7. CONTROL PANEL

7.1 Introduction

The control panel of the CX/CXL/CXS drive features an Alphanumeric Display with seven indicators for the Run status (RUN, , , READY, STOP, ALARM, FAULT) and two indicators for the control source (Panel/Remote). Furthermore, the panel embodies three text lines for the menu location, menu/submenu descriptions and the amount of the submenus or the value of the monitored item. The eight push buttons on the control panel are used for the control of the frequency converter, parameter setting and value monitoring.

The panel is detachable and isolated from the input line potential.

The display examples in this chapter present the text and numeric lines of the Alpha-numeric Display only. The Run status indicators are not included in the examples.

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RUN STATUS INDICATORS

RUN	=	lights when motor is running
	=	show the selected rotation
STOP	=	lights when motor is not running
READY	=	lights when input voltage is supplied and the unit is ready for use
FAULT	=	lights when a fault in frequency drive occurs
ALARM	=	lights when a warning is given
Panel/ Remote	=	show the active control source

Figure 7-1. Control panel with LCD display.

= *Menu button (left)*
Move backward in the menu

= *Menu button (right)*
Move forward in the menu

= *Browser button (up)*
Move in the main menu and between pages inside the same submenu.
Change value.

= *Browser button (down)*
Move in the main menu and between pages inside the same submenu.
Change value.

= *Enter button*
Acknowledgement of changed value.
Fault history reset.
Function as programmable button.

= *Reset button*
Fault resetting

= *Start button*
Starts the motor if the panel is the active control source

= *Stop button*
Stops the motor if the panel is the active control source

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7.2 Control panel operation

The data on the panel are arranged in menus and submenus. The menus are used for the display and editing of measurement and control signals, parameter settings, reference values, and fault displays. Through the menus, you can also adjust the contrast of the display and use the programmable buttons.

The desired submenu can be entered from the main menu by using the *Menu buttons*.

The symbol **M** on the first text line stands for the main menu. It is followed by a number that refers to the submenu in question. See the CX/CXL/CXS User's Manual and the Application Manual for the specific parameters available for the needed CX/CXL/CXS setup. The arrow (→) in the lower right corner indicates a further submenu that can be entered by pushing the *Menu button (right)*.

