SIGNAL RELAY - F SERIES

INSTALLATION GUIDE

The package includes the controller and this installation guide.

Description / Product Overview

This guide covers model numbers:

- ERM-FSU-24 equipped with an 902 MHz radio
- ERM-FSY-24 equipped with an 868 MHz radio

The ERM-FS controllers are intended for indoor use only.

The Signal Relay Controller uses wireless technology to monitor any room's environment and can be used to interface with Building Energy Management Systems or HVAC equipment. This translates into quick installations with less disruption to occupants, allowing facilities to accelerate retrofit schedules and start saving money sooner.

The controller has patented Smart Click and Simple Tap technology which allows installers and facility operators to manage configuration settings without any special tools.

The package includes the controller and this installation guide.

Signal Relay Operation

The signal relay (also referred to in this guide as “the controller”) will activate the dry contact relay with received input from a linked sensor or switch.

As a signal controller, it operates the relay based on:

- ambient light levels monitored by an wireless photo sensor
- occupancy state monitored by a wireless occupancy sensor
- switch action from a wireless single or dual paddle wall switch
- switch action from a wireless key card switch
- switch action from a wireless door/window switch
- gateway control implementing schedules or other events

Remote Devices supported by the signal relay

Device	Models
Wireless switches	PTM265, ETRS, ETRH,PTM265KC
Light Sensors	TAP models
Motion Sensors	ROS, MOS, RVS, RCS, OWS
Door/Window switches	MC models

Controller and Wall Switches

The signal relay controller works with the wireless single and dual rocker switches. A switch ON action activates the relay closed and the OFF action opens the relay.

Tip: To link a wall switch to the signal relay- Put the controller in Learn Mode and activate the switch three times ON in succession (See LEARN Button -pg 6).

Controller and Timed Switches

The controller can be configured so the single and dual rocker switches become timed switches. An ON action closes the relay and a timer is set to count down. Once the timer expires, the relay opens.

The time period is configurable and has 5 settings: no timer (default), 5 minutes, 15 minutes, 30 minutes and 1 hour. Additionally, if the user presses the wall switch ON multiple times (to a total of 5 presses), the timer interval is added for each ON press. If ON is pressed while the lights are on and the timer is counting down, an additional period of time is added to the timer total.

For example: if the timer setting is 1 hour and the user pressed the switch ON twice, the total timer period is 2 hours. If there is 30 minutes left on the timer and ON is pressed again, the timer is extended to 1 hour 30 minutes before the relay will open.

The controller will toggle the relay (flick-warn) 1 minute before the timer is due to expire to warn users of the pending OFF event.

To configure the time period, refer to the section on ”Configuring the Controller”.

Controller and Key Card Switches

The key card switch is common in hospitality applications for indicating when the room is occupied by a guest. The key card used to unlock the door is inserted into the switch, the controller will close the relay. The controller can be used to set HVAC equipment like PTAC units into a occupied operating mode. When the guest leaves and the card is removed from the switch, an egress timer will expire and the relay will open setting the unit into set-back mode. The egress timer default is a 30 second timer. This value can be changed using the Garibaldi configuration software.

When used for this hospitality application, it is not advised having other devices linked permanently (other than a wall switch) to the controller as this may result in unintended results.

When multiple key cards are used with one controller and any switch is active with a card inserted then the controller relay will remain closed. All linked switches must be inactive before the controller opens the relay.

When linking a key card to the controller, activate the switch three times in succession with the controller in LEARN mode.

Controller and Window Switch

The MC-21 switch is a proximity (reed) switch and when linked with the controller, can open or close the relay. The relay will close when the switch is closed, opening the relay when the switch is opened after a timer expires.

NOTE: Using the switch in this application, link the switch to the controller with the magnet apart from the switch.

This is useful for temperature control applications where the temperature equipment is disabled when a window is left open. For lighting applications that require a light to turn on when a door is opened (closet or storage room), the relay action can be inverted. The relay inversion and timer value are configurable via simple tap, see the section titled “Configuring the Controller”.

Occupancy Based Lighting Applications

The controller will open the relay when there is no motion detected in the room indicated by a linked wireless motion sensor.

Occupancy sensors only: When only occupancy sensors are linked to the controller, the sensor will activate the relay closed on occupancy, open on vacancy.

