drive.web
speedy

Distributed Process Controller

models **dw220, dw222, dw223, dw225 & dw226**

Installation & Operation Manual

drive.web automation

$\mathsf{C}\mathsf{E}$ Conformity Statements:

EMC Standard, EN 61326-1: 2006, Electrical Equipment for Measurement, Control and Laboratory Use.
　Emissions Class A, Commercial Equipment.
　Immunity Table 2, Industrial Equipment.

LVD Standards, EN 61010-1: 2010, Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use and;
　EN 61010-2-030: Particular Requirements for Testing and Measuring Circuits.

speedy is an industrial controller designed for permanent installation by qualified professionals. If it is used in a manner not specified herein the protection provided may be impaired.

speedy and its packaging contain recyclable materials and a small rechargeable battery, classed as "portable", that is permanently affixed to the underside of the main circuit board. The battery must be removed with wire-cutting pliers and separated for proper disposal.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1)This device may not cause harmful interference, and (2)this device must accept any interference received, including interference that may cause undesired operation.

This Class [A] digital apparatus complies with Canadian ICES-003. Cet appareil numerique de la classe [A] est conforme à la norme NMB-003 du Canada.

Warning! It is essential that you read and understand this entire manual and the entire contents of the **_savvy_** software **_Help_** menu before proceeding with your installation and configuration. See page 7 for **_savvy_** installation instructions. For more information and to download manuals and software, go to **_www.driveweb.com_** or contact us. See page 20.

Warning! Your use of **_savvy_** software and **_drive.web_** devices may cause motors and machinery to power up with high Voltages or start or operate in an unexpected, dangerous or lethal way. It is essential that you are completely familiar with all of the equipment and the system design before attempting to program or edit a program or connect to any live device. It is also essential that a risk assessment is conducted to identify hazards. Risks must be reduced to tolerable levels.

Warning! You are entirely responsible for the configuration or use of any **_drive.web_** product. By configuring or using these products you agree to indemnify and hold harmless Bardac Corporation, its' employees, directors, officers, distributors and resellers against the consequences of your configuration or use of the products.

Warning! Information in this manual is subject to change without notice. You are responsible for verifying the proper operation of your **_speedy_** module. Special care must be taken after loading new firmware or installing new options.

Warning! Avoid permanent damage to your **_speedy_**, never exceed any **min** or **max** values. Do not connect any **_speedy_** terminal to mains circuits. See page 4 for details.

Product identification, *speedy* model number

speedy is a programmable device using *drive.web* distributed control over Ethernet for industrial process automation. To program and use a *speedy* you must get the *savvy* software tools from *www.driveweb.com*. Please see pages 7 to 11.

To find the *speedy*'s firmware version, launch *savvy* and choose *Get Detailed Info* from the *speedy* contextual menu. See pages 11.

dw220 generic ModbusRTU master up to 500kbps.

dw222 for *Optidrive E2* variable frequency drive.

dw223 for *Optidrive Plus* open-loop vector drive.

dw225 for *Yaskawa YF7* inverter drive.

dw226 for *Optidrive HVAC* variable-torque AC pump and fan drive.

speedy standard features

- *drive.web* distributed process control.
- 10/100Base-T(X) Ethernet, page 6.
- Update firmware with *savvy* software.
- Ultra-compact, may be permanently bonded inside equipment.
- High-speed ModbusRTU on EIA485. *dw220* up to 500kb/s.
- Basic Control Function Block Library.

speedy options

Software options may be added using *savvy*. See page 12.
See *savvy* User Manual for up-to-date function block listings.

04 ModbusTCP/IP Slave/server. See page 18.

05 Process Control Recommended for most applications.

06 Winder Control See page 19.

10 Math with internal 32-bit *Calculator*.

25 EIP/PCCC Slave/server. See page 18.

26 savvyPanel Operator station interface. See pages 13-17

29 Solar With sun position azimuth and zenith.

36 Motion Control With *Trapezoid Motion* and *Cam Profile*.

50 DIN rail mount with terminal block wiring.

speedy Stock Controllers

Order standard option packs with four-digit model number suffix.

