drive.web
speedy ®

Distributed Process Controller

model *dw221*

Installation & Operation Manual

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.

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 page 11.

dw221 is for PL/X-Series Digital DC drives with **firmware version 6.12 or higher, only.**

speedy standard features

- *drive.web* distributed process control.
- 10/100Base-T(X) Ethernet, page 6.
- Update firmware with *savvy* software.
- Promotes PL/X drive control software updates.
- Fitted onto the PL/X control board.
- 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*.

speedy Stock Controllers

Standard option packs are ordered 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 libraries to -1121.

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

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.

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.

speedy Installation Procedure

Warning! Risk of electric shock resulting in injury or death! PL/X drive is powered from more than one source of high-Voltage electricity.

Only qualified personnel should proceed with installation!

Risk of damage to equipment if installed improperly!

1. Ensure all electricity sources are removed and isolated.
2. Ensure that you and the equipment are grounded with ESD control equipment.
3. Loosen the thumb screws and remove the upper and lower terminal covers.
4. Locate and remove the four Philips head screws that hold the PL/X display-keypad-cover assembly in place. A long-shank #2 Philips head screwdriver is recommended.
5. Gently lift the cover and display assembly and rotate it upwards and away from the drive. **Support the assembly** above the drive so that you **do not strain the two ribbon cables.**
6. *dw221* locates at the lower left corner of the PL/X control board.

PL/X control board with *dw221* installed.

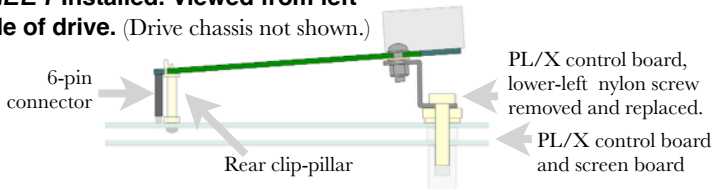(Display assembly removed.)

Do not remove this screw.

7. Remove the nylon screw at the lower-left corner of the PL-series control circuit.

speedy **Installation Procedure** continued...

8. Carefully install **dw221**, using the rear clip-pillar as a guide, while ensuring that the 6 pins on the PL/X control board are inserted into **dw221's** connector.

dw221 Installed. Viewed from left side of drive. (Drive chassis not shown.)

6-pin connector

Rear clip-pillar

PL/X control board, lower-left nylon screw removed and replaced.

PL/X control board and screen board

9. Double-check the 6 connector pins are properly aligned and inserted! Misalignment may cause permanent damage!

10. Thread the nylon screw into the PL/X control board mounting hole, and tighten. This is the lower-left hole that was revealed in step 7. above.

11. Re-install the PL/X display-keypad-cover assembly and the four attachment screws.

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. When using WinXP or other obsolete operating systems, contact us for details before plugging-in to USB.

Some *savvy* functions are not available via USB. You can not change IP addresses, or other network settings.

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.

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*.

Get started with *savvy* continued...

***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 the ***speedy*** and it packaging is its ***MAC Address***.

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

- A PL-Series icon should appear with IP address beneath. The graphic depicts the actual frame size of the drive.

192.168.1.71

- 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

Get started with *savvy* continued...

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.

- *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.

- *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

Laminator Stage 2

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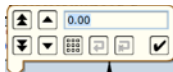
**Click blue connection block or arrow** to jump to other end.

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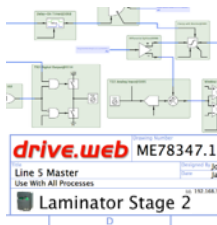
savvy-SFD **Signal Flow Diagram Upgrade**

- 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*.
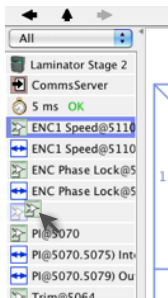
savvyPanel Operator Station

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℠

- 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***.

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.

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.
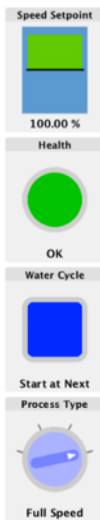
savvy overview

- • • • • *savvyPanel* System Example
- – – – – (dashed line legend)

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.

Extruders Management   A1 Extruder   Polymer Co-Extrude

Upper Rewind   Fast Unwind   Air and Water

Navigate Up Arrow

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*

Extruders Management **Overview**

Comms Server   Function Block Engine

Extruders Management **Function Block Engine**

savvy-SFD

SFD Note may be set up as a *savvyPanel* link

Operator Link
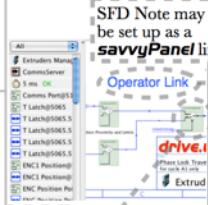
drive.

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

SDI(0) Input 0
100.65 %

SDI(0) Input 1
100.00 %

SDI(2) Output
100.00 %

SDI(0) Select
Input 1
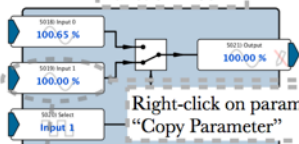
Right-click on parameter, "Copy Parameter"

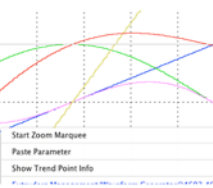Right-click on parameter "Add to Parameter Dock"

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.

