Preset Reference 1**	0.00%	0.00%	0.00%	0.00%
212	**Preset Reference 2**	0.00%	0.00%	0.00%	0.00%
213	**Preset Reference 3**	0.00%	0.00%	0.00%	0.00%
214	**Preset Reference 4**	0.00%	0.00%	0.00%	0.00%
215	**Current Limit**	1.1	1.1	1.1	1.1
216	**Frequency Bypass Bandwidth**	DISABLED	DISABLED	DISABLED	DISABLED
217	**Frequency Bypass 1**	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
218	**Frequency Bypass 2**	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
219	**Frequency Bypass 3**	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
220	**Frequency Bypass 4**	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
221	**Warning: Low Current**	0.0 A	0.0 A	0.0 A	0.0 A
222	**Warning: High Current, I**	I [A]	I [A]	I [A]	I [A]
223	**Warning: Low Frequency**	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
224	**Warning: High Frequency**	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
225	**Warning: Low Reference**	-999,999.999 Hz	-999,999.999 Hz	-999,999.999 Hz	-999,999.999 in wg
226	**Warning: High Reference**	999,999.999 Hz	999,999.999 Hz	999,999.999 Hz	999,999.999 in wg
227	**Warning: Low Feedback**	-999,999.999 Hz	-999,999.999 Hz	-999,999.999 Hz	-999,999.999 in wg
228	**Warning: High Feedback**	999,999.999 Hz	999,999.999 Hz	999,999.999 Hz	999,999.999 in wg

3... Inputs and Outputs

No.	*Parameter Description*	*Factory*	*Supply Fan Setup 1*	*Return Fan Setup 2*	*Exhaust Fan Setup 3*
300	**Terminal 16, Digital Input**	RESET	RESET	RESET	RESET
301	**Terminal 17, Digital Input**	NO OPERATION	NO OPERATION	NO OPERATION	NO OPERATION
302	**Terminal 18, Digital Input**	START	START	START	START
303	**Terminal 19, Digital Input**	REVERSING	REVERSING	REVERSING	REVERSING
304	**Terminal 27, Digital Input**	SAFETY INTERLOCK	SAFETY INTERLOCK	SAFETY INTERLOCK	SAFETY INTERLOCK
305	**Terminal 29, Digital Input**	JOG	JOG	JOG	JOG
306	**Terminal 32, Digital Input**	NO OPERATION	NO OPERATION	NO OPERATION	NO OPERATION
307	**Terminal 33, Digital Input**	NO OPERATION	NO OPERATION	NO OPERATION	NO OPERATION
308	**Terminal 53, Analog Input Voltage**	NO OPERATION	REFERENCE	REFERENCE	NO OPERATION
309	**Terminal 53, Min. Scaling**	0.0 V	0.0 V	0.0 V	0.0 V
310	**Terminal 53, Max. Scaling**	10.0 V	10.0 V	10.0 V	10.0 V
311	**Terminal 54, Analog Input Voltage**	NO OPERATION	NO OPERATION	NO OPERATION	FEEDBACK
312	**Terminal 54, Min. Scaling**	0.0 V	0.0 V	0.0 V	0.0V
313	**Terminal 54, Max. Scaling**	10.0 V	10.0 V	10.0 V	5.0V
314	**Terminal 60, Analog Input Current**	REFERENCE	NO OPERATION	NO OPERATION	REFERENCE
315	**Terminal 60, Min. Scaling**	4.0 mA	4.0 mA	4.0 mA	4.0 mA
316	**Terminal 60, Max. Scaling**	20.0 mA	20.0 mA	20.0 mA	20.0 mA
317	**Live Zero Time**	10 sec.	10 sec.	10 sec.	10 sec.
318	**Function After Time Out**	NO FUNCTION	NO FUNCTION	NO FUNCTION	NO FUNCTION
319	**Terminal 42, Output**	MTR CURRENT	MTR CURRENT	MTR CURRENT	MTR CURRENT
320	**Terminal 42, Output, Pulse Scaling**	5000 Hz	5000 Hz	5000 Hz	5000 Hz
321	**Terminal 45, Output**	OUT. FREQ.	OUT. FREQ.	OUT. FREQ.	OUT. FREQ.
322	**Terminal 45, Output, Pulse Scaling**	5000 Hz	5000 Hz	5000 Hz	5000 Hz
323	**Relay 1, Output Function**	NO ALARM	F OUT > F HIGH	NO ALARM	NO ALARM
324	**Relay 1, ON Delay**	0 sec.	60 sec.	0 sec.	0 sec.
325	**Relay 1, OFF Delay**	2 sec.	60 sec.	2 sec.	2 sec.
326	**Relay 2, Output Function**	RUNNING	RUNNING	RUNNING	RUNNING
327	**Pulse Reference, Max. Frequency**	5000 Hz	5000 Hz	5000 Hz	5000 Hz
328	**Pulse Feedback, Max. Frequency**	25000 Hz	25000 Hz	25000 Hz	25000 Hz
364	**Serial Comm. Output 42 Control**	0%	0%	0%	0%
365	**Serial Comm. Output 45 Control**	0%	0%	0%	0%

