drive.web speedy®

Distributed Process Controller

models **dw220, dw222, dw223, dw225**

Installation & Operation Manual

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UL Certification Statements

This process control equipment to be supplied by Class2, LPS, limited power supply.

CE 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 5 for **savvy** installation instructions. For more information and to download manuals and software, go to **www.driveweb.com** or contact us. See page 8.

⚠ **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 Invertek Drives Pty Ltd, 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***. 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 3 for ratings.

lwIP is incorporated into ***speedy*** firmware. lwIP Copyright (c) 2001-2004 Swedish Institute of Computer Science. All rights reserved.
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Product Identification - *speedy* Model Numbers

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

Find ***speedy*** firmware version. Use ***savvy***, ***Get Detailed Info*** from ***speedy*** contextual menu. Page 5.

dw220 generic controller.

dw222 for ***Optidrive E2*** variable frequency drive.

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

dw225 for ***Yaskawa YF7*** inverter drive.

speedy Standard Features

- ***drive.web*** distributed process control.
- 10/100Base-T(X) Ethernet. See page 3.
- 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 6.

04 ModbusTCP/IP - Slave/server. See page 8.

05 Process Control - Recommended for most applications.

06 Winder Control - Diameter Calc., Taper Tension, Torque Comp.

10 Math - With internal 32-bit ***Calculator***.

25 EIP/PCCC - Slave/server. See page 8.

26 savvyPanel - Operator station interface. See pages 7, 8.

29 Solar - Calculates sun position azimuth and zenith.

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

50 DIN rail mount with terminal block wiring.

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.

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. **A 100mA fast-acting fuse or 1A current-limiting is required!**
Supply from Class 2, LPS, limited power supply only.

Unisolated serial port - 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.

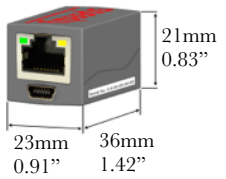
Adhesive mounting - Clean adhering surfaces with alcohol first. Use caution, bond is permanent. Adhere on or near the drive or Modbus device.
Do not obstruct air vents, access points or product labels. Do not attach **speedy** near AC power lines, hot spots, heatsinks, cooling fans, etc.

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).

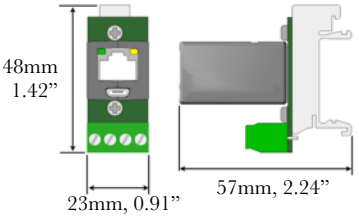
Signal wiring notes - Use twisted-pair wiring. All wiring outside of the metal enclosure should be shielded cable with individually shielded twisted-pairs such as **Belden 8163**. Ground the shield at only one end with a 360° clamp where the shield enters your metal enclosure. Separate all wiring from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

Dimensions & Clearances - 1" clearances must be provided on three long sides to promote airflow.

Standard Model



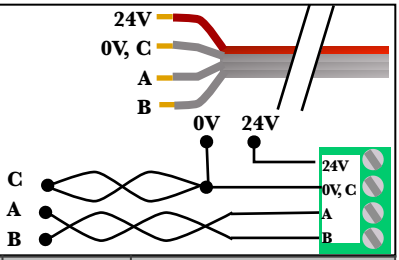
DIN rail Mount Option



speedy Power and Serial Port Connections

dw220 and dw225
Standard 15", 24AWG, solid-wire connections.

DIN rail mount option.
Single, local device connections.



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

- ***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.
- ***C***, EIA485 Common Reference is required.
- 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 Notes

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	Optidrive Plus	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

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.

dw225 *Yaskawa YF7* notes

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

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

Set up your computer - Get savvy

Use free **drive.web savvy** software to setup, program, monitor, and perform data trending.

- Go to **www.driveweb.com** and click on ***Get savvy***, or contact us to get the latest version of **savvy.**

speedy USB - Plug and Play

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

speedy Ethernet Networking & Programming

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 IP address, 10.189.189.189.
- Use *Category 5e* cable or better, with 8P8C/RJ-45 connectors for each **drive.web** device and the host computer.
- For systems with more than one **drive.web** device, use an Ethernet switch for all **drive.web** devices and computer.

Get started with savvy

- We strongly recommend attending our free online training seminars. See page 8.
- We strongly recommend you read the ***User Manual*** and ***Getting Started Guides*** under the ***Help*** menu.
- Use ***Create Phantom*** in the ***Directory*** menu to explore **drive.web** products and options, design, and configure offline. ***Export Data*** to save your work. ***Import Data*** into phantoms to work offline.