Occupancy sensors with switches: When switches and sensors are linked, the controller will activate the relay closed on a switch ON action and open on vacancy.

Room Occupancy State Latch: The MC proximity switch can be used on an entry door to trigger a door open-close event. Used together with a linked wireless motion sensor, the door event triggers a latch of the room occupancy. The controller will latch the room occupancy state with receipt of two motion sensor telegrams (4 to 5 minutes after the entry door open/close event).

After the room has been latched as occupied, only another door event can clear the latched state. If the room is latched vacant and an occupied telegram is received from the sensor, the room state will latch occupied.

This is an alternate solution to the key card application for dormitory or hospitality projects for defining room occupancy state.

NOTE: To learn the door switch as an entry door occupancy trigger, link the switch to the controller with the magnet in place next to the switch.

Daylight Harvesting Application

The controller will open or close the relay based on a set point and the ambient light level in the room. A wireless photo sensor monitors light levels and must be linked to the controller to provide the light level in the room.

When the controller is configured for daylight harvesting, the set point is where the relay closes. The relay open set point is 20% of the sensor Full Scale Range (FSR) greater than the relay close set point.

NOTE: The TAP light sensor is designed to be mounted indoors to monitor reflected (not direct) natural light levels.

Open Loop Daylight Control example: Mount the wireless light sensor so it is facing downwards and monitoring reflected natural light. The TAP light sensor has two ranges; 0-500 lux (0-50 foot-candles) and 0-1024 lux (0-100 foot-candles). The daylight control set point default value is 60% of the sensors full range. If the sensors range is set to 500 lux (50 FC), the controller will turn the lights on when the sensor records 300 lux (30 FC) and will shut lights off at 80% or 400F lux (40 FC), see below.

Setting the set point is covered later in this document under “Configuring the Controller”. The daylight harvesting application will override the Auto-ON feature of occupancy sensors if the light level is sufficient and calls for the lights to be signaled off. The daylight harvesting application can be overridden by a manual wall switch when the light is off by clicking on. If the light level remains above the Light-OFF-Set point, the controller will signal to turn the light off again after 250 seconds (open the relay). The daylight harvesting application does not affect the operation of the wall switch or motion sensor when the light is on. If the light is on, either the switch or motion sensor can signal to override the light off.

See the section on Occupancy Based Lighting Application - Photo-inhibit for alternative functionality.

Radio Range Confirmation

The controller includes patent pending technology that interfaces with specific sensors to indicate the radio strength of the sensor signal received at the controller.

To evaluate the radio single strength, the sensor must also support the test and be linked to the controller. Do not have any repeaters in the controllers vicinity enabled during the test.

Sensors supporting the radio range confirmation test include:

- Temperature sensors, RTS
- Occupancy sensors - RVS,RCS, OWS, ROS and MOS models
- Photo sensors - TAP models
- Window/Door switches - MC models

The range confirmation test is invoked at the sensor and sends unique telegrams to the controller. The controller will evaluate the signal strength from the sensor and send back a unique telegram containing the strongest signal value received. This value is displayed at the sensor using color LEDs.

Consult the sensor installation guide for more details.

Preparing to Install the Signal Relay

The controller may be installed in a non-metallic electrical junction box or affixed with double sided tape to a non-metallic surface close to the 24 VAC/DC power supply. A pin or pen is needed for pressing the controller buttons when assigning the wireless switches or sensors.

Installing the Controller

For best results, the controller should be installed were radio signal are not impeded by metal surrounds or obstacles.

The orange antenna wire should be placed considering obstructions of radio signals. Use tape to hold the antenna in place if needed. Avoid running the antenna along any grounded metal plating. For the best results, the controller should be mounted in a non-metallic electrical junction box. Consult your electrical code requirements.

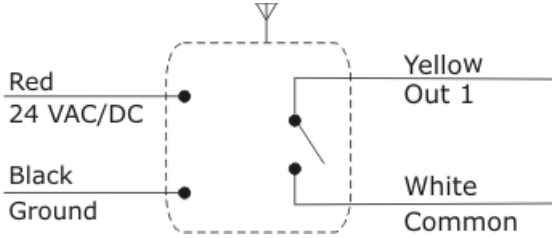
NOTE: The controller should only be installed in an indoor location.