- **-1121 Smart Systems Controller** includes **-04-05-25-26,** Process Control library and Ethernet servers; ModbusTCP, EIP/PCCC, and **savvyPanel**.

- **-1122 Smart Systems Winders and Motion** includes **-04-05-06-25-26-36,** adds Winder and Motion Control.

speedy apps Engineered Solutions

Generic engineered solutions include required options (in parentheses), system configuration, and wiring diagram. Contact us for many other engineered solutions. Compatible options may be added.

-1101 Open-loop constant tension center winder (**05**, **06**)

-1102 Closed-loop dancer control center winder (**05**, **06**)

-1103 Closed-loop loadcell control center winder (**05**, **06**)

-1106 Coordinated drive, line master controller (**05**)

speedy installation

speedy is designed for permanent installation by qualified professionals.

Environment: UL/IEC Pollution Degree 2,

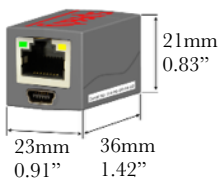Temperature, Operating, 0°C to 50°C. Storage, -20°C to 60°C.

Altitude 3000m max.

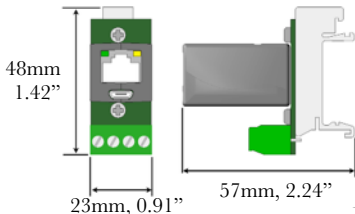Humidity 95% max. non-condensing.

Dimensions & Clearances:

1" clearances must be provided on three long sides to promote airflow.

Standard Model

21mm
0.83"

23mm
0.91"

36mm
1.42"

DIN rail Mount Option

48mm
1.42"

23mm, 0.91"

57mm, 2.24"

speedy installation continued...

Weight: Standard-19g(0.7oz). w/ DIN rail & terminals - 28g(1.0oz)

Power requirements: Regulated 24VDC ±5%, 40mA.
Do not connect to a distributed DC power network.
External 100mA fast-acting fuse or 1A current-limiting is required!

Serial port EIA485(RS485) 0.1 to 500Kbps. Unisolated. Power and serial circuits must have compatible common-mode Voltages.

Ethernet: MDI 8P8C, "RJ45" jack, 100baseTX, 10BaseT, Full Duplex, Auto Negotiation, Auto-MDIX, IEEE 802.3ab.

USB port Peripheral-type, Micro-B jack.

Ethernet LEDs For setup, troubleshooting and monitoring:
100 Green LED indicates 100BaseTX Ethernet connection.
Link / Activity Yellow LED. On for Link, flashing for activity.

Adhesive mounting. Clean adhering surfaces with alcohol first. Use caution, bond is permanent. Adhere on or near the drive or Modbus device.
Do not obstruct air vents, access points or product labels. Do not attach **speedy** near AC power lines, hot spots, heatsinks, cooling fans, etc.

DIN rail option. Use 35x7.5mm rail per IEC 60715, EN50022.
Terminal wiring: Strip 7mm(0.28") or use ferrules.
Use 0.2mm^2(AWG24) minimum.
One wire, 2.5mm^2(AWG12) maximum.
Two wires, 1.5mm^2(AWG14) maximum.
Two wires with ferrules, 1mm^2(AWG18) maximum.
Terminal tightening torque: 0.5 Nm (4.4 in·lbs)

Signal wiring notes. Use twisted-pair wiring. All wiring outside of the metal enclosure should be shielded cable with individually shielded twisted-pairs such as **Belden 8163**. Ground the shield at only one end with a 360° clamp where the shield enters your metal enclosure. Separate all wiring from RF noise sources and AC power cabling.

speedy power and serial connections

dw220

Standard 15", 24AWG, solid-wire connections.

24V
0V, C
A
B

DIN rail mount option. Single, local device connections.

0V   24V

C
A
B

24V
0V, C
A
B

dw222, dw226
RJ45

B
A
24V
0V, C

dw223
RJ11

A
24V
0V, C
B

dw225

YF7 terminal	Wire name
SP	24V
IG and SN	0V, C
S- and R-	A
S+ and R+	B

Standard 15", 24AWG, solid-wire connections.

24V
0V, C
A
B

DIN rail option. Single, local device connections.

