Hi-Z Antennas™
Receiving Array Controller
With an OLED Display and USB Control

Modern Directional control for ALL Hi-Z Antennas Receiving Arrays

Direction Control With Fully Continuous Rotation Rotary Encoder

Crystal Clear Readout Using an OLED Display

Direction Control Utilizing Most Popular Logging Programs and USB

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1 Introduction

T hank you for selecting the Hi-Z Shack Switch-2-PLUS system. The Hi-Z part number "HIZ-SS2-PLUS" represents a new concept in technology. This controller is built specifically for controlling your Hi-Z Antenna Receiving Array. You can use this controller stand alone or with external USB direction control. At the heart of the controller is a microprocessor, a graphical display, and a control knob. The control knob is used to command the antenna array to select an azimuth direction, for configuration, diagnostics, and enabling special features. The controller has a graphical display that shows the selected azimuth direction and additional user configurable information. A USB interface is used to power the controller and accept direction commands from a user's computer program. The USB connector powers the microprocessor and its display while also providing a communication path with a typical Antenna Control and/or Logging program. USB power is still needed when the controller is used without computer direction control. Hi-Z has designed and proofed this product to work under the Windows operating system. The USB driver we recommend is suitable for Windows only and is not needed in Windows 10. Our understanding at this time is that Mac and Linux drivers can be downloaded at https://www.pjrc.com/teensy/td_download.html . Hi-Z Antennas does not have the resources to verify Mac or Linux drivers for the Teensy processor.   We also do not have verification of any programs that use the DeFacto standard Yaesu GS-232 rotor control using Mac or Linux operating systems. Hi-Z uses this standard for USB communication.
You may E-mail contact@hizantennas.com for the latest information we may have.

There are many quality QSL Logging and Antenna Control applications available to the ham community. This product provides hams using a logging or rotator control application to remotely control the direction of their Hi-Z Antenna Array.

    An Example of a quality direction control program would be the PstRotatorAz program. Tried and True at Hi-Z among many others.

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2 Jumpstart, or "Real Hams Don't read manuals"

Very important reading before operating your HIZ-SS2-PLUS system:

What's in the box: Controller with display, knob, a terminal strip on the rear, a rear Micro USB B input connector, an installation CD, PLUS a copy of this manual.

Before connecting the HIZ-SS2-PLUS system to your computer or array it would be prudent to try this controller by simply supplying it with power from a Cell phone charger or cell phone backup battery or any wall type USB supply. The cable to use is a USB A to USB Micro B cable. This cable is typical of the ones used to charge cell phones.

Do not connect this controller to your computer yet unless you have Windows 10 operating system. The reason is a driver should be installed in older systems before connecting the controller to the computer. If you absolutely must use a computer for the first operation and it is an XP, Vista, Win 7 or 8 machine then proceed to the driver install section below to install the driver before plugging the HIZ-SS2-PLUS controller into the computer.

Assuming you have powered the controller you should see an initial screen saying Hi-Z Relay and the software version presently installed. After a brief moment of this the display will switch to our pre-programmed setting for a Hi-Z 4-8 Pro array. Notice as you rotate the knob the direction indication will change through all 8 of the directions available with the 4-8 Pro array. If you are watching the display for 15 minutes without making any selection the display will be reduced to a single dot that jumps around the screen like a screen saver. Turning the direction control or a request from a computer will restore the screen to normal.

