Getting Started with the iVS-3S Polyphase Power Quality Socket Recorder

The iVS-3S is a self-contained, 3-phase Power Quality all-weather, digital instrument that measures and records voltage, current, and power on three channels

Simply plug it into any standard 3-phase meter base with the revenue meter installed on top. The iVS-3S monitors RMS voltage, current, power factor, demand, phase angle, waveform capture, and harmonics to the 31st

8/2023

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Safety Information

Safety Notice

Please read this before installing the iVS-3S. The iVS-3S recorder contains dangerous voltage levels during operation. Do not disassemble the recorder.

THERE ARE NO USER SERVICEABLE PARTS INSIDE.

Do not install or operate near open bodies of water.

The iVS-3S is intended for use with standard 3 phase meter bases, with the appropriate revenue meter plugged into the recorder.

Always wear protective gloves and safety glasses during installation and operation of the iVS-3S. If possible, disconnect power during installation.

When removing an installed iVS-3S, always completely remove the revenue meter before attempting to remove the recorder from the meter socket.

The USB port is electrically isolated from the 120VAC line. However, to ensure user safety and prevent damage to the unit, plug only the supplied iVS-3S USB cable into this port. Plug the other end of the communications cable into a USB port.

Although the iVS-3S has been designed and built to be as safe as possible, great care should be exercised at all times during operation and installation.

Always follow the National Electric Code as well as any local safety procedures.

Introduction

Power Monitors Incorporated (PMI), an industry-leading product design and manufacturing firm based in Mt. Crawford, Virginia, specializes in applying advanced technologies to develop state-of-the-art power quality recording solutions for residential, commercial, retail, institutional, industrial, and substation applications. Since 1987, we have worked directly with electrical utilities and their customers to identify and address a wide array of power quality concerns. We pride ourselves in delivering leading-edge recorders and software that are as easy to use as they are affordable. Our 24/7 technical support is consistently rated "best in the business."

Dedicating ourselves to this high standard of quality, we have developed the iVS-3S meter socket recorder. The iVS-3S combines the powerful, technologically advanced analysis capabilities of our other recorders with the specific needs of single-phase meter base applications. We developed the iVS-3S meter socket recorder specifically to diagnose and record power quality issues at the revenue meter. The unit plugs into specific 3 phase meter sockets to measure and record voltage, current, power, harmonics, and more, detecting outages, sags, and swells.

We created the lightweight and rugged iVS-3S with your needs in mind. It is perfect for analyzing electrical power issues at the customer level. After looking through this manual and using the iVS-3S meter socket recorder, please contact us if you have any questions about its operation or if you have any ideas for new features or additional products. Total customer satisfaction is our primary goal, and we appreciate any input to help us develop products to meet your future needs. We are always available to discuss how PMI can help you meet your power monitoring needs.

iVS-3S Polyphase Recorder Overview

The iVS-3S PQ recorder connects using a USB converter cable and needs the AC wall adapter connected when not in a meter base. Refer to the section on connecting the iVS-3S.
Physically connecting the iVS-3S recorder to a meter base is the same as connecting other PMI socket recorder. Refer to the section on Installation.

The iVS-3S recorder must first be initialized. This is done by connecting the iVS-3S meter socket recorder to your computer using the USB communications cable and the AC wall adapter, then connecting to the ProVision® software. The ProVision software is used to download the data to a file and analyze the recorded data.

The latest ProVision software and USB driver software can be downloaded from the Power Monitors Website: https://powermonitors.com/downloads

Download the Provision manual from: https://powermonitors.com/downloads

Meter Forms

6S, 8S, 9S, 36S

12S

14S-17S

Installation

Please read the safety section carefully before installation. Always exercise extreme caution when installing the iVS-3S meter socket recorder. Interrupt the electrical service to the point of connection whenever possible. Always wear gloves and safety glasses, as well as any additional applicable protective equipment. Do not install the iVS-3S unless you are qualified by your utility to install and remove revenue meters. Remove the revenue meter at the installation site using normal safety precautions. Make whatever notations your procedures require about the status and identification of the meter at the time of removal. Install the iVS-3S meter socket recorder in the meter socket by sliding the blades of the recorder into the receptacles in the socket. The top of the unit is marked with a sticker inside the front face. If needed use the locking ring supplied with the iVS-3S to secure the recorder to the meter base. Reinstall the revenue meter using the front of the iVS-3S recorder as the meter socket. Attach the clamp or locking ring you would normally use to install a meter. The iVS-3S socket should accommodate the existing hardware. Secure your utility's standard meter seal and make any notations your procedures require about the status and identification of the meter at the time of installation.