TIP: To link the first switch; triple click a wireless wall switch 3 times ON, followed by triple click OFF, then again triple click ON, all within 5 seconds. Use this switch to verify the controller relay is turning the load on and off.

TIP: For wall box applications, use a wall switch back plate (Echoflex part PTM2651GF-W) and mount over the wall box. Install the faceplate over the back plate. This allows the antenna room to protrude from the wall and have better reception performance.

Wiring Instructions

The signal relays have a red (24+) and black (ground) wires for power input. They have a 3A dry contact output between the gray and yellow wires. Do not cut or cap the orange (902MHz radio) or blue (868MHz radio) antenna wire. Use only approved wire. Cap off all unused wires except the antenna wire.



Wire Specification Table

Connection	Color	Min. Size
Ground	Black	22AWG
24VAC/DC	Red	22AWG
Relay Output	Yellow	22AWG
Relay Output	White	22AWG

Power Supply: 24VAC/DC
Power Consumption: 1.0 W full load

Outputs
N.O. Relay rating 3A@30 VDC
LEDs - Clear and Learn

Diagnostic LED's and buttons

LEARN button

The LEARN button is used to link switches or sensors to the controller.

1. Press the button marked LEARN for a half second. In link mode the LEARN LED will stay ON and the POWER LED will toggle every 2 seconds.
2. Using the switch that will be linked to the controller, press the wall switch ON three times. If linking a sensor, press the sensors TEACH or LINK button, refer to the sensor documentation.. The POWER LED will remain lit for 4 seconds while it links the new device. It will resume toggling allowing you to link another device up to a total of 20 devices.

NOTE: Linking a switch or sensor that is already linked to a controller, will remove or un-link it from the controller.

3. To exit link mode, press the LEARN button on the controller again for a half second. Link mode will also time out after no activity in 30 seconds.

CLEAR button

The CLEAR button erases all devices linked to the controller and resets the controller to factory default settings. Press the CLEAR button (approximately 5 seconds) until the green LEARN LED blinks on.

LED Blink Codes and operation

The table below describes the LED activity & associated mode of the controller.

Description	Learn LED	Power LED	Relay
LINK mode	ON	Toggle 2 sec.	Toggle
Storing ID	ON	ON 4 sec.	ON 4 seconds
Clearing ID	ON	OFF 4 sec.	OFF 4 seconds
CLEAR mode	ON 1 Sec.	N/A	ON 1 sec.

Normal Operating Mode - number of long blinks indicates the linked device type followed by short blinks counting the number of devices linked.

Description	Learn LED	Power LED
Factory Default	OFF	ON Solid
Linked switch(es)	OFF	1 long blink followed by short blinks counting switches repeatedly
Linked occupancy sensor(s)	OFF	2 long blinks followed by short blinks counting sensors repeatedly
Linked photo sensor(s)	OFF	3 long blinks followed by short blinks counting sensors repeatedly
With Central Command	OFF	4 long blinks followed by short blinks counting switches repeatedly
Linked Keycard Switch	OFF	5 long blinks followed by short blinks counting switches repeatedly
Linked Entry Door Trigger	OFF	6 long blinks followed by short blinks counting switches repeatedly
Linked Door Switch	OFF	7 long blinks followed by short blinks counting sensors repeatedly

Configuring the Controller

There are a few methods of configuring parameters in the controller. Simple Tap is a quick method of changing a parameters setting, one at a time. For accessing the complete set of configuration parameters, use the Smart Click process on the following pages.

There are three methods of configuring parameters in the controller.

1. Simple Tap
2. Smart Click
3. Garibaldi Commissioning Software (not covered in this guide)

Simple Tap Instructions

Simple Tap is a quick method of changing a parameters setting, one at a time. For accessing additional configuration parameters, use the Smart Click process on the following pages.

Simple Tap uses the switches and sensors that are linked to the controller to set the associated configuration parameters. You must be able to access the sensors teach button or the switches to perform the simple tap process. If the sensor is linked to multiple controllers and you do not want to make changes to all, turn the controllers relay off (relay open) to ignore the Simple Tap changes. You must be able to monitor if the relay is open or close (feedback is required) for Simple Tap (ie: connect to a LED or use an ohmmeter to monitor relay's state).