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 go up, back, or forward. Window menus change as you navigate.

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 functions are limited by password-protected capability level . See ***File > Capability...***

Device Directory Window

Warning! Changing a device IP address **WILL** disrupt its network connections! If a **speedy** is communicating with other devices, be prepared for system disruption. 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***.
- **speedy** serial number is also its ***MAC Address***.
- Enter a valid IP address and click OK.

- An icon appears with IP address beneath. Drive-dedicated models depict the actual frame size of the drive.

Get started with *savvy* continued...

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

10.189.189.189

Warning! Importing data 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.

- *Directory > Import / Export Data.* All device configurations and connections in the directory in one *.dw-system* file.

Laminator Stage 2

speedy Icon Contextual Menu

- ***Change Name*** - Name your ***speedy*** for easy identification.
- ***Import / Export Device Data...*** - Load / save configuration data to / from this ***speedy*** only.
- ***Unlock, Lock, Set Password*** - Choose ***Restrict Modification*** for view-only, or ***Restrict All Access***.

Laminator Stage 2

Click the *speedy* icon to view the device configuration.

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 other ***drive.web*** devices.

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 a parameter, drag and drop onto a parameter in the other viewer.

Parameter Contextual Menu - Most parameter data is 16-bit. 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 - Increment, decrement, default, last state, or keyboard entry.

Click blue connection block or arrow to jump to other end.

Upgrade *savvy* and *speedy*

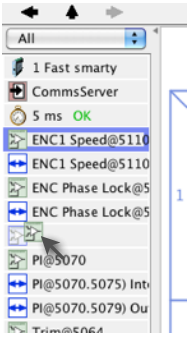
Upgrade ***savvy*** with ***SFD*** **Signal Flow Diagram**.

Upgrade ***speedy*** with software options.

Process credit cards or ***Vouchers*** online or ***Coupons*** offline.

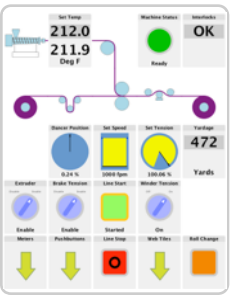
- To upgrade ***savvy*** go to the ***Commerce*** menu, select ***Upgrade savvy***, check desired options, click OK.
- To upgrade ***speedy***, choose ***Upgrade Device...*** in its contextual menu, check desired options, click OK.
- To process ***Vouchers***, choose ***Pay>Online Via Vouchers*** in the ***Shopping Cart***. Enter codes on separate lines.
- To process ***Coupons***, use ***Commerce*** menu > ***Coupon Manager***. Enter codes in the top box, click the ***Add*** button, and the coupon is recognized. 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. Change execution order by dragging function blocks up or down the list. In this picture, ***ENC1 Speed*** function block is moved so that it is 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®.

- Configurations are stored in the **drive.web** devices.
- **savvy-SFD** upgrade is required to edit or build **savvyPanel** systems.
- **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.

Get savvyPanel free from the Apple App Store℠

- 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.
- Explore the demo with **savvy**. Select ***File*** menu> ***Demo Mode > Discover Internet Demo Devices***.

savvyPanel Pages

Systems Page where multiple **savvyPanel** systems are present.

- A **savvyPanel** system may contain tiles from many **drive.web** devices.
- A **drive.web** device contributes 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. Page name appears in window title bar.

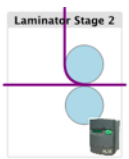
savvyPanel Tiles

Parameter Tiles - Touch a settable parameter to set. Setter includes slider, keypad, 1x and 10x increment and decrement, return-to-default, and revert.

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.



Apple, iOS, iPad, iPhone and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a a service mark of Apple Inc.

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.

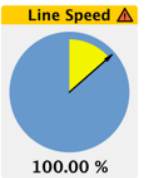
Latch and ***SR Latch*** - For lighted start-stop pushbuttons.

Setpoint & Monitor - Adjust meter and setter range. Dual blocks enable dual-display meters.

Enumerated Parameter - 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 with a warning symbol. The tile 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 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.

- Find Modbus specifications - http://modbus.org/specs.php

speedy Comms Server *dwOption-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.

dwOption-04 ModbusTCP/IP slave/server

- Supported Modbus Function Codes; 1 thru 6, 15, and 16.
- Supports up to **five simultaneous clients/masters**.

dwOption-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.
- 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 Training Courses

Free online interactive training seminars take about one hour.
Specialized online and factory training sessions are also available.
To register email **training@invertekdrives.com.au** or call.

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