



**OEM SAFphire**  
**Model OEM-DDCS**

*Programmable Linear Controller*

*For use with ABB Drives*

**Hardware Guide**

Manual Version 1.1

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## **FOR YOUR SAFETY**

**Only qualified personnel should install this equipment, after first reading and understanding all the information in this manual. All instructions should be strictly adhered to. The user should consult SAF or a SAF supplier for clarification of the contents of this manual should any doubt or questions arise.**

**The installation of this equipment must be conducted in accordance with all national, regional and local electrical codes.**

**All drawings and technical representations included in this manual are for typical installations and should not in any way be considered for specific applications or modifications. Consult SAF Drives for supplemental instructions.**

**SAF Drives accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation, application or adjustment of this equipment.**

**The contents of this manual are believed to be correct at the time of printing. In following with our commitment to the ongoing development and improvement of our products SAF reserves the right to change the specification of this product and/or the content of this instruction manual without notice.**



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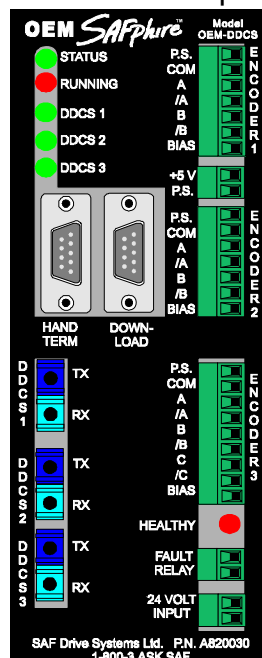
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## OEM SAFphire Overview

OEM SAFphire provides a leading edge drive control solution at an off-the-shelf price. It is a full featured, multiple drive, digital controller in a fixed I/O configuration, based on SAF's SAFphire technology.

Each version of OEM SAFphire combines the identical processing core of SAFphire with inputs, outputs and communication capabilities designed for specific applications. The same programming software and function blocks are available for OEM SAFphire that exist for SAFphire. The model OEM-DDCS version includes 3 encoder input channels, a serial port for communicating to either Allen-Bradley or Modicon PLC's or MMI's and 3 DDCS fiber optic channels for communications to ABB ACS600 or DCS500 drives. All of the hardware inputs and outputs found on the drives can be accessed over the fiber optic DDCS link, eliminating the need and cost of local inputs and outputs on the controller itself.

OEM SAFphire combines exceptional performance and flexibility into a small form factor, DIN rail mount package.



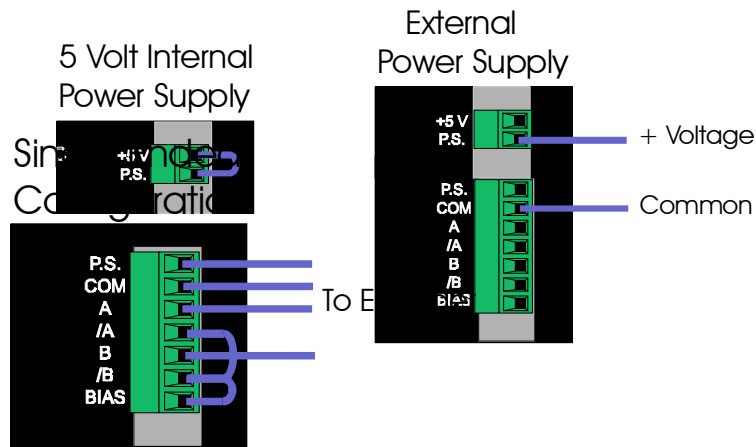
## Model OEM-DDCS Hardware

The hardware of the model OEM-DDCS OEM SAFphire is designed to control small to medium sized drive systems using ABB ACS600 AC Drives or DCS500 DC Drives.