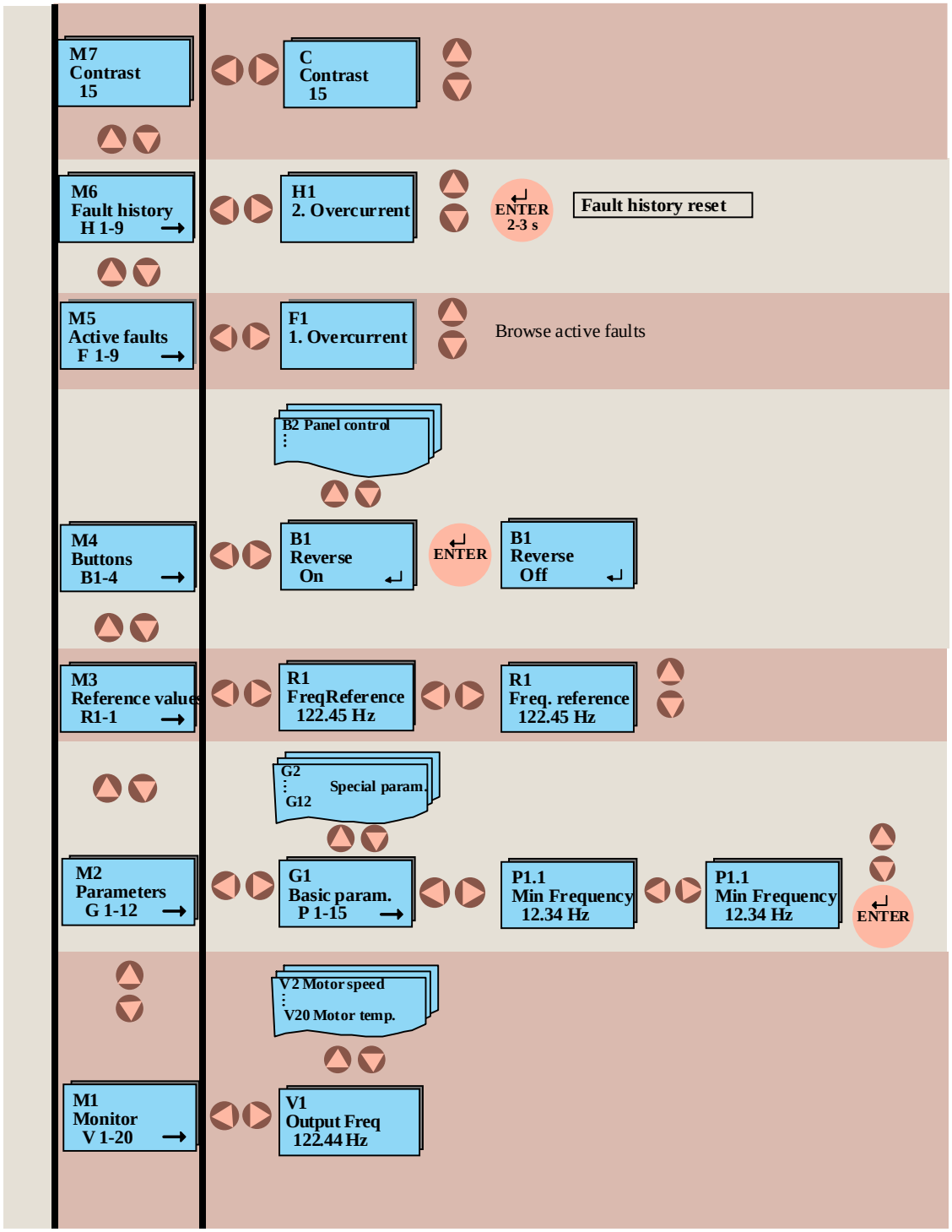

Figure 7-2. Panel operation

7.3 Monitoring menu

The monitoring menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M1** is visible on the first line of the alpha-numeric display. How to browse through the monitored values is presented in Figure 7-3. All monitored signals are listed in Table 7-1. The values are updated once every 0.5 seconds. This menu is meant only for signal checking. The values cannot be altered here. See 7.4 Parameters.

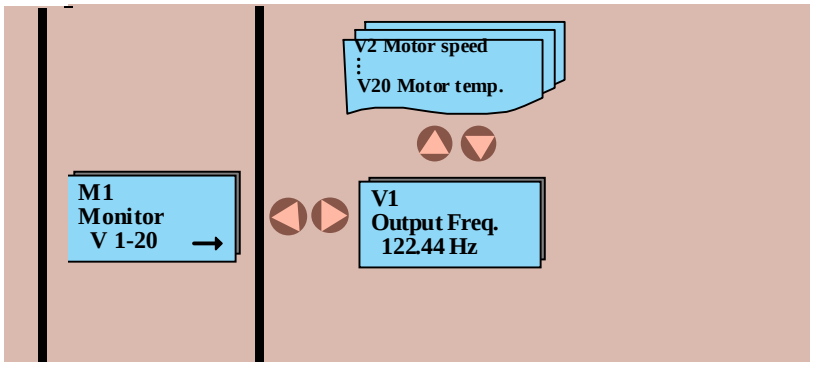

Figure 7-3. Monitoring menu 7_3.fh8

Code	Signal name	Unit	Description
V1	Output frequency	Hz	Frequency to the motor
V2	Motor speed	rpm	Calculated motor speed
V3	Motor current	A	Measured motor current
V4	Motor torque	%	Calculated actual torque/nominal torque of the unit
V5	Motor power	%	Calculated actual power/nominal power of the unit
V6	Motor voltage	V	Calculated motor voltage
V7	DC-link voltage	V	Measured DC-link voltage
V8	Temperature	”C	Heat sink temperature
V9	Operating day counter	DD.dd	Operating days[1], not resettable
V10	Operating hours, trip counter	HH.hh	Operating hours[2], can be reset with programmable button #3
V11	MW hours counter	MWh	Total MWh, not resettable
V12	MW hours, trip counter	MWh	Resettable with programmable button #4
V13	Voltage/analog input	V	Voltage of terminal U_{in}+ (term. #2)
V14	Current/analog input	mA	Current of terminals I_{in}+ and I_{in}- (term. #4, #5)
V15	Digital input status, gr. A		See Page 63
V16	Digital input status, gr. B		See Page 63
V17	Digital and relay output status		See Page 63
V18	Control program		Version number of the control software
V19	Unit nominal power	kW	Unit power size of the unit
V20	Motor temperature rise	%	100% = nominal motor temperature has been reached