24V
0V, C
A
B

24V
0V, C
A
B

Serial Connection	EIA485 Name	Modbus Name	Description
A	A or Data −	D0	Inverting Pin
B	B or Data +	D1	Non-Inverting Pin
C	SC or Data 0V	Common	Common Reference

speedy **serial port connections** continued...

- *A* and *B* must share a single twisted-pair. *C* may use one or both conductors in another pair. Do NOT pair *C* with other signals.
- EIA485 Common Reference is required. It is named *C* so that it is not confused with other common, ground or shield connections.
- Correct multipoint topology is daisy-chain or trunk with device at each end and additional devices on short stub branches. Star, ring, or extended branch topologies are NOT recommended.
- Connect line termination between *A* and *B* at both physical ends of a ModbusRTU network, typically 150Ω, 0.5W or, for networks with line polarization, 120Ω, 0.25W and 1nF, 10V cap in series.
- Do NOT provide line termination on any network with an *Optidrive*.

Drive setup

speedy model	Supported drive	Required drive settings	Related drive settings
dw220	Generic	Baud-rate, framing	Serial loss behavior
dw222	OptidriveE2	P-36; Address = 1, Baud rate= 115.2Kbps	P-36, Comms Loss Trip Enable
dw223	OptidrivePlus	P2-26, Baudrate = 115.2Kbps P2-27, Address = 1	P2-26, T, trip or R, ramp on serial loss
dw225	YaskawaF7	H5-01 = 1F, decimal 31 H5-02 = 4, 19.2Kbps H5-03 = 00, No parity H5-06 = 05, Min. delay 5ms	H5-04 Stopping Method H5-05 Serial Fault Detect
dw226	OptidriveHVAC	P-36; Address = 1, Baud rate= 115.2Kbps	P-36, Comms Loss Trip Enable

dw223 *Optidrive Plus* notes

- Check drive **model number** and **firmware version**. **P0-28** and **P0-29** should indicate 2.2 or higher. Model number must end in **-M** for firmware versions prior to 3.0.

Drive setup continued...

dw225 Yaskawa YF7 notes

- Check **Flash ID**, U1-14 = 3020.
- Check internal line termination switch **S1-1**.
- Cycle **YF7** power, wait for the screen to blank before re-powering, for parameter changes to take effect.

Set up your computer - get *savvy*

With free *drive.web savvy* software, easily program and monitor *speedy*, perform data trending, and create distributed control systems.

- To download the latest version of *savvy*, go to *www.driveweb.com* and click on *get savvy*.
- **Java Runtime Environment** must be installed to run *savvy*. There is a link on the *get savvy* page to download Java for free.
- If you do not have internet access, install *savvy* and Java from the *Bardac* **Infodisk**. Browse to the *savvy* link, off-line installation. Contact us for the files or **Infodisk**.
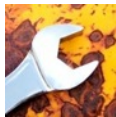
speedy USB - plug and play

Experience plug-and-play access to *speedy* **and** its local Ethernet network. Requires 0x201A firmware or later. Contact us for details.

speedy Ethernet networking & programming

Before proceeding, it is important to have a basic understanding of Ethernet TCP/IP networks. Assigning an invalid or duplicate IP address will cause serious network malfunctions!

- Find useful networking information. Under the *Help* menu click on *Getting Started with savvy* section.
- *speedy*s are all shipped with the same IP address, 10.189.189.189. Consult your company's IT department for an appropriate, unique IP address.

Ethernet Network Requirements

- A standard *Category 5e* cable with 8P8C/RJ-45 connectors on both ends for each **drive.web** device and the host computer.

- For systems with more than one **drive.web** device, an Ethernet switch with ports for all **drive.web** devices and your computer.

Get started with *savvy*

- We strongly recommend attending our free on-line training seminars. To register and get your invitation, call or e-mail **training@driveweb.com**.

- Before proceeding with your systems designs it is very important to familiarize yourself with **savvy**, the configuration software.

- We strongly recommend you read the ***User Manual*** and ***Getting Started Guides*** under the ***Help*** menu.

- Use ***Create Phantom*** in the ***Directory*** menu to practice, explore all **drive.web** products and options and design and configure off-line. Design systems in Phantom devices and ***Export Data*** under the ***Directory*** menu for later use in live devices. ***Import Data*** into phantoms to work off-line.

savvy Window Title Bar indicates the current view.