Simple Tap allows you to:

- Enable or disable the motion sensor Auto-ON feature
- Adjust the motion sensor Auto-OFF timer
- Set the relay open/close set points for open loop
- Select Daylight Harvesting or Photo-Inhibit mode
- Invert the relay state response to the window switch
- Adjust the window switch timer

Disable/Enable the Auto-ON feature

1. Ensure the relay is closed (Light On).
2. Tap the occupancy sensors teach button followed by three quick consecutive clicks of a linked wall switch ON.
3. To enable Auto-ON, click once more ON, to disable click OFF. The relay will pulse (open/close- light will blink) once to confirm the change.

Adjust the Motion Sensor Auto-OFF Timer

1. Turn the light On (relay is closed).
2. Tap the occupancy sensors TEACH button to reset the timer period. There are 6 possible settings and the number of taps on the button counts the number according to the time period, see the table below. Level 1 (time out 0 seconds - demo mode) is set by tapping 3 times, consecutive taps up to a maximum of 8 taps is Level 6 (time out 25 minutes). The relay will pulse (open/close) once on the third tap and then begin counting the level set after 3 seconds.

Taps	Occ. Sensor Timer	Relay Pulses
3 taps*	0 sec.	1 blink
4 taps	5 min.	2 blinks
5 taps	10 min.	3 blinks
6 taps	15 min. DEFAULT	4 blinks
7 taps	20 min.	5 blinks
8 taps	25 min.	6 blinks

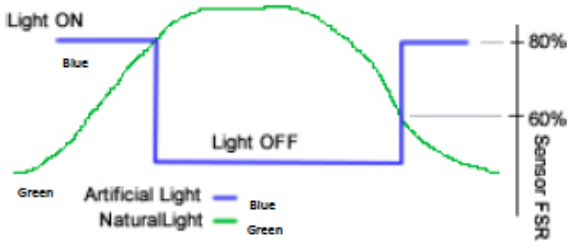
* for demonstration purposes only

Set the Lighting Set Point:

The controller can signal to turn lights on and off by opening and closing the relay based on the measured light level from the light sensor. The daylight harvesting set point is used to adjust how the relay responds to the relative light levels.

The daylight harvesting set point can be set to an absolute value useful in open-loop sensor applications. The set point value becomes the Light-ON-Set point, see the table below.

1. With the lights on (relay closed), tap the light sensors teach button 4 times to set the set point to 20%.
2. Tap the button additional presses incrementing the set point value by 20%. Five (5) taps would equal 40%, seven (7) taps would be 80%.
3. The light will blink (relay will pulse) once at three taps and then begin blinking according to the level set to confirm the change after 3 seconds.



Daylight Set Point

Taps	Light ON	Light OFF	Relay Pulses
4 taps	20%	40%	2 blinks
5 taps	40%	60%	3 blinks
6 taps	60%	80%	4 blinks
7 taps	80%	100%	5 blinks

Daylight Harvesting or Photo Inhibit Mode

You can select daylight harvesting mode (default) or photo-inhibit mode. For more information on the daylight harvesting mode, see the sections at the beginning of this guide titled Occupancy Based Lighting Applications.

Photo Inhibit: This feature requires a linked photo sensor. When photo inhibit is enabled, the Auto-ON feature will be ignored when the natural light level measured by the light sensor is above the daylight set point. The photo inhibit feature will not turn lights OFF if the lights are ON.

A light sensor and wall switch must be linked to the controller before proceeding.

1. With the light on, Press the photo sensors TEACH button once followed by clicking the switch ON three times within 5 seconds.
2. Either
   - click the switch once more ON to activate Photo-Inhibit operating mode.
   - or click the switch once OFF to activate Daylight harvesting operating mode.

The set point values are a percentage of the full scale range of the linked photo sensor.

Invert Relay State Response with Window Switch

When linked as a window switch, the proximity switch will open the relay when the switch is open, closing the relay when the switch closes and after the window switch timer expires.

To invert the relay state, the proximity switch and a wall switch must be linked to the controller.

1. Close the relay (by pushing the on side of a linked switch).
2. Press the door/window switches TEACH button once followed by clicking the switch ON three times within 5 seconds.
3. Either
   - click the switch once more ON to invert the relay state.
   - or click the switch once OFF to set back to default state.