Extruders Management Adder@4680   Extruders Management Waveform Generator@4691

115.42 %   20.06 %

Extruders Management 2-in Switch@16218   Extruders Management Pick@693

115.42 %   100.00 %

Dock menu > Show Trend

Start Zoom Marquee
Paste Parameter
Show Trend Point Info

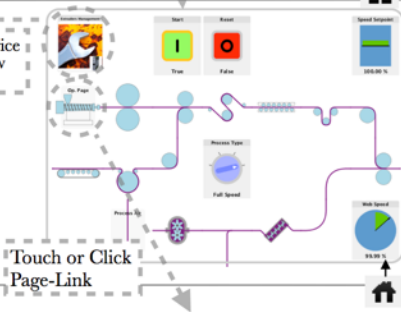# *savvyPanel* overview

Extruders West **Unwind / Rewind**

savvyPanel
Systems

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

Touch or Click

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.

Systems Button.
Requires Home Password if set.

Home Page

Touch Device
Tile to view
the SFD

Start **Reset**

I **O**
True False

Speed Setpoint

100.0 %

On Page

Process Type

Full Speed

Web Speed

99.99 %

Process

Touch or Click
Page-Link

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.

Home Button.
Requires Home Password if set.

Operator Pages

System OK **Speed Setpoint** **Home**

85.44 %

Right-click in an empty
grid location and,
"Paste Parameter".
Choose desired graphic. e (1)

Melt Temp.

112.59

°C

Web Management

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.

Graphic Tiles Create diagrams with a variety of 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* support 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.
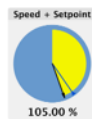
savvyPanel launch, setup and important notes

- 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.

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

speedy Ethernet Server Options 04 & 25

Warning! Use of *speedy* options **04** and **25** may cause motors and machinery to energize with high Voltages or start or operate in unexpected, dangerous, or lethal ways. 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.

● **Note!** You cannot write or force parameters that are read-only or have incoming *drive.web* connections.

● *Comms Server Indirect* parameters are sequentially numbered. Enter any parameter numbers to read or write them with one operation. Click the *Comms Server* button or add more sequential parameters with *Comms Server Indirect* function blocks in the *Utility* list set. You can directly address any numbered parameter in your function block engine. You are **NOT** required to use *Indirect* parameters.
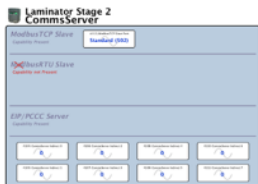
speedy Option 04 ModbusTCP/IP Slave/Server

● For Modbus specs go to http://modbus.org/specs.php

● *ModbusTCP Slave Port* 502 is the standard specified in the protocol. You may change this to match the master in the unusual case that it is non-standard.

● 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.**

speedy Option 06 *Winder Control* Library

Accurate speed calibration is essential for commissioning.

Diameter Calculator Associate in *Taper Tension* and *Torque Compensator* blocks.

Taper Tension Change web tension as diameter changes.

Torque Compensator Block Set Forward/Reverse friction compensation, Unwind/Rewind modes.

# *speedy* Option 36 *Motion Control* Library

Trapezoid Motion Block Set accel and decel rates, max speed, nominal time, and tuning. Provides optimal speed setpoints to move to the setpoint.

Cam Profile Block Graphic cam editor in which Y-axis represents the *Output* value for any X-axis *Input* value.

2-Axis Closed-Loop Position w/ Touch-Control Example

Requires **dwOptions-05-26-36**, Process and Motion Control libraries, and **savvyPanel**.

Moves are controlled by a single **savvyPanel** position setter. The second axis follows a cam profile of the main axis with an additional **savvyPanel** trim.
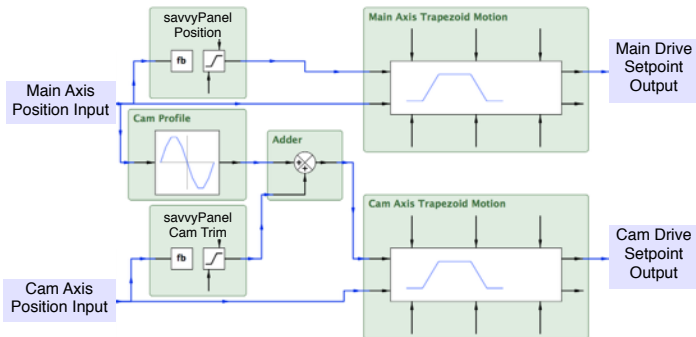
drive.web Product Line Highlights

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

- Options; serial-ports, +six digital inputs, freq. I/O, dual stepper, dual encoders with line shaft, 115VAC I/O

savvyPanel Touch Hi-resolution, *drive.web* operator panel.

- Model *dw230* is 7" diagonal.

savvy-SFD Signal Flow Diagram, pg. 12.

savvyPanel operator panel app, pgs. 13-17.

drive.web products are designed & assembled in the **USA**.

Get *drive.web* help. Call or Email **techsupport@driveweb.com**

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@driveweb.com** or call.