Table 7-1. Monitored signals

[1]DD = full days, dd = decimal part of day
[2]HH = full hours, hh = decimal part of hour

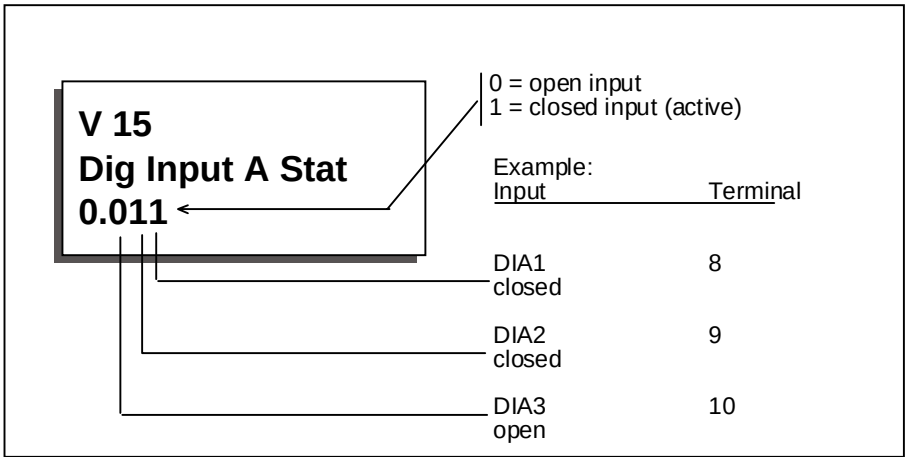

Figure 7-4. Digital inputs, Group A status.

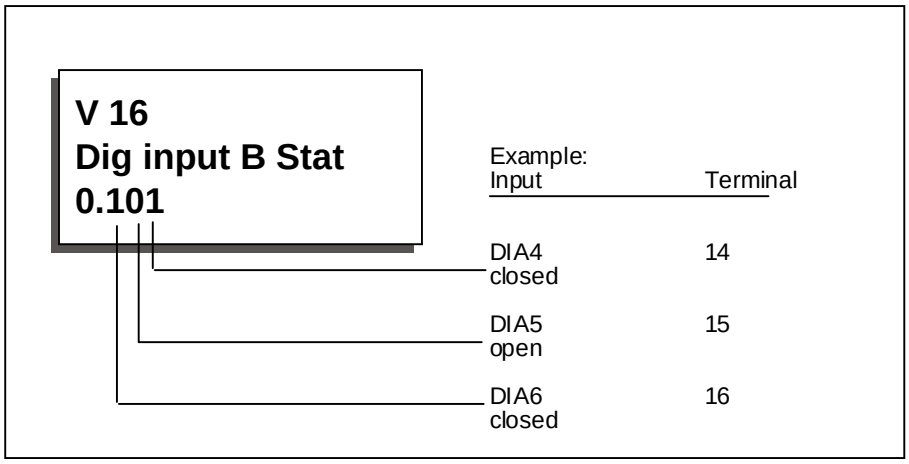

Figure 7-5. Digital inputs, Group B status.

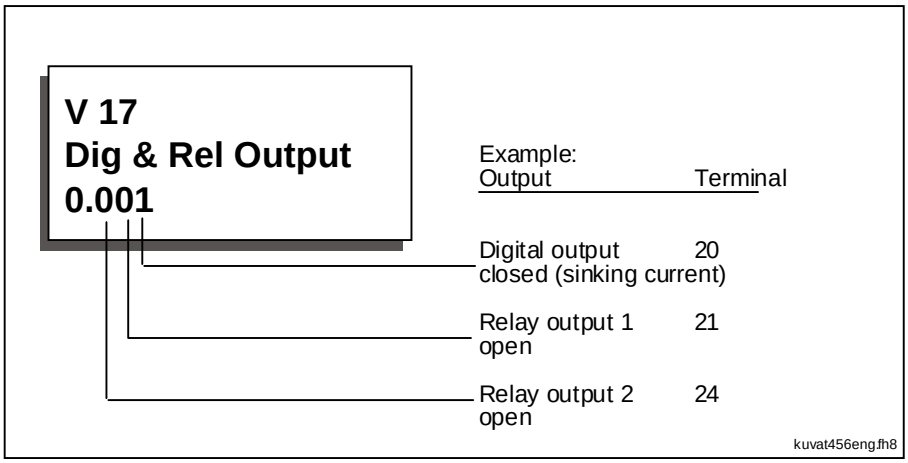

Figure 7-6. Output signal status.