### Encoder Inputs

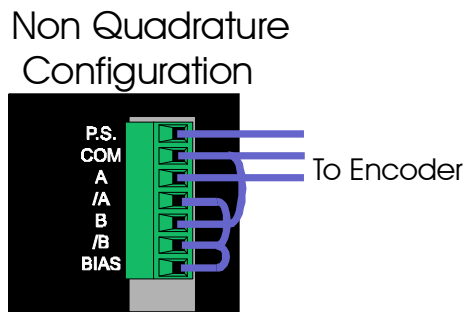
3 rotary pulse encoder inputs are provided. All 3 inputs can accept differential, quadrature input signals. Encoder input 3 can also accept a differential marker channel. To power the encoders from the internal 5 volt supply, connect the +5V terminal to the terminal labelled P.S. To use an external power supply of a different voltage, connect it between common (COM) and P.S. The same power supply must be used for all

encoder channels.



If the encoder being used does not have differential outputs (A, B only, no NOT outputs), connect the unused inputs (/A /B /C) to the terminal labeled BIAS.

If the encoder being used is not quadrature (no B /B outputs), connect the B input to COM.



If the encoder being used has open collector outputs and requires pull up resistors, they must be mounted external to the unit.

<b>Encoder Input Specifications</b>	
Max Input Frequency	300 kHz
Max External Power Supply	24 Volts
Max Encoder Current Draw (per channel)	150 mA

### **DDCS Fiber Optic Channels**

3 DDCS Fiber Optic Communication channels are provided for communications with ABB ACS600 or DCS500 Drives. For more

information see SAFphire to ABB Drives Communications Using DDCS. The DDCS channels can also be used for communications between OEM SAFphires or between OEM SAFphires and SAFphire with a CA417 card. For more information see SAFphire to SAFphire Communications Using DDCS.

<b>DDCS Specifications</b>	
Baud Rate	4 Mbaud
Max Cable Length	10 meters using Plastic Cable
Max Data Sets per Node	3 pairs
Max Nodes per Channel	8

### **Download Port**

The Download Port is a RS232 port with two functions. It can be used for Downloading / Annunciating programs from a PC with SBL or it can be used for Modbus or DF1 communications to a PLC or other compatible device. This port does not require or use any handshaking signals (RTS, CTS)

<b>DB9 Male Pin</b>	<b>Function</b>
2	Receive Data
3	Transmit Data
5	Common

For more information on configuring the port, see SWITCHES. For more information on communications between OEM SAFphire and other serial devices, please see the appropriate App Note.

### **Handterm Port**

The HandTerm Port is a RS232 port with two functions. It can be used for HandTerm Operations or it can be used for Modbus or DF1 communications to a PLC or other compatible device. This port does not require or use any handshaking signals (RTS, CTS). The HandHeld receives power from terminal 9 of this port.

<b>DB9 Male Pin</b>	<b>Function</b>
2	Receive Data
3	Transmit Data
9	+5V for HandHeld
5	Common

For more information on configuring the port, see SWITCHES. For more information on communications between OEM SAFphire and other serial devices, please see the appropriate App Note.

### **Fault Relay**



The Fault Relay provides a set of dry contacts that are normally wired into the ESTOP circuitry. These contacts will be closed whenever the OEM SAFphire is properly executing a Block Program. These contacts will open when downloading a new program, or if the Block Program is not executing (hardware failure, invalid program etc)

<b>Fault Relay Specifications</b>	
Current Rating	1 A resistive
Voltage Rating	120 VAC

## 24 Volt Input

OEM SAFphire will accept 24 V AC or DC as input power. When using a DC power source, polarity does not matter.

<b>24 Volt Input Specifications</b>	
Input Voltage	24 Volts AC or DC +/- 25%
Input Power	20 VA

## LEDs

LEDs are provided to indicate the status of OEM SAFphire.

**STATUS:** This green LED will flash once per second for normal operation. Other patterns indicate the following:

<b>STATUS LED Patterns</b>	
OFF solid	Hardware Failure
ON solid	Executing out of BootBlock Memory, due to 386 Code Checksum Error or SWITCH SETTINGS
1 Flash then OFF	386 Memory Test Error
2 Flash then OFF	320 Memory Test Error
3 Flash then OFF	320 Code Checksum Error
4 Flash then OFF	Block Program Checksum Error
5 Flash then OFF	Invalid Hardware Code
6 Flash then OFF	Flash Write Error (see Jumper Settings)
7 Flash then OFF	Invalid Block Program