Status Bar, above the viewing area, provides **Navigation Arrows** and object and location data.

- **savvy** views are hierarchical with the ***Device Directory View*** at top. Use the ***Navigation Arrows*** to view the next higher level or go backward and forward through views. Note that window menus change as you navigate.

Get started with *savvy* continued...

Hover cursor over active object, device, function block, connection, or parameter icon to view object information in the *Status Bar* and reveal a *Hover Button*.

Click a Hover Button or right-click an active object to access a *Contextual Menu*. See below.

***savvy* functionality may be limited** if you do not have the required password-protected capability level (see *File > Capability...*) or a device is locked with a password (see contextual menu below).

Device Directory Window

Warning! Changing a device IP address **WILL** disrupt its network connections! If a *speedy* is communicating with other devices or drives you must be prepared for system disruption and to remap connections in those devices when changing an IP address. In the *File* menu choose *Utility > Remap Export File* to remap a *dw-system* file with different IP address(es).

- Select *File > Administrate > Set IP Addresses for System*.

- The serial number marked on your *smarty* is its *MAC Address*.

- Enter a unique IP address within your computer's subnetwork, click OK.

- A *speedy* icon should appear with IP address beneath. With drive-dedicated models, the graphic depicts the actual frame size of the drive.

10.189.189.189

- If the icon at right appears, a network connection problem exists. Check connections, LEDs, and that the *speedy* IP address is within your computer's Ethernet subnet mask.

10.189.189.189

Device Directory Window - Directory Menu.

● *Discover via USB...* Perform basic operations without needing to configure your computer's Ethernet port.

● *Discover by IP Address...* Anywhere on the internet, locally or via a public IP address, VPN or similar.

Warning! Importing a configuration into your *speedy* will result in immediate execution of that configuration. **Dangerous Voltages and rotating machinery may result!** Use a phantom to preview a configuration.

   ● *Import / Export Data.* All device configurations and *drive.web* connections between devices in the directory. All in one *.dw-system* file.

speedy Icon Contextual Menu

● *Change Name.* Name your *speedy* for easy identification.

Laminator Stage 2

● *Import / Export Device Data...* Load / save configuration data to / from this *speedy* only.

● *Find Parameter...* Enter parameter number, name, or partial name to view it.

Laminator Stage 2

● *Unlock, Lock, Set Password.* The *speedy* at top-right is locked to *Restrict Modification*. Viewing configuration is possible. The *speedy* below it is locked to *Restrict All Access*. Select lock type when setting password.

Laminator Stage 2

Get started with *savvy* continued...

Click the *speedy* icon to view the *Device Overview* (Standard *savvy*, no *SFD*). Find the *Function Block Engine* icon and, if options **04** or **25** are present, the *Comms Server* icon, at top-right.

Function Block Engine Window - FBE Menu (Standard *savvy*, no *SFD*),

● Add function blocks in the order to be processed. Processing order is left to right, top to bottom.

Click function blocks to view parameters and details.

Connect between parameters and to parameters in other *drive.web* devices over Ethernet.

Warning! Making a connection results in immediate execution of that connection. **Dangerous Voltages and rotating machinery may result!**.

● Under the *File* menu, choose *New Viewer...* and then, *File > Open Device Directory*.

● With two viewer windows, click on a parameter, **drag** a connection, and **drop** onto a destination parameter in the other viewer.

Parameter Contextual Menu

● Most parameter data is 16-bit. Raw decimal integer values **0 to 65535 or ±32767.** Data is formatted, limited, and scaled depending on the parameter. Use *Get Info* or *Re-Scale...* to verify or change.

Click parameters for the Setter Box Adjust value with convenient graphical buttons or keyboard entry. Also find buttons for return to default or last state.
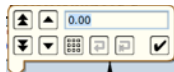
**Click blue connection block or arrow** to jump to other end.

Upgrade *savvy* and *speedy*

Upgrade *savvy* with *SFD* **Signal Flow Diagram**.
Upgrade *speedy* with software options.
Process credit cards or *Vouchers* on-line or *Coupons* off-line.