7.4 Parameters

The parameter menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M2** is visible on the first line of the alpha-numeric display. Parameter values are changed as shown in Figure 7-7:

Push the *Menu button (right)* once to move into the Parameter Group Menu (G) and twice to enter the desired parameter group and the parameters there. Locate the parameter you want to change by using the *Browser buttons*. Push the *Menu button (right)* once again to enter the Edit menu. Once you are in the edit menu, the symbol of the parameter starts to blink. Set the desired new value with the *Browser buttons* and confirm the change by pushing the Enter button. Consequently, the blinking stops and the new value is visible in the value field. The value will not change unless the Enter button is pushed. You can go back in the menu by pressing the *Menu button (left)*.

Several parameters are locked, i.e. uneditable, when the drive is in RUN status. If you try to change the value of such a parameter, the text **locked** will appear on the display.

In the Edit menu when a parameter receiving text values (e.g. Param. 1.16: 0=Parameter changes enabled; 1=Parameter changes disabled) is displayed, it is possible to view the numerical value corresponding to the text value by pressing the *Menu button (right).* The numerical value remains visible as long as the menu button is held down. You can browse through the numerical values by pressing the *Browser buttons* at the same time with the menu button.

You can return to the main menu anytime by pressing the *Menu button (left)* for 1–2 seconds.

The basic application embodies only those parameters necessary for operating the device (Group 1). The parameter group 0 includes the parameter for selection of "Five In One+" applications. See Chapter 11 of the CX/CXL/CXS User's Manual.

Other applications include more parameter groups.

Once in the last parameter of a parameter group, you can move directly to the first parameter of that group by pressing the *Browser button (up)*.

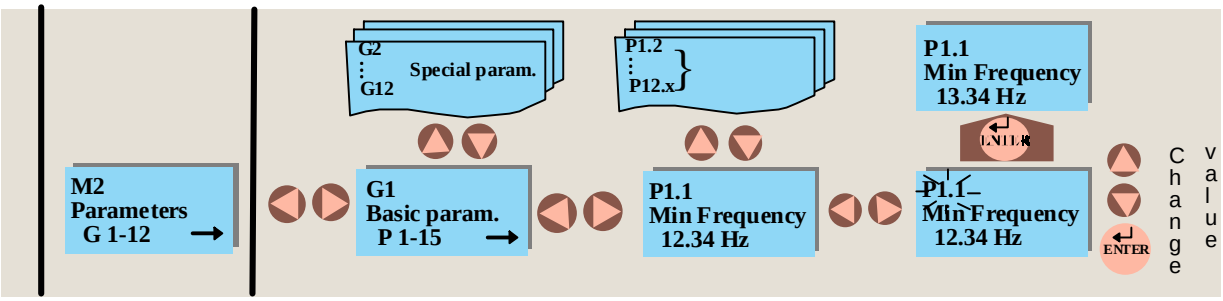

Figure 7-7. Parameter value change procedure

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7.5 Reference menu

The Reference menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M3** is visible on the first line of the alpha-numeric panel.

The frequency reference can be changed by changing the value on the display with the *Browser buttons.* See *Figure 7-8*.

Press the *Menu button (right)* once and the symbol **R1** starts to blink. Now, you are able to alter the frequency reference value with the *Browser buttons*. Pressing the *Enter button* is not necessary. Motor speed changes as soon as the frequency reference changes or the load inertia allows the motor to accelerate or decelerate.

In some applications, there might be several references. In this case, pressing the *Menu button (right)* once brings you to the menu where you can choose (with the *Browser buttons*) the reference you wish to change. Another push on the button takes you to the editing menu.