**RUNNING:** This red LED will appear to be on (actually flashing once per scan time) whenever the program is executing.

**DDCS1:** The green LED will be on whenever DDCS channel 1 is transmitting.

**DDCS2:** The green LED will be on whenever DDCS channel 2 is transmitting.

**DDCS3:** The green LED will be on whenever DDCS channel 3 is transmitting.

**HEALTHY:** This red LED will be on whenever the FAULT RELAY contacts are closed.

## Switches

There are 3 rotary switches found at the top of the OEM SAFphire. These switches control the configuration of the DOWNLOAD PORT and the HANDTERM PORT. SW1 is located towards the front (connector side) of the OEM SAFphire. SW3 is located towards the back (panel side) of the OEM SAFphire.

<b>SW1 Settings</b>	
0	Reserved (don't use)
1-F	OEM SAFphire Node Address. Settings A-F correspond to 10-15. This is the Node Address used for downloading and announcing block programs.

<b>SW2 Settings (DOWNLOAD PORT)</b>	
0	Disable port
1	DF1 communications. See SAFphire to AB PLC Communications App Note.
2	Modbus Slave communications. See SAFphire to MMI Communications App Note.
3	Modbus Master @ 19.2 kbaud See SAFphire to Modicon PLC Communications App Note.
4	Modbus Master @ 9600 baud See SAFphire to Modicon PLC Communications App Note.
B	Download @ 19.2 kbaud. User for communications to programming computer with SBL.
C	Download @ 38.4 kbaud. User for communications to prog. Computer with SBL.
D	Download @ 57.6 kbaud. User for communications to prog. Computer with SBL.
E	Download @ 115.2 kbaud. User for communications to prog. Computer with SBL.
F	Download @ 19.2 kbaud. Force Operation from BootBlock Memory (ignores 386 code already downloaded, can only download 386 code)

<b>SW3 Settings (HANDTERM PORT)</b>	
0	Disable port
1	DF1 communications. See SAFphire to AB PLC Communications App Note.
2	Modbus Slave communications. See SAFphire to MMI Communications App Note.
3	Modbus Master @ 19.2 kbaud See SAFphire to Modicon PLC Communications App Note.
4	Modbus Master @ 9600 baud See SAFphire to Modicon PLC Communications App Note.
7	HandTerm communications. User for communications to SAF Hand Held Terminal for parameter monitoring / tuning.

## **Jumpers**

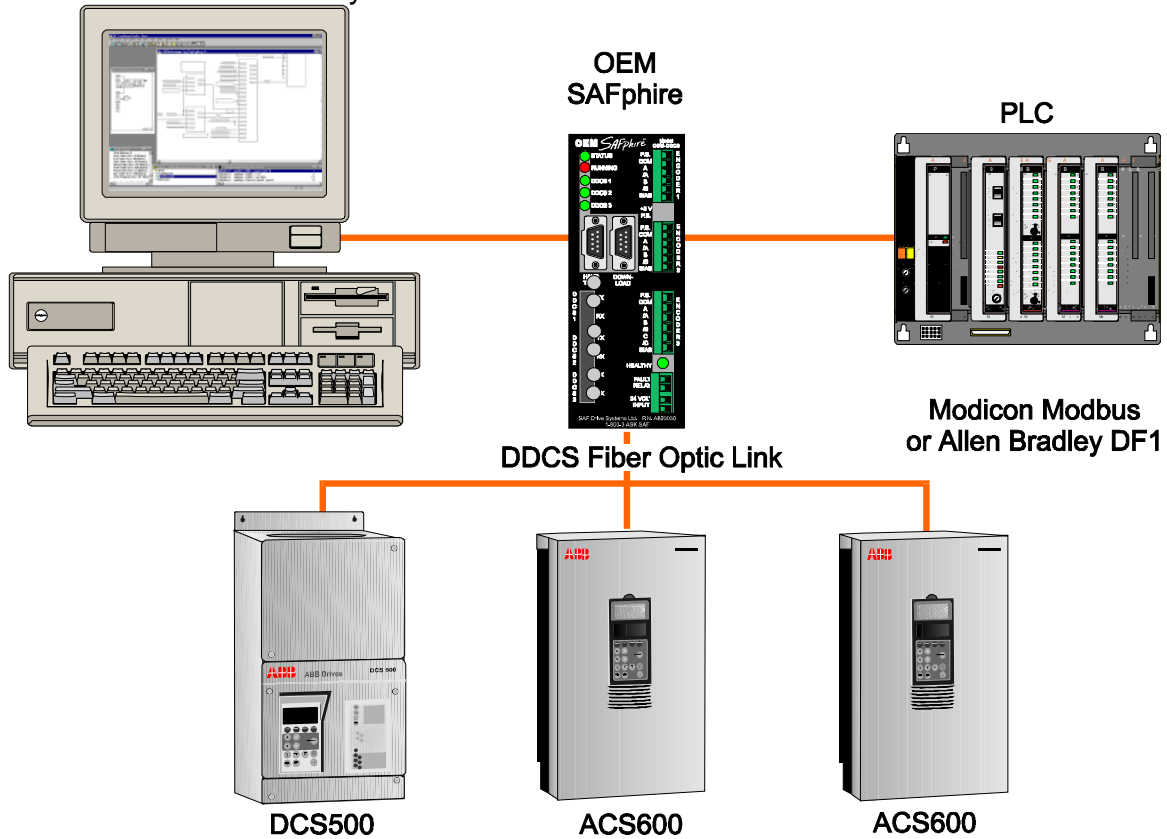
There are a number of Jumpers inside the OEM SAFphire. These are not