Adjust the Window Switch Timer

1. Turn the light ON.
2. Tap the window switches TEACH button to reset the timer period. There are 6 possible settings and the number of taps on the button counts the number according to the time period, see the table below. Level 1 (time out = 0 seconds) is set by tapping 3 times, consecutive taps up to a maximum of 8 taps is Level 6 (time out 2.5 minutes).The relay/light will blink once on the third tap and then begin counting the level set after 3 seconds.

Taps	Timer	Relay pulses
3 taps	0 sec.	1 blink
4 taps	30 sec.	2 blinks
5 taps	1 min.	3 blinks
6 taps	1.5 mins.	4 blinks
7 taps	2 mins.	5 blinks
8 taps	2.5 mins.	6 blinks

Using Smart Click to Configure the Controller

Configuring the controller requires that at least one wireless wall or hand held switch is linked to the controller.

The Smart Click menu includes these parameters:

Level 1: Learn Mode
Level 2: Clear Switch/Clear All
Level 3: Repeater Function
Level 4: Status Telegram Function
Level 5: Time out Periods
Level 6: Auto-ON with Motion Function
Level 7: Not Used
Level 8: Lighting Set-point

Linking the First Switch

1. Press the CLEAR button until the green LEARN led blinks ON, about 6 seconds.
2. With the controller cleared or in the factory default state, click the wireless switch ON three times, OFF three times and ON three times quickly within 5 seconds. The red POWER led will begin a blinking pattern [one long followed by one short], see the section on LED blink codes.

Using this method of linking a switch will only work on the first wireless switch. Use the learn button or Smart Click to link additional switches.

Entering Smart Click Configuration Mode

It is important to have feedback (attached light) from the controller during configuration. Perform the configuration changes when the controller has been installed on a lighting circuit. The switch used to configure a controller using Smart Click should only be linked to the controller you're configuring. Add an additional switch if necessary.

Entering Smart Click Configuration Mode

1. *Using a linked switch (see above), turn the light OFF.*
2. *Press and hold the switch OFF until the light turns ON, about 10 seconds.*
3. *Press ON until the light blinks, about 5 seconds. The light will repeatedly blink once every 5 seconds* indicating it is at level 1 of Smart Click.

NOTE: You can exit Smart Click at any time by pressing OFF for 5 seconds.

Level 1 - Linking an additional switch or sensor

1. Enter ***Smart Click configuration mode*** and with the light blinking once, press ON for 3 seconds. The light will blink ON/OFF faster, once every second.
2. Add additional wireless switches by clicking the new switch ON 3 times quickly. Add sensors by pressing the TEACH or LINK button on the sensor.
3. Exit Smart Click by pressing OFF for 5 seconds.

Level 2 - Clear switches or sensors (restore factory defaults)

1. Enter ***Smart Click configuration mode*** and click the switch ON once so the light is blinking twice.
2. Press ON for three seconds.
3. Click the switch ON 5 times to clear the switch, click ON 5 times again to clear ALL switches and sensors and reset the controller to factory defaults.
4. Press OFF for 5 seconds to complete clearing and exit Smart Click.

Level 3 - Repeater Function - repeats any telegram within range.

The repeater function can be enabled/disabled by accessing the controller buttons.

1. Press the Clear button and hold then quickly press the Learn button once to disable, twice to enable single hop and three times to enable dual hop repeating. The learn LED will blink the corresponding value of the button press.
2. Release the Clear button.

If there is no access to the controllers buttons, follow the Smart Click steps below.

1. Enter ***Smart Click configuration mode*** and click the switch ON twice so the light is blinking three times.
2. Press ON for 3 seconds. If the repeater function is enabled the light will turn ON, if disabled the light will be OFF.
3. Click ON to activate this function, OFF to deactivate. There is no selection for enabling dual hop repeating with Smart Click.
4. Exit Smart Click by pressing OFF for 5 seconds.

Level 4 - Status Telegram - the controller can broadcast a status telegram per EEP A5-11-01. The telegram will broadcast every 100 seconds. The status telegram can be enabled/disabled by accessing the controller buttons.

1. Press the Learn button and hold, press the Clear button once to disable, twice to enable (this sends the learn telegram).
2. Release the Learn button. The learn LED will blink once when disabling, twice when enabling this telegram.

If there is no access to the controllers buttons, follow these Smart Click steps.