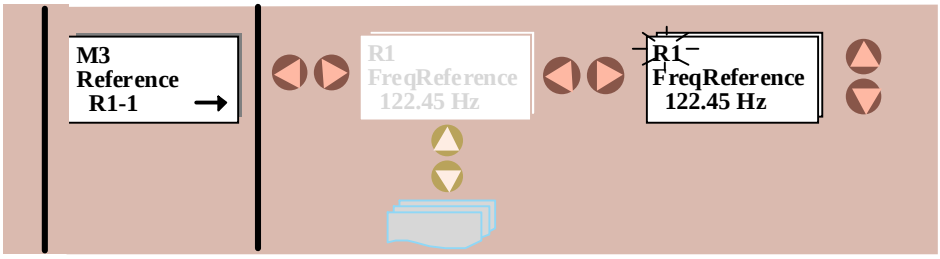

Figure 7-8. Reference setting on the control panel 7_8.fh8

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7.6 Programmable push-button menu

The programmable push-button menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M4** is visible on the first line of the Alpha-numeric display.
In this menu, there are four functions that can be attached to the *Enter button*. Each function has two positions: On and Off. The functions are available in this menu only. In other menus, the *Enter button* is used for its original purpose. The status of the controlled function is shown through a feedback signal. Enter the edit menu with the *Menu button (right)*. The function attached to the button is controlled with the *Enter button*. When the Enter button is pushed, the Enter symbol (↵) on the display inverts and the feedback value (On/Off) changes confirming the status change. The Enter symbol remains inverted as long as the Enter button is held down. See Figure 7-9.

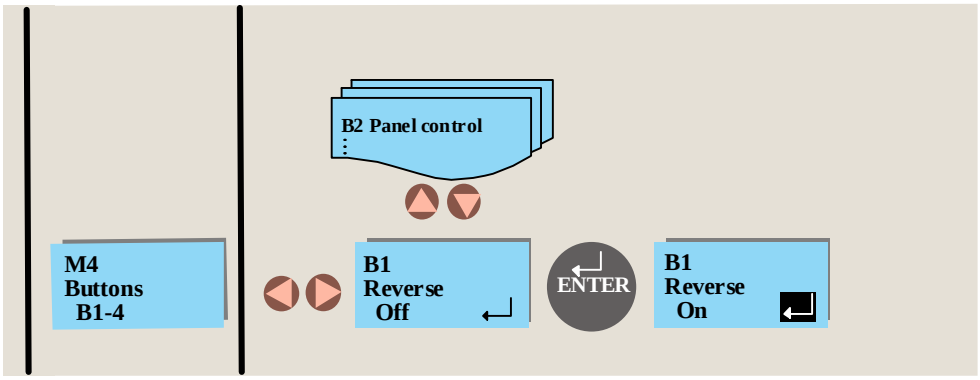

Figure 7-9. Programmable push-button

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Button number	Button description	Function	Feedback information		
			0	1	Note
B1	Reverse	Changes the rotation direction of the motor. Available only when the control panel is the active control source	Forward	Backward	Feedback information flashes as long as the direction is different from the reference.
B2	Active control source	Selection between I/O terminals and control panel	Control via I/O terminals	Control from the panel	
B3	Operating hours, trip counter; Reset	Resets the operating hours trip counter when pushed	No resetting	Reset of the operating hours trip counter	
B4	MWh counter, reset	Resets the MWh trip counter when pushed	No resetting	Reset of the MWh trip counter	

Table 7-2. Programmable push-button descriptions

7.7 Active faults menu

The Active faults menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M5** is visible on the first line of the alpha-numeric display as shown in Figure 7-10.

When a fault brings the frequency converter to a stop, the fault symbol **F**, the ordinal number of the fault, the fault code and a short description of the fault are displayed. In addition, the indication FAULT will appear on the first line of the display. If there are several faults at the same time, the list of active faults can be browsed with the *Browser buttons.*
The display can be cleared with the *Reset button* and the read-out will return to the same display it had before the fault trip.

The fault remains active until it is cleared with the Reset button or with a reset signal from the I/O terminal.

Note! Remove external Start signal before resetting the fault to prevent unintended re-start of the drive.