meant for user adjustment under normal circumstances.

<b>Jumper</b>	<b>Function</b>	<b>Default</b>
J3	When not installed, writes to Bootblock memory are disabled. If writes to BootBlock are attempted with this jumper not installed, the STATUS LED will indicate a FLASH WRITE ERROR.	not installed
J4	When installed, a +5V power supply is made available at pin 9 of the HANDTERM Port. This is required for Hand Held Terminal operation	installed
J5	When installed, 16 will be added to the Node Address as set by SW1.	not installed
J6	Installing this jumper will cause the OEM SAFphire to reset.	not installed

## Typical Configurations

The following shows a typical usage of OEM SAFphire in a small to mid-size ABB Drive System.



## SBL Blocks

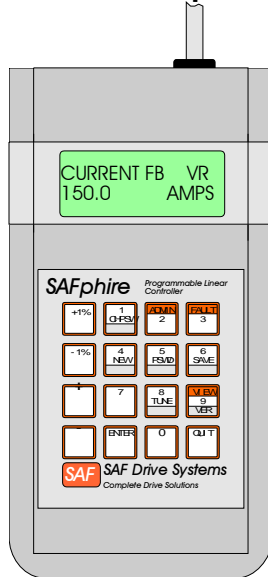
OEM SAFphire uses different input / output SBL blocks than SAFphire. The following blocks are the hardware dependant blocks for OEM SAFphire. Documentation for their usage can be found in the SBL Block Descriptions Manual

- DDCS INPUT
- DDCS OUTPUT
- COMM READ REG
- COMM WRITE REG
- COMM STATUS
- ENCODER INPUT

## Dimension and Mounting

OEM SAFphire is DIN Rail Mount. Requiring panel space of 2.75 inches (73 mm) wide, 7 inches high (185 mm), and a panel depth of 8 inches (212 mm) (including RS232 connectors).

## HandTerm Operation Guide

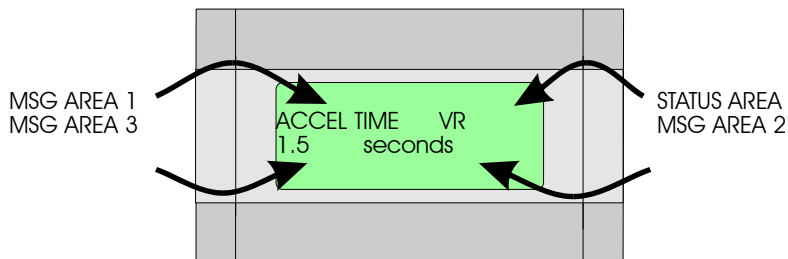


### Introduction

HandTerm is an optional tool for OEM SAFphire. It is an RS232 device that is primarily a maintenance or engineering tool and because of the lightness of construction should not be subjected to physical abuse. Variables of all types can be displayed on the LCD display of HandTerm. These variables may be viewable (to look at only), or tuneable (to look at and change, if desired) as controlled by the SBL program. The keypad is self explanatory and with a few minutes of practice, can be quickly mastered. A standard nine pin connector on the cable provides for easy connection or disconnection to OEM SAFphire. The user can plug into a number of OEM SAFphires this way.