Press in on the direction knob and you will see the screen change to a set of directories like "Set Antenna Type" or "Dir or Angle" and more. These directories are for setting up the controller for all of its programmable functions. For the moment select "Set Antenna Type" by rotating the direction knob. Depress the knob again and as initialized by Hi-Z you will see "4-8Pro". Rotate the knob and you will see the Hi-Z preprogrammed names of all the current Hi-Z arrays. You can select your array type now or leave it at the "4-8 Pro" setting. You select your array by depressing the button again after you have rotated the knob to your array type. The screen will then go back to the normal direction control display. The display will also time out and go back on its own from the programming directories if you
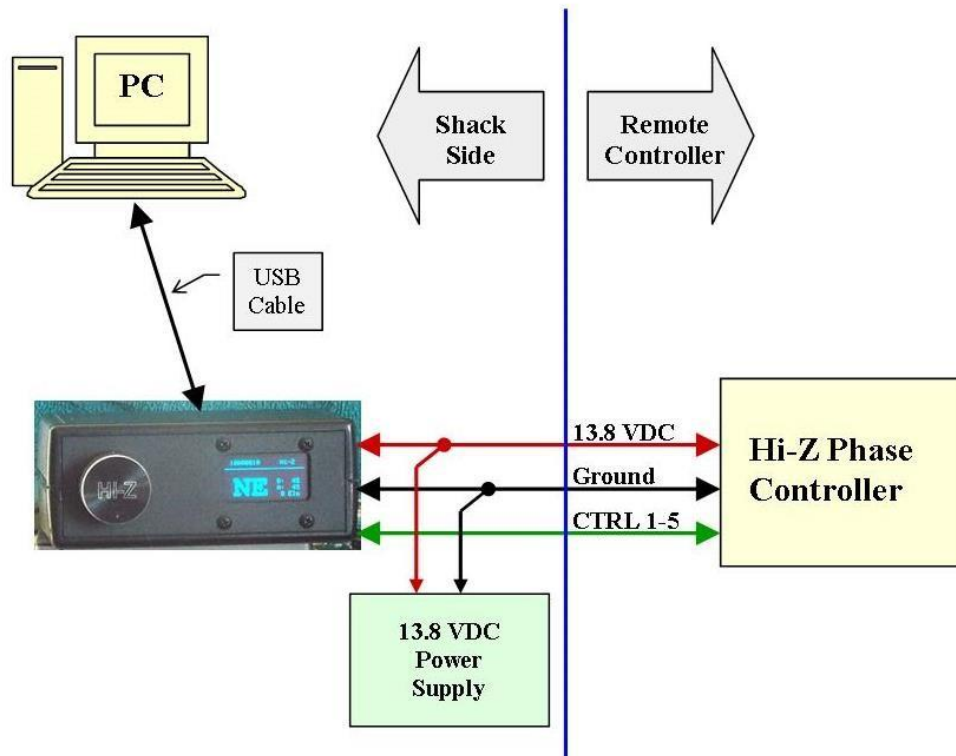
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wait too long to depress or select anything. Disconnect the USB power after the initial indoctrination of the controls.

Besides the 5 Volts the controller gets from the USB power you will need to supply <u>11 to 14</u> Volts from your shack supply or the same supply that runs the Hi-Z Array. This supply's minus or ground must be connected to the array ground. Either its feedline ground or a separate ground leading to the array. This is necessary because the HIZ-SS2-PLUS controller has an optically isolated division between your computer and the Hi-Z array that extends into the antenna field for electrical event protection.

3 Connecting the Wires

The rear connector is labeled so that you can easily connect the 12 Volt supply and ground as well as the necessary and the CTRL lines needed by the array. The controller's connector is numbered exactly as the array CTRL lines are numbered so they can easily be transferred from a shack switch retrofit or new array install. Consult the Hi-Z array manual for CTRL wiring.

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So go ahead and connect the 12 Volt supply at this time and also the CTRL lines coming from the array. Connect the USB power but not from the computer yet, and watch the new controller initialize and become active for direction control. If you did not select your intended array to control in the previous steps, depress the direction control knob and select your array now using the previous description of the programming directions that ends with a knob depress. You should be able to control your array's direction easily at this point using the direction control knob.

4 Programming

All basic programming of the HIZ-SS2-PLUS begins with a push of the direction control knob and ends with the same push after making a selection. All the programming functions below assume the SS2-PLUS has been powered up either by a USB supply or a computer after it has been set up for USB drivers. All programming will remain in effect when the controller is powered off and it will return when the power is restored. Once you have selected a function and then a Sub function you can escape without any changes by pressing the Hi-Z knob for 3 seconds and then releasing back to the Direction screen.