- To upgrade *savvy* go to the *Commerce* menu, select *Upgrade savvy*, check desired options, click OK.
- To upgrade *speedy*, choose *Upgrade Device…* in its contextual menu, check desired options, click OK.
- Your selected options will appear in the Shopping Cart. Select your method of payment.
- To process *Vouchers,* choose *Pay>Online Via Vouchers* in the *Shopping Cart*. Enter *Voucher* codes on separate lines.
- To process *Coupons* click *Buy* and forward the code to your *drive.web* distributor. When you receive your coupons go to the *Commerce* menu and choose *Coupon Manager*. Enter codes in the top box and click the *Add* button. Click *Apply*.
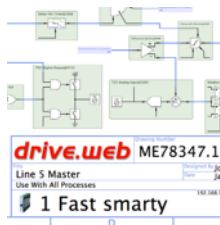
savvy-SFD **Signal Flow Diagram Upgrade**

- With *savvy-SFD*, build systems graphically. The live drawings are stored in your *speedy*.
- Set drawing borders and annotate multi-page drawings.
- A filterable list of function blocks and connections is at the left of the *Signal Flow Diagram* showing **program execution order** from top down. The order in which function blocks are processed can greatly influence system performance and the function of logic engines.

  Change execution order by dragging function blocks up or down the list. In this picture, *ENC1 Speed* function block and its outgoing connection will be moved so that they are processed after *ENC Phase Lock*.
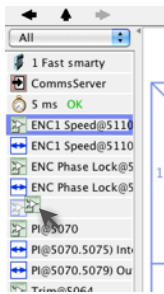
savvyPanel Operator Station

Computers, Apple® mobile digital devices; iPad®, iPhone®, and iPod Touch® are operator touch stations with **savvyPanel**. Requires Windows(XP, Vista, 7), Mac OS X, Linux-based Ubuntu, or iOS®.

- Operator station configurations are stored in the **drive.web** devices.

- Editing and building **savvyPanel** systems requires **savvy-SFD** upgrade.

- **dwOption-26 savvyPanel**, must be installed in **drive.web** devices to enable the full suite of tiles. A limited set is available without the option.

- Find complete information on **savvyPanel** in the **savvy** User Manual.
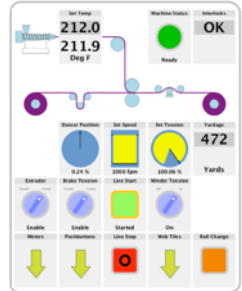
Get *savvyPanel* free from the Apple App Store^{SM}

- When your iPad or iPhone is connected to the internet via WiFi, Demo Mode connects to a live drive system in our plant in Maryland, USA.

- Touch **Roll Change** button to reset the roll length.

- Enable all section switches; extruder, brake, winder,

- Touch the **Line Start** button and watch the line accelerate, run, and then automatically slow to stop at the required length.

- Touch **Set Speed, Set Temp** or **Set Tension** to open the setter and make changes.

- Touch the parameter name in the setter to get info

- Touch page-link arrows to browse demo pages.

- Explore the demo with **savvy** on your computer. In the **File** menu, choose **Demo Mode > Discover Internet Demo Devices**.

savvyPanel Pages

Systems Page is available when multiple *savvyPanel* systems are discovered.

- Each *savvyPanel* system may contain tiles from **many *drive.web* devices**.

- Each *drive.web* device may contribute to **only one *savvyPanel* system.

- Touch the systems button, or , in the window bar to access the systems page from home page. Lock this button with home password.

Home Page is the first operator page in a *savvyPanel* System.

- Access home page from any operator page with the home button, . Lock with the home password.

Operator Pages show graphic, page-link, and parameter tiles.

- Pages can be renamed. The name appears in the window title bar.

savvyPanel Tiles

Parameter Tiles Touch a settable parameter to see its *savvyPanel* **Setter**. Includes slider, keypad, 1x, 10x increment, default, and revert.

- A parameter is settable if it is not read-only and has no incoming *drive.web* connection.

   Meter Digital panel meter, dial, or bar meter. Unipolar, bipolar, full-scale, and percent choices.

   Indicator Variety of colors. Shows on/off, true/false boolean state. All non-zero values are true.