Figure 7-10. Active faults menu

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Fault codes	Fault	Possible cause	Checking
F1	Overcurrent	The frequency converter has measured too high a current (>4*In) in the motor output: - sudden heavy load increase - short circuit in the motor cables - unsuitable motor	Check loading Check motor size Check cables
F2	Overvoltage	The voltage of the internal DC-link of the frequency converter has exceeded the nominal voltage by 35% - deceleration time is too fast - high overvoltage spikes at utility	Adjust the deceleration time
F3	Ground fault	Current measurement detected that the sum of the motor phase current is not zero - insulation failure in the motor or the cables	Check the motor cables
F4	Inverter fault	The frequency converter has detected faulty operation in the gate drivers or IGBT bridge - interference fault - component failure	Reset the fault and restart again. If the fault occurs again contact your Vacon distributor.
F5	Charging switch	Charging switch open when START command active - interference fault - component failure	Reset the fault and restart again. If the fault occurs again contact your Vacon distributor.
F9	Undervoltage	DC-bus voltage has gone below 65% of the nominal voltage - most common reason is failure of the utility supply - internal failure of the frequency converter can also cause an undervoltage trip	In case of temporary supply voltage break, reset the fault and start again. Check utility input. If utility supply is correct and internal failure has occurred. Contact your Vacon distributor.
F10	Input line supervision	Input line phase is missing	Check the utility connection
F11	Output phase supervision	Current measurement has detected that there is no current in one motor phase	Check motor cables
F12	Brake chopper supervision	- brake resistor not installed - brake resistor broken - brake chopper broken	Check brake resistor - If resistor is OK the chopper is broken. Contact your Vacon distributor
F13	Drive undertemperature	Temperature of heat sink below -10"C	

Table 7-3. Fault codes (continues on next page)

Fault codes	Fault	Possible cause	Checking
F14	Drive overtemperature	Temperature of heat sink over 90”C (CXS series) Temperature of heat sink over 77”C (CX/CXL series up to 75 kW) Temperature of heat sink over 70”C (CX/CXL series from 90 kW)	- Check the cooling air flow - Check that the heat sink is not dirty - Check ambient temperature - Check that the switching frequency is not too high compared with ambient temperature and motor load
F15	Motor stalled	The motor stall protection has tripped	- Check the motor
F16	Motor overtemperature	The frequency converter motor temperature model has detected motor overheat - motor is overloaded	Decrease motor load. Check the temperature model parameters if the motor was not overheated
F17	Motor underload	The motor underload protection has tripped	
F18	Analogue input polarity fault or analogue input hardware fault	Wrong analogue input polarity Component failure on control board	Check the polarity of the analogue input. Contact your Vacon distributor.
F19	Option board identification	Reading of the option board has failed	Check the installation - If installation is correct, contact your Vacon distributor
F20	10 V voltage reference	+10 V reference shorted on control board or option board	Check the cabling from +10 V reference voltage
F21	24 V supply	+24 V supply shorted on control board or option board	Check the cabling from +24 V reference voltage
F22 F23	EEPROM checksum fault	Parameter restoring error - interference fault - component failure	When the fault is reset the frequency drive will automatically load parameter default settings. Check all parameter settings after reset. If the fault occurs again contact your Vacon distributor
F25	Microprocessor watchdog	- interference fault - component failure	Reset the fault and restart. If the fault occurs again contact your Vacon distributor
F26	Panel communication error	The connection between panel and the frequency converter is not working	Check the panel cable
F29	Thermistor protection	Thermistor input of the I/O expander board has detected increase of the motor temperature	- Check motor cooling and loading - Check thermistor connection (If thermistor input of the I/O expander board is not in use it has to be short circuited)
F36	Analog input I_{in} < 4mA (signal range selected 4-20 mA)	The current in the analog input I_{in} is below 4 mA - signal source has failed - control cable is broken	Check the current loop circuitry
F41	External fault	Fault is detected in external fault digital input	Check the external fault circuit or device

Table 7-3. Fault codes (cont.)

7.8 Active warning display

When a warning occurs, a text with a symbol **A#** appears on the display. In addition, the indication ALARM will appear in the top right corner of the display. Warning codes are explained in Table 7-4.

The display does not have to be cleared in any special way.

The warning on the display does not disable the normal functions of the push buttons.