Here is an example using the <u>Hi-Z Knob</u> for a programming sequence.

| Direction Screen | Set Antenna screen | Set Antenna screen | Back to Direction Screen |

5 Set Antenna Type

First, push the Hi-Z knob which brings up the directories of all the programming functions. Rotate the Hi-Z knob until "Set Antenna Type" is viewed on the screen. Depress the Hi-Z knob again and you will see one of the Hi-Z arrays description displayed. Rotate the knob until you see the correct array you are programming the controller for. Depress the knob again and the array will be set into memory and the screen returns to the normal direction readout screen. Check the upper left corner or bottom right corner of the screen where you will see the selected array type.

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6 Dir or Angle

The direction readout on the screen can be set for compass directions such as N,NE,S,and SE etc. or in degrees such a 0, 90,135, or 270 etc. The available directions or angles will depend on the Hi-Z array's available angles. This controller is shipped pre-programmed for compass directions and to change it, again a knob depress and rotate the knob until you see "Dir or Angle". Depressing the knob again brings up the current setting and rotating the knob allows you to set Direction or Angle. After this selection a knob press takes you back to the normal direction readout screen.

7 Set Offset

If you have installed your Hi-Z array off axis of a normal compass heading such as North, Northeast, 90 Degrees etc. you can offset the controller to match your offset. To enter this mode push the knob and rotate it until you see "Set Offset". Pressing the knob again you will see "-Value and below it a number. The number is the value of the offset in degrees. You can adjust this positive by clockwise direction or negative in the counter clockwise direction. Set in your number of degrees offset and again push the knob to return to the normal direction readout screen. When you return to the direction screen look at the two sets of numbers Starting with "R" and "A". "R" means the Requested direction in degrees and "A" means the Actual direction the array is pointing. This part of the display reads in degrees regardless of the Direction or Angle setting for the direction readout.

8 Auto Rotate

The "Auto Rotate" function allows this controller to continuously step to each available direction automatically. It can rotate "CW" for clockwise with the array viewed from above or "CCW" for counterclockwise viewed from the top. Again to enable this function, press the Hi-Z knob and rotate it until the "Auto Rotate" function is displayed. Press the knob again and rotate the knob for three choices "CW", "CCW", or "Stop". Select the direction you want and again press the knob and you will return to the Direction display screen with "Auto Rotate" enabled. The controller will continue to step through each direction available with the array selection until the Hi-Z knob is pushed again. One simple knob press returns you to the direction screen when using "Auto Rotate"

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9 Enable Flip

The "Enable Flip" function allows the operator to select the opposite 180 degree direction of an array to be selected with a simple depression of the Hi-Z knob. The knob can be repeatedly pressed after the function is enabled to flip back and forth between two 180 degree different directions until this function is disabled. To enable this function depress the Hi-Z knob while in the normal direction readout screen which will bring up the function directories again. Rotate the direction knob until "Enable Flip" is displayed. Press the knob again and you will see the current state of the function. Rotate the knob until you see the Enable the flip function. Depress the knob again and you will be returned to the normal direction readout screen. Now you can repeatedly press the knob causing the array to shift between two 180 degree different directions. You can still rotate the direction control and flip between two different 180 degree flip directions. To stop this function depress the Hi-Z knob for 3 seconds. When you let the knob up it will return the controller to the Direction screen.

10 Display Sig

The "Display Sig" function allows the user to set what items are displayed in the upper left corner of the display. There are 3 items available to display there. One is "Ant Type", another is "Relay" and the other is "None". If you select "Ant Type" the display simply shows the current Hi-Z array selected for control. Selecting "Relay" will fill the upper left area with 8 numbers either 0 or 1. These numbers show the state of the actual output switches that control whatever array or user device is connected to the controller. A "0" indicates the switch is off and a "1" indicates the switch is on. The internal switches switch the output to Ground when activated. To select what you want displayed in the upper left corner of the display depress the Hi-Z knob and rotate it to "Display Sig" Depress the knob again and you will then be able to rotate it to select the three functions. Once you have pressed the knob for a function you will return to the normal direction readout screen. With your selection displayed in the upper left corner of the display.