   Pushbutton Momentary actuators in a variety of colors, also lighted **Start/Stop**.

   Multi-position Switch For enumerated parameters.
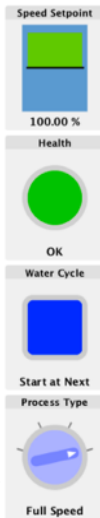
savvy overview

· · · · · *savvyPanel* System
Example

Device Name

Device Directory

Discover devices when *savvy*
launches or by using the
Directory menu. Discover by;
group, *savvyPanel* system,
Discovery file, or all local
devices automatically.

Navigate Up Arrow

Extruders Management   A1 Extruder   Polymer Co-Extrude

Upper Rewind   Fast Unwind   Air and Water

Function Block Engine

With standard *savvy*, the device
overview screen gives access to
Comms Server setup, Function
Block Engine, and native device
functions where applicable.
With *savvy-SFD* place function
blocks graphically. Use function
block list to review and arrange
execution order.

Touch or Click

Standard *savvy*

savvy-SFD

SFD Note may
be set up as a
savvyPanel link

Function Block

View functional elements and
signal paths in relation to
parameters. Parameters show
type, *drive.web* connections,
read-only and not at default
adornments.

Touch or Click a
Function Block
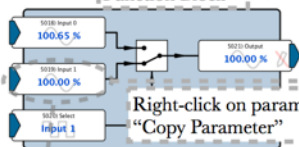
Right-click on parameter,
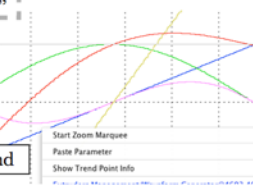"Copy Parameter"

Parameter Dock

Add parameters of interest to set,
view, create trend graphs, and
export .csv files for spreadsheets.
Save docks and open multiple
docks in different viewer
windows.

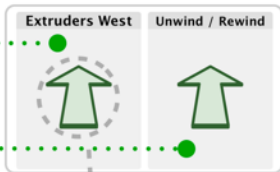Right-click on parameter
"Add to Parameter Dock"

Dock menu > Show Trend

Start Zoom Marquee
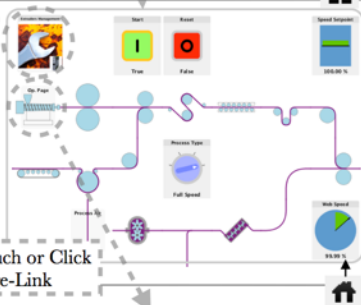
Paste Parameter

Show Trend Point Info

savvyPanel overview

Systems Page

View all available *savvyPanel* systems. Assign a *savvyPanel* system in each device's contextual menu, one per device. If a *savvyPanel* password is set in the device, it must also be added in *savvyPanel* operator station software.
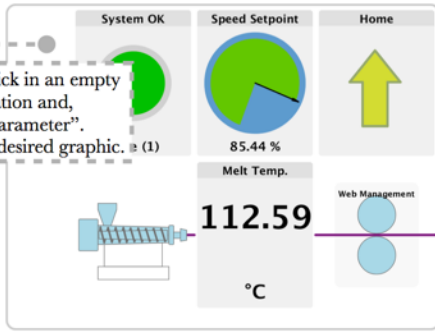
savvyPanel Systems

✕

savvyPanel Password is not set in *savvyPanel* operator station. No *savvyPanel* data is shown.

Touch or Click

Systems Button.
Requires Home Password if set.

Touch Device Tile to view the SFD

Home Page

The first page in a *savvyPanel* system. Similar to Operator Pages except that it may be accessed from any Operator Page by pressing the Home button. Touch page-link tiles to go to Operator Pages.

Touch or Click Page-Link

Home Button.
Requires Home Password if set.

Operator Pages

Up to 256 possible. May be page-linked in any way. Set *savvy* preferences so that operators view a specific page at launch. Restrict access to the Home Page and pages linked only from the Home Page with the Home Password. Provide links to the home page to bypass the home password. A page-link to the Home Page bypasses the Home Password.

Right-click in an empty grid location and, "Paste Parameter". Choose desired graphic.