Code	Warning	Checking
A15	Motor stalled (Motor stall protection)	Check motor
A16	Motor overtemperature (Motor thermal protection)	Decrease motor loading
A17	Motor underload (Warning can be activated in Five In One applications)	Check motor loading
A24	The values in the Fault History, MWh counters or operating day/hour counters might have been changed in the previous mains interruption.	No actions necessary. Take a critical attitude to these values.
A28	The change of application has failed.	Choose the application again and push the Enter button.
A30	Unbalance current fault; the load of the segments is not equal.	Contact your Vacon distributor.
A45	The frequency converter overtemperature warning; Overtemperature trip limit minus 5 degrees. See Table 7-3: F14	Check the cooling air flow and the ambient temperature.
A46	Reference warning; the current of input I_{in+} <4 mA (Warning can be activated in Five in One applications)	Check the current loop circuitry.
A47	External warning; (Warning can be activated in Five-InOne applications)	Check the external fault circuit or device.

Table 7-4. Warning codes

7.9 Fault history menu

The fault history menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M6** is displayed on the first line of the alpha-numeric panel.

The memory of the frequency converter can store the maximum of 9 faults in the order of appearance. The latest fault has the number 1, the second latest number 2 etc. If there are 9 uncleared faults in the memory, the next fault will erase the oldest from the memory.

Pressing the *Enter button* for about 2…3 seconds resets the whole fault history. Then, the symbol H# will change for 0.

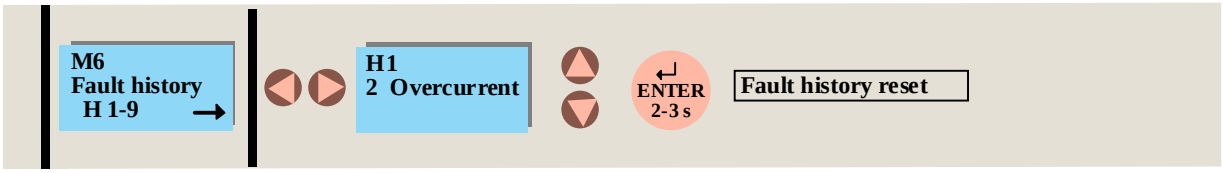

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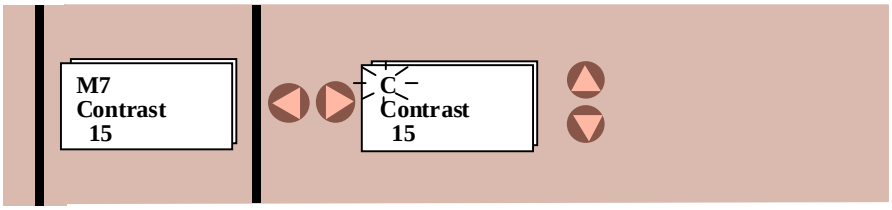
Figure 7-11. Fault history menu

7.10 Contrast menu

In case the display is unclear you can adjust the its contrast.

The contrast menu can be entered from the main menu by pushing the *Menu button (right)* when the symbol **M7** is visible on the first line of the alpha-numeric display.

Use the *Menu button (right)* to enter the edit menu. You are in the edit menu when the symbol **C** starts to blink. Then change the contrast using the *Browser buttons*. The changes take effect immediately.



7_12.fh8

Figure 7-12. Contrast setting

7.11 Controlling the motor from the control panel

The CX/CXL/CXS can be controlled from either the I/O terminals or the control panel. The active control source can be changed with the programmable push button b2 (see chapter 7.6). The motor can be started, stopped and the direction of rotation can be changed from the active control source.

7.11.1 Control source change from I/O terminals to the control panel

After changing the control source the motor stops. The direction of rotation remains the same as with I/O control.
If the Start button is pushed at the same time as the programmable push button B2, the Run state, direction of rotation and reference value will be copied from the I/O terminals to the control panel.

7.11.2 Control source change from the control panel to the I/O terminals

After changing the control source, the I/O terminals determine the run state, direction of rotation and reference value.

If motor potentiometer is used in the application, the panel reference value can be copied for a value of motor potentiometer reference by pushing the start button at the same time as the programmable push button B2. Motor potentiometer function mode must be "resetting at stop state" (Local/Remote Application: param. 1**.** 5 =4, Multi-purpose Application : param. 1**.** 5 = 9).