11 Display Adv

The "Display Adv" function allows the user to turn on or off three items in the lower right corner of the direction readout screen. The "R:" item is the requested direction in degrees either by computer or if using "Set Offset". Requested can be different than what is available for a given display so the "A:" item reads out the actual direction the array is reading as opposed to the "R:" requested direction. The other item included in the lower right corner is the Hi-Z array currently selected for control. To select having or not having

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the lower right corner readout depress the Hi-Z knob and rotate it to "Display Adv". Depress it again and you will see "Enabled" or "Disabled" by rotating the Hi-Z knob. Once you have selected your preference depress the knob again and you will return to the normal Direction display screen.

12 Display Off

The "Display Off" function allows the user to set the time that the screen saver will take before turning the display to a dim single dot jumping around the screen. The time can be set for many values between 15 minutes and three hours. It can even be disabled by this function. These organic screens are new technology and their lifetime may be affected by long term high brightness use. To be on the safe side we have included the screen saver function. To select the time of the screen saver time out or to disable it depress the Hi-Z knob and rotate it until you see the "Display Off" function. Depress the knob again and the current value of time will be displayed. Rotating the knob will then bring up all the values available including the "Disabled" one. Select the value you want and depress the knob again and you will be back to the Direction readout screen.

13 Display Brightness

The "Display Brightness" function does exactly what it says. There are 5 values of brightness available with the factory default value being BI=3. To access the "Display Brightness" function depress the Hi-Z knob and rotate the knob until you see "Display Brightness". Depress the knob again and the screen will change to where you can see "BI" and a "BV" values. Rotate the knob to change between the 5 BI values available. This is no place for "All Knobs To The Right". The factory default is BI=3 and in normal room light the display is quite readable. Again, these OLED displays are new and the lifetime is unknown so be gentle with your selection of BI value. Depress the knob and you will return to the normal Direction display screen.

14 Force Outputs

The "Force Outputs" function allows the user to control the unused switches out of the 8 available. Each Hi-Z array uses a different amount of CTRL lines which leaves some unused. These are available to switch 12 Volt devices with a grounding switch. Current is limited to 100 ma. To force an unused switch to off or on depress the Hi-Z knob and rotate it to "Force Outputs". Depress it again and the screen will show a matrix of the switch connector output number and below it a 1 or zero to display if it is off or on. The numbers with an "X" below them are the switches used for the particular Hi-Z array

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selected. To change a bit rotate the knob and an arrow will move below a switch number that can change state with the press of the knob. Turning the knob to where the arrow is off the edge of the available switches will cause "Exit" to show where depressing the knob will return to the normal direction screen. Setting the "Display Sig" function to show the "Relay" output states is very useful when forcing the outputs.

15 Rly Test, Walking 1s

The "Rly Test Walking 1's" function is a diagnostic test mode that allows a user to verify switched outputs quickly. This function allows all 8 of the switched outputs to be switched to ground in a sequential manner. The outputs will switch for a 1 second period then advance to the next higher output connector number. It will continue to switch through this sequence until stopped. To enable this function depress the Hi-Z knob and then rotate it until the "Rly Test Walking 1s" function is displayed. Depressing the knob again will start the function. Depressing it again will terminate the test.

16 Rly Test, Val

This function is a quick way to activate any one of the 8 switches at the output connector. As you rotate the Hi-Z knob when this function is enabled the unit will switch any of the available outputs to an on state for testing purposes. To select this function, depress the Hi-Z knob and rotate it until the "Rly Test, Val" function shows. Depress the knob again and then when you rotate the knob you can select any individual switch to an on state. Depressing the knob again disables this function and returns you to the direction readout screen.

17 Display Volt

This function allows the user to measure the voltage supplied by the USB power source. It allows you to make sure the source and the cable in use is supplying the proper 5 Volts as it should. To select this function depress the Hi-Z knob and rotate it until you see "Display Volt". Press the knob again and the unit will show the actual voltage being supplied by the power source and cable. Depressing the knob again disables this function and returns the unit to the direction display screen. The voltage reading should be between 4.75 and 5.25 Volts DC. Values lower than this may be an indication of a bad USB cable and normal operation may be negatively affected.