Some metering systems use metering CTs with a 5 amp secondary, typically located in a CT cabinet (e.g. Forms 6, 8, 9, and 36S). Ensure that these metering CTs are shorted with a shorting block or other means before removing the revenue meter. The PMI recorder does not provide any means for shorting the metering CTs.

Tab Style

Tab style meter bases require the use of special hardware called tabs. Tabs are used to fasten the recorder to the meter base when the lid will not go over the socket recorder. The tabs are secured by screw adjustments as shown below.

Newer style meter bases do not require a special locking tab to hold the socket recorder in place. The lid of the meter base goes over the socket recorder and is secured when closed. The Socket recorder is secured in the meter base as shown below.

Use the supplied ring to connect the iVS-3S to the revenue meter

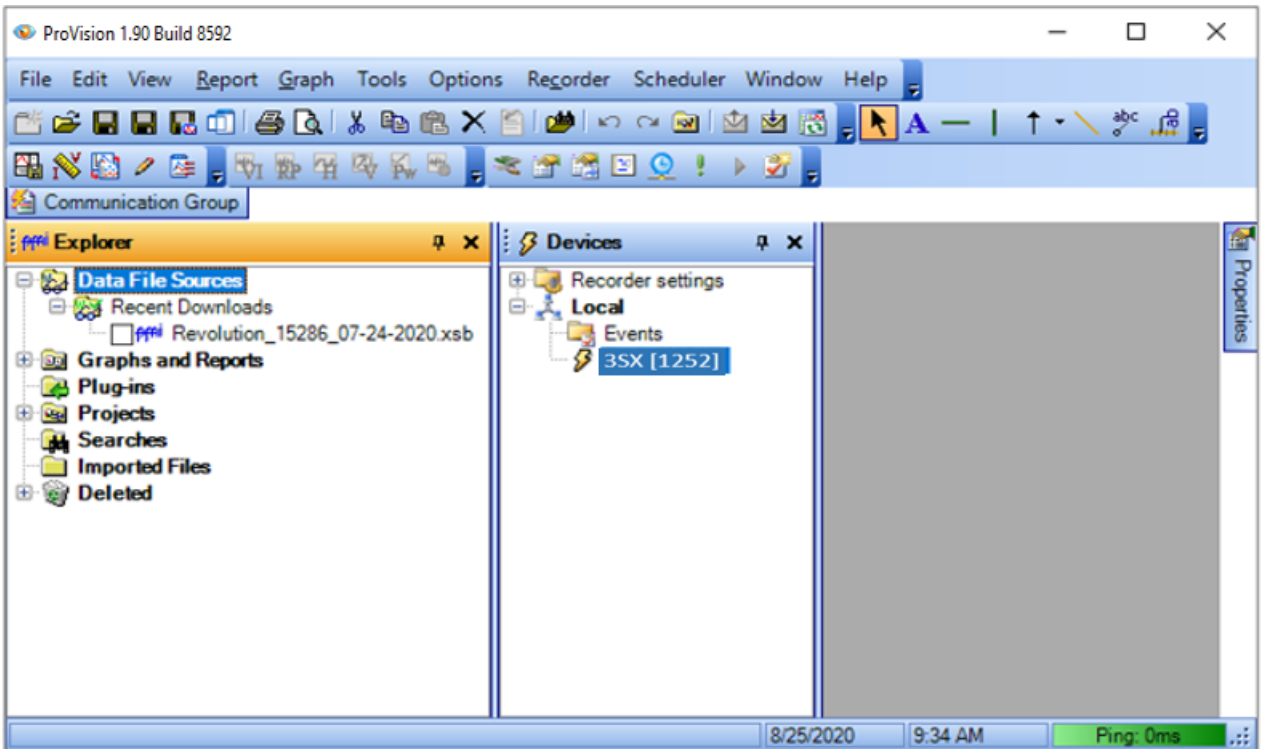
ProVision®

ProVision® is Power Monitors' Power Quality (PQ) data analysis software. Sophisticated tools and advanced communications greatly expand the ability to record, manage and analyze power quality data.