1. Enter ***Smart Click configuration mode*** and click the switch ON three times so the light is blinking four times
2. Press ON for 3 seconds. If the status telegram function is enabled the light will turn ON, if disabled the light will be OFF.
3. Click ON to activate this function, OFF to deactivate
4. Exit Smart Click by pressing OFF for 5 seconds

Level 5 - Timeouts - the controller can be configured to wait a period of time after an ON event from a wireless switch or occupancy sensor before turning the load OFF (auto OFF).

1. Enter ***Smart Click configuration mode*** and click the switch ON four times so the light is blinking five times.
2. Press ON for 3 seconds. The light will turn ON and OFF per the table settings below. Click ON to move down the table, OFF to move up.
3. Exit Smart Click by pressing OFF for 5 seconds.

Relay (Light)	Timed Switch	Occ. Sensor Timer
OPEN	no auto-OFF	0 sec. (demo)
1 blink	5 min.	5 min.
2 blinks	15 min.	10 min.
3 blinks	30 min.	15 min.
4 blinks	60 min.	20 min.
5 blinks	N/A.	25 min.

Level 6 - Auto ON Function - use with a motion sensor to signal to turn lights ON automatically when motion is detected. If a motion sensor is used with no switch then Auto-ON is enabled automatically. If a switch is linked later, Auto-ON is disabled.

1. Enter ***Smart Click configuration mode*** and click the switch ON five times so the light is blinking six times.
2. Press ON for 3 seconds. If the auto-on function is enabled the light will turn ON, if disabled the light will be OFF.
3. Click ON to activate this function, OFF to deactivate.
4. Exit Smart Click by pressing OFF for 5 seconds.

Level 7 - Not Applicable

Level 8 - Lighting Set point - use with a open-loop photo sensor (light sensor) to automatically turn lights on and off depending on ambient light levels. If the light from the fixture does not impact the light reading at the sensor then it is an open loop application.

Enter ***Smart Click configuration mode*** and click the switch ON seven times so the light is blinking eight times.

1. Press ON for 3 seconds. Default setting is 60% of the light sensors full range. There are 4 steps from 20% to 80%, the light will blink the step count. (see table below).
2. Click on to increase the set-point, off to decrease the set-point.
3. Exit Smart Click by pressing OFF for 5 seconds.

	Light Set Point		
Taps	**Light ON**	**Light OFF**	**Light/Relay**
4 taps	20%	40%	2 blinks
5 taps	40%	60%	3 blinks
6 taps	60%	80%	4 blinks
7 taps	80%	100%	5 blinks

This concludes the configuration directions for the controller.

Default Settings for Controller

Repeater	disabled
Status	disabled

Time-outs

Motion sensor	15 minutes
Switch	no time out
Key card switch	0 seconds
Window Switch	30 seconds
Auto-ON	enabled with no linked switch, disabled

With Linked Wall Switch

Light-ON-Set point	60% of sensor FSR
Light-OFF-Set point	85% of Light-ON Set point
Grace Timer	30 seconds

Status Feedback Telegram

EEP: A5-11-01

DB_3 Illumination	0 … 510lx, linear n=0…255
DB_2 Illumination Set Point	Min. … Max., linear n=0…255
DB_1: Dimming Output Level Min.	… Max., linear n=0…255
DB_0.BIT_7: Repeater	0b0 disabled, 0b1 enabled
DB_0.BIT_6: Power Relay Timer	0b0 disabled 0b1 enabled
DB_0.BIT_5: Daylight Harvesting	0b0 disabled 0b1 enabled
DB_0.BIT_4: Dimming	0b0 switching load 0b1 dimming load
DB_0.BIT_3: Learn button	0b0 Teach-in telegram 0b1 Data telegram
DB_0.BIT_2: Magnet Contact	0b0 open 0b1 closed
DB_0.BIT_1: Occupancy	0b0 unoccupied 0b1 occupied
DB_0.BIT_0: Power Relay	0b0 off 0b1 on

Regulatory Statements

(902 MHz models only)

FCC Part 15.231

Contains FCC ID: SZV-TCM320U

The enclosed device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(I.) this device may not cause harmful interference and

(ii.) this device must accept any interference received, including interference that may cause undesired operation.

IC RSS-210

Contains IC: 5713A-TCM320U

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