This concludes the preparation and programming of the HIZ-SS2-PLUS Shack Switch replacement. This product is ready to use if you are not intending to use USB external

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direction control. The next sections deal with setting up the USB connection on your computer.

18 Installing The USB Driver

Again, it is not necessary to install the driver for Windows 10 and above. However it is necessary to use the install program for Windows XP, Windows Vista, Windows 7, and Windows 8. This driver installation program is provided on the CD packaged with this system. The program is called "serial_install.exe". This program can also be found at the web address http://www.pjrc.com/teensy/serial_install.exe . To access the program on the CD, put the CD in your computers CD drive. If it does not ask you what you want to do, then proceed to look in your directories until you find your CD drive and its contents. Once you find "serial_install.exe" just double click it and then tell your computer its OK to let the program run and make changes. Hi-Z's liability is limited to the cost of the Hi-Z product when any Hi-Z customer uses this CD where damage is claimed.

Once the driver is installed and the HIZ-SS2-PLUS is connected to the computers USB for the very first time it is IMPORTANT to give the computer ample time to read the USB port and access the proper driver. Sometimes this can take a minute or more on the very first connection to a USB port. After this has settled down it should be time to access your rotor or direction control program. It is our experience that Windows is kind of finicky about USB ports. We suggest that you start with the exact USB port that you will use and not change. In some cases one has to uninstall the driver and reinstall it again when changing USB ports.

19 Solving USB Driver Problems

Occasionally Windows in some of the older versions will have difficulty loading drivers such as used with HIZ-SS2-PLUS shack switch replacement. This is where the Device Manager program, standard in your Windows operating system will become your friend. There are a couple of ways if not more where you can find this Windows program. Likely the simplest way is to left click on the START button which will bring up lots of starting options. Control Panel should be one of them. If not then Search for the control panel. It should show up and sometimes the actual goal "Device Manager" may show up

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during this search. On some of the older systems you can click on the Start window and then you type control panel in the space, hit enter and it will bring up the Control Panel.

Once you have brought up the Control Panel, Device Manager should be one of items available. If it is not then click on Administrative Tools, then click Computer Management where you will then be able to click on Device Manager. Then you should be able to see the list which should include one of these, USB serial controllers, Other Devices, Ports: Com and LPT. and more. It is in one of these places that the normally installed Driver will show up. If a device shows up here as not installed correctly it will usually be highlighted with a message or a yellow color. You can plug and unplug and then replug the HIZ-SS2-PLUS and watch for the Teensy device to appear and disappear from the list which indicates you have identified the SS2-PLUS needing driver assistance. Just remember to give the computer up to a minute to find a driver after making changes to the device manager object.