Graphic Tiles Create diagrams with process elements.

Page-Link Tiles A graphic tile that is also a page-link. Touch to change the view to that page.

Device Tiles Link to device's signal flow diagram in Java-based ***savvyPanel***. Appears as graphic tile in iOS.

Function blocks enable *savvyPanel* actions

Alarm Annunciator Provides a system-wide alarm annunciation when active. Touch to view page 255.

Presence Monitor Indicates the presence of a tagged ***savvyPanel*** application viewing a particular page.

Latch and ***SR Latch*** for lighted start-stop pushbuttons.

Setpoint & ***Monitor*** blocks control meter range. *Setpoint* clamps setter. Dual blocks enable dual-display meters

Enumerated Parameter block in ***Utility*** group. Only custom enumerations appear in the setter and multi-position switch.

savvyPanel launch, setup and important notes

● See the ***savvy*** user manual for detailed instructions.

● Launch ***savvyPanel*** via command line or batch file.

● Limit operators to ***savvyPanel*** only. Specify start system and page.

● Discover devices automatically, specifically by discovery file, or filtered by group and/or ***savvyPanel*** name.

● Operator's note: If communication with a ***drive.web*** device is interrupted, affected tiles indicate a yellow bar at top with an exclamation warning. The displayed value is not updated.

● ***dw215*** YF7-native parameters are not supported. Connect to function block engine for ***savvyPanel***.

Important Design Note An over-range enumeration is required if misreading an out-of-range value could cause a hazard.

speedy Comms Interfaces-Modbus & EIP/PCCC

Warning! Use of *speedy* comms interfaces, ModbusTCP, ModbusRTU and EIP/PCCC, may cause motors and machinery to energize with high Voltages or start or operate in an unexpected, dangerous or lethal way. It is essential that you are completely familiar with the Ethernet server protocol, equipment, and the system design before use of these options. It is also essential that a risk assessment is conducted to identify hazards and that risks are reduced to tolerable levels.

- For Modbus specs go to http://modbus.org/specs.php
- Boolean values are 0 or 1. Non-zero values are Boolean true.

speedy Ethernet server support, options 04 & 25

- **Note!** You cannot write or force parameters that are read-only or have incoming *drive.web* connections.
- Click the *Comms Server* icon in the *FBE* or *SFD* view.

speedy option 04 ModbusTCP/IP slave/server

- *ModbusTCP Slave Port* 502 is the standard specified in the protocol.
- Supported Modbus Function Codes; 1 thru 6, 15, and 16.
- Supports up to **five simultaneous clients/masters.**

speedy option 25 EIP/PCCC Server

- Supports PLC5 Typed-Write and Typed-Read commands.
- See Appendix B of the *savvy* User Manual for information and *drive.web* parameter IDs mapping to PLC5 file numbers and register addresses.
- Supports up to **two simultaneous clients.**

ModbusRTU Master & bus-share drive interface

Adding network devices may affect serial link performance with drive-dedicated devices.

- Modbus Function Codes **FC 01-06** and **16** are supported. Also special Yaskawa Holding Register.
- A device Modbus address must be unique on the network!

drive.web Product Line Highlights

Drive-dedicated *smarty* and *speedy* models:

Supported Drive	*smarty* Model	*speedy* Model
Generic	*dw210*	*dw220*
PL/X Digital DC Drive	*dw211*	*dw221*
Optidrive P2	*dw214*	*dw224*
Optidrive Plus	*dw213*	*dw223*
Optidrive HVAC	*dw216*	*dw226*
Optidrive E2	*dw212*	*dw222*
Optidrive E2 Single Phase Output	*dw212*	*dw222*
YaskawaF7	*dw215*	*dw225*

smarty DIN rail *drive.web* controller.

- Sixteen flexible, bipolar-analog / digital I/O

- Hardware options; dual serial-ports, add six digital inputs, frequency I/O, relay-rack, dual stepper control.

- External options; remote, dual encoder module with re-transmit, high-Voltage I/O.

- Encoder control; cyclic and linear positioning, electronic line shaft, registration, event counts

savvy-SFD Signal Flow Diagram upgrade, see page 13.

savvyPanel operator touch station app, see pages 14 to 17.

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