All parameters are presented in alpha-numeric form in engineering units to avoid confusing computer codes. SAF Drives and Automation recommends however, that an Industrial Grade Operator Station be used for any permanent plant floor installations.

### Display Overview



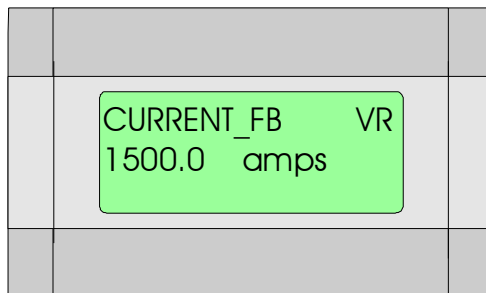
The display is divided into four areas. The top right hand area of the display is the status area. The status area consists of two characters. The first character indicates the mode. The possible modes are:

- C - command mode
- V - view mode (parameter can be viewed only)
- V - view mode (flashing V indicates parameter can be tuned)
- T - tune mode
- A - admin mode
- F - fault mode

The second character is the status character. It is set in the SYS\_CONFIG block. It can be used to indicate the status of machines controlled by OEM SAFphire. The possible status are:

- R - running
- J - jog
- S - stopped
- E - error
- F - faulted

The message areas are used to display alpha numeric information relating to the current mode or command. An example is in the view mode. A parameter such as current\_fb would be shown as follows:



## ***Operating Modes***

### **Command Mode**

Command Mode is indicated by a C as the mode character in the status area.

This mode acts as a top level menu allowing the user to move between the other modes.

The user has the following options:

- FAULT (3) - view active faults
- ADMIN (2) - enter administration mode
- VIEW (9) - enter view mode

### **View Mode**

View Mode is indicated by a V (flashing or solid) as the mode character in the status area.

In this mode the user is able to scroll through the list of the parameters names and their current values. A parameter can be either viewable or tuneable. Parameters are stored alphabetically with all viewable parameters before tuneable parameters. Tuneable parameters are indicated by a flashing V as the mode character. Viewable parameters are indicated by a solid V as the mode character. In the View Mode, the user has the following options.

<+> - display next parameter name and value

<-> - display previous parameter name and value

TUNE (8) - tune the displayed parameter (i.e. enter tune mode) This option is only accessible if the parameter is tunable. This is indicated by a flashing V in the top right hand corner of the screen.

QUIT - quit (return to command mode)

### **Tune Mode**

Tune Mode is indicated by a T as the mode character in the status area. Tune mode allows the user to modify the value of the selected parameter. After the parameters have been tuned, they are still only stored in static memory. If the user wishes the changes to be kept they must be saved. (see Admin Mode)

The user has the following options:

NEW (4) - enter new value for parameter followed by the <ENTER> key

<+1%> - add 1% of the parameter's range to its value

<-1%> - subtract 1% of the parameter's range from its value

<+> - increment the parameter's value

<-> - decrement the parameter's value

<QUIT> - quit (return to view mode)

### **Admin Mode**

Admin Mode is indicated by an A as the mode character in the status area.

The administration menu is used to perform administration type functions.

The user has the following options.

<VER> - Display information relative to software version, program information, parameter status, Node Address etc.

<SAVE> - Save the tuned parameters to battery backed memory so that if power to the rack is interrupted, it will default to the tuned parameters.

<QUIT> - return to command mode

### **Fault Mode**

Fault Mode is indicated by an F as the mode character in the status area. This mode displays active faults. The active fault is determined by a SYS\_CONFIG block and the fault table. The message displayed can be edited using the SBL Development System. Pressing any key will return the user to the command mode.



## Technical Support

### **Contact Us**

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