Here is a device manager display showing the "Teensy USB Serial" device and its assigned com port when installed correctly. Double clicking this item will allow driver changes or uninstallation.
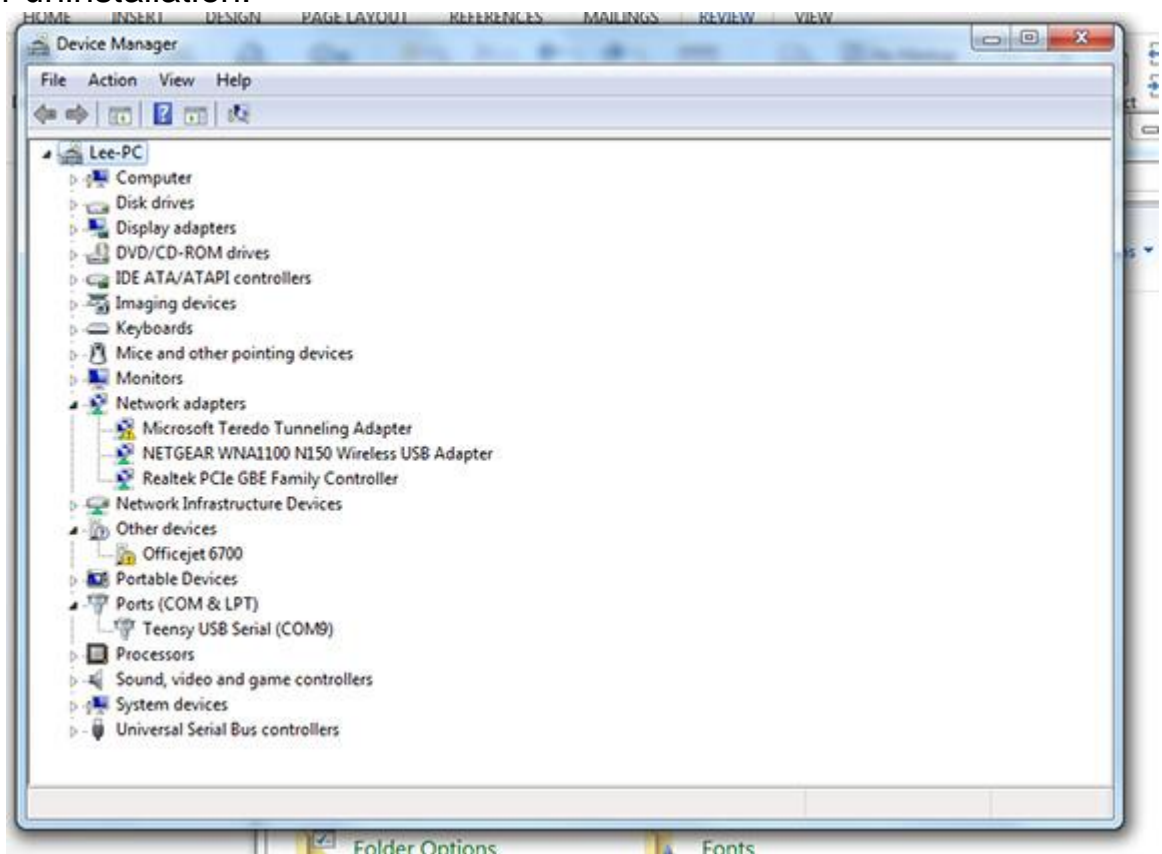
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It may be necessary to uninstall this device at the Device Manager and then install the driver again from the disc supplied or the web address. Then plugging the SS2-PLUS back in again. Inability to get the device installed correctly may require using a different USB port Then if necessary installing the driver again. Double clicking the device that the computer has recognized when plugging the SS2-PLUS into the USB port will bring up the necessary screen to update the driver or uninstall the device. Because the Teensy driver as supplied is a clickable program rather than a data file it must be ran from the CD or web address supplied before plugging the SS2-PLUS into the USB port again. Sometimes after running the driver install program it may be necessary to tell the computer to search for the driver. This is done after double clicking the Teensy USB Serial item in the Device manager. Once the port is working it will then display what com port number is assigned the Teensy USB Serial device. Jot it down for use with any external direction controlling program.

We have not had any real difficulty getting the driver installed to date. These tips and tricks are in hopes of warding off possible problems. To avoid further problems and to keep Windows happy it is advised to continue to use the same physical USB port. The following port settings are usually windows default values, but should be verified and then used for configuring your logging and/or rotor control program.

Bits per second: 9600, Data bits: 8, Parity: None, Stop bits: 1, and Flow control: None.

Once the driver is installed correctly you are ready to have an external program control the SS-2-PLUS.

20 Connecting to Your Favorite Application

The software developed for the Hi-Z USB OLED Controller is designed to use the Yaesu GS-232 protocol. This is a very common rotator protocol that most logging and rotator applications support.

You must plug in the SS2-PLUS before launching your control application.

When connecting a logging or rotator control application to the Hi-Z USB OLED Controller. You will need to configure the application to use the Teensy assigned serial COM port number. In Windows you can find the serial COM port number by viewing the Ports (COM & LPT) tab in the Device Manager. In your logging or rotor control application, select Yaesu GS-232 for the rotator type. And, you must input the com port obtained from driver installation. This is a standard protocol among many programs available. You are

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now ready to control your Hi-Z antenna array using your favorite logging or rotator control application.

NOTES

Thank You for selecting Hi-Z Antennas Products.
Find more information at www.hizantennas.com
Our products are handled exclusively through DX Engineering
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