4... Application Functions

No.	*Parameter Description*	*Factory*	*Supply Fan Setup 1*	*Return Fan Setup 2*	*Exhaust Fan Setup 3*
400	**Reset Function**	INFINTE AUTO	INFINTE AUTO	INFINTE AUTO	INFINTE AUTO
401	**Automatic Restart Time**	10 sec.	10 sec.	10 sec.	10 sec.
402	**Flying Start**	ENABLE	ENABLE	ENABLE	ENABLE
403	**Sleep Mode Timer**	OFF	OFF	OFF	OFF
404	**Sleep Frequency**	0 Hz	0 Hz	0 Hz	0 Hz
405	**Wake up Frequency**	60 Hz	60 Hz	60 Hz	60 Hz
406	**Boost Setpoint**	100%	100%	100%	100%
407	**Switching Frequency**	DEPENDS ON VFD – NO YORK ADJUSTMENT NECESSARY			
408	**Interference Reduction Method**	ASFM	ASFM	ASFM	ASFM
409	**Function in Case of No Load**	WARNING	WARNING	WARNING	WARNING
410	**Function in Case of Phase Loss**	TRIP	TRIP	TRIP	TRIP
411	**Function at Over Temp**	TRIP	TRIP	TRIP	TRIP
412	**Trip Delay Overcurrent**	60 sec.	60 sec.	60 sec.	60 sec.
413	**Minimum Feedback**	0.000	0.000	0.000	-1.000
414	**Maximum Feedback**	100.000	100.000	100.000	1.000
415	**Units Relating to Closed Loop**	%	%	%	in wg
416	**Feedback Conversion**	LINEAR	LINEAR	LINEAR	LINEAR
417	**Feedback Calculation**	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM
418	**Setpoint 1**	0.000	0.000	0.000	0.000
419	**Setpoint 2**	0.000	0.000	0.000	0.000
420	**PID Normal/Inverse Control**	NORMAL	NORMAL	NORMAL	NORMAL
421	**PID Anti Windup**	ENABLE	ENABLE	ENABLE	ENABLE
422	**PID Start-up Frequency**	0 Hz	0 Hz	0 Hz	10.0 Hz
423	**PID Proportional Gain**	0.30	0.30	0.30	0.20
424	**PID Integral Time**	OFF	OFF	OFF	10.0 sec.
425	**PID Differentiation Time**	OFF	OFF	OFF	OFF
426	**PID Differentiation Gain Limit**	5.0	5.0	5.0	5.0
427	**PID Lowpass Filter Time**	0.01	0.01	0.01	0.03