The easy-to-use graphical user interface is designed to get both the novice and the advanced user up to speed quickly.

ProVision will connect to your iVS-3S recorder using a USB adapter cable. The AC wall adapter is installed into the jack in the face of the recorder (do not use the jack in the USB adapter cable) and will power the iVS-3S when not installed and powered on AC power.

ProVision is used on Microsoft Windows based computers.

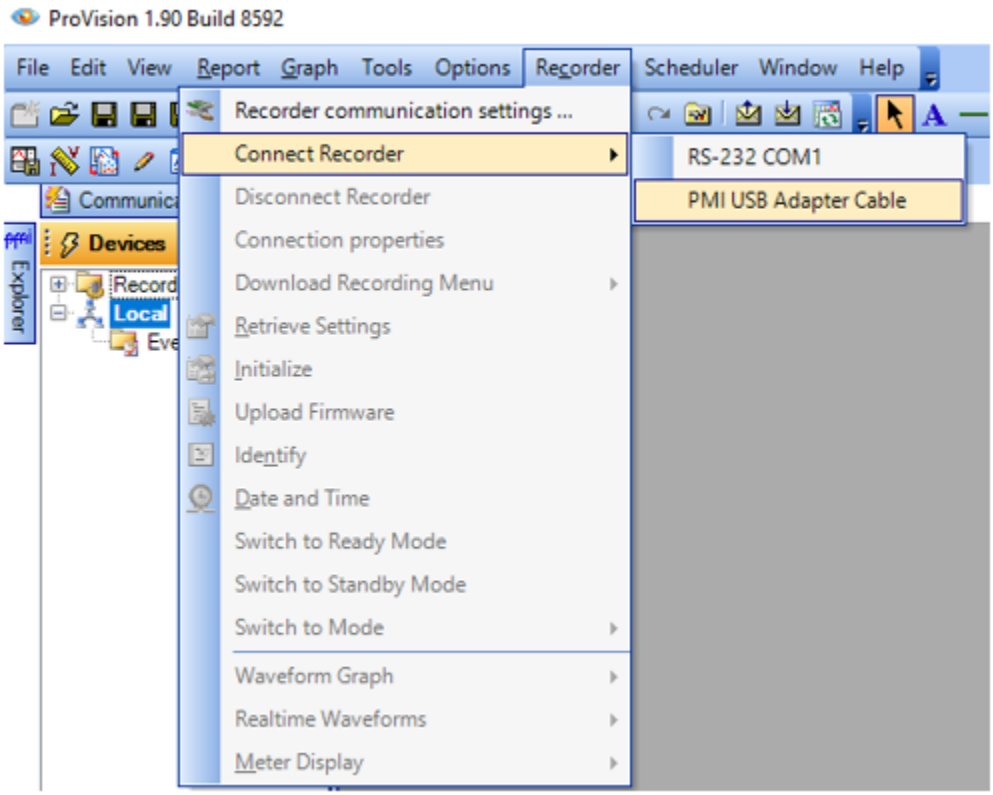


Connecting the iVS-3S Recorder to ProVision

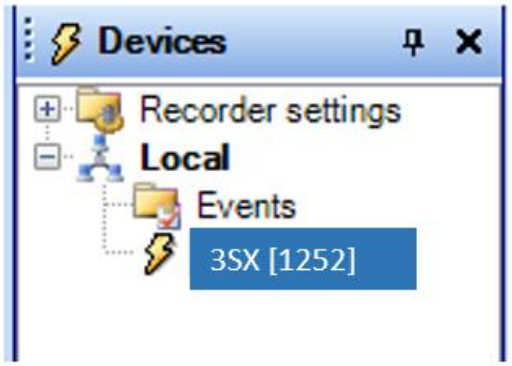
Insert the AC wall adapter into the face of the recorder and into a wall outlet

Insert the USB adapter cable into the round connector on the recorder and insert the USB connector into a USB port on your laptop or PC

In Provision select the ‘Recorder’ menu tab at the top of Provision
then select ‘Connect Recorder’
next select ‘PMI USB Cable’



Once connected, the iVS-3S will show in the Devices Pane of Provision.
Refer to the Provision