5.. Serial Communication

No.	Parameter Description	Factory	Factory Default for All Setups
500	**Protocol**	FC	
501	**Address**	001	
502	**Baudrate**	9600 BAUD	
503	**Coasting**	LOGIC OR	
504	**DC-brake**	LOGIC OR	
505	**Start**	LOGIC OR	
506	**Reversing**	DIGITAL INPUT	
507	**Selection of Setup**	LOGIC OR	
508	**Selection of Preset Reference**	LOGIC OR	
509	**Data Read-out:**	REFERENCE %	
510	**Data Read-out:**	REFERENCE UNIT	
511	**Data Read-out:**	FEEDBACK	
512	**Data Read-out:**	FREQUENCY	
513	**User Defined Read-out**		
514	**Data Read-out:**	CURRENT	
515	**Data Read-out:**	POWER, kW	
516	**Data Read-out:**	POWER, HP	
517	**Data Read-out:**	MOTOR VOLTAGE	
518	**Data Read-out:**	DC LINK VOLTAGE	
519	**Data Read-out:**	MOTOR TEMP.	
520	**Data Read-out:**	DRIVE TEMP.	
521	**Data Read-out:**	DIGITAL INPUT	
522	**Data Read-out:**	TERMINAL 53, ANALOG INPUT	
523	**Data Read-out:**	TERMINAL 54, ANALOG INPUT	
524	**Data Read-out:**	TERMINAL 60, ANALOG INPUT	
525	**Data Read-out:**	PULSE REFERENCE	
526	**Data Read-out:**	EXTERNAL REFERENCE %	
527	**Data Read-out:**	STATUS WORD, HEX	
528	**Data Read-out:**	HEAT SINK TEMP.	
529	**Data Read-out:**	ALARM WORD, HEX	
530	**Data Read-out:**	CONTROL WORD, HEX	
531	**Data Read-out:**	WARNING WORD, HEX	
532	**Data Read-out:**	EXTENDED STATUS WORD, HEX	
533	**Display Text**	LINE 1	
534	**Display Text**	LINE 2	
535	**Bus Feedback 1**	00000	
536	**Bus Feedback 2**	00000	
537	**Data Read-out:**	RELAY STATUS	
555	**Bus Time Interval**	60 sec.	
556	**Bus Time Interval Function**	NO FUNCTION	
560	**N2 Overide Release Time**	OFF	
565	**FLN Bus Time Interval**	60 sec.	
566	**FLN Bus Time Interval Function**	OFF	
570	**Modbus Parity & Message Framing**	NO PARITY	
571	**Modbus Communication Timeout**	100 MS	

NOTE: Parameters 509 - 537 cannot be changed while the drive is running.

6.. Service Functions

No.	*Parameter Description*	*Factory*	*Factory Default for All Setups*
600	Operating Data:	OPERATING HOURS	
601	Operating Data:	HOURS RUN	
602	Operating Data:	kWh COUNTER	
603	Operating Data:	NO. OF POWER UPS	
604	Operating Data:	NO. OF OVERTEMPS	
605	Operating Data:	NO. OF OVERVOLTAGES	
606	Data Log:	DIGITAL INPUT	
607	Data Log:	BUS COMMAND	
608	Data Log:	BUS STATUS WORD	
609	Data Log:	REFERENCE	
610	Data Log:	FEEDBACK	
611	Data Log:	OUTPUT FREQUENCY	
612	Data Log:	OUTPUT VOLTAGE	
613	Data Log:	OUTPUT CURRENT	
614	Data Log:	DC LINK VOLTAGE	
615	Fault Log:	ERROR CODE	
616	Fault Log:	TIME	
617	Fault Log:	VALUE	
618	Reset of kWh Counter	DO NOT RESET	
619	Reset of Hours Run Counter	DO NOT RESET	
620	Operating Mode	NORMAL OPERATION	
621	Nameplate:	UNIT TYPE	
622	Nameplate:	POWER COMPONENT	
623	Nameplate:	ORDERING NO.	
624	Nameplate:	SOFTWARE VERSION NO.	
625	Nameplate:	LCP IDENTIFICATION NO.	
626	Nameplate:	DATABASE IDENTIFICATION NO.	
627	Nameplate:	POWER COMPONENT IDENTIFICATION NO.	
628	Nameplate:	APPLICATION OPTION TYPE	
629	Nameplate:	APPLICATION OPTION ORDERING NO.	
630	Nameplate:	COMMUNICATION OPTION TYPE	
631	Nameplate:	COMMUNICATION OPTION ORDERING NO.	

NOTE: Parameters 600 - 617 and 621 - 631 cannot be changed while the drive is running.

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P.O. Box 1592, York, Pennsylvania USA 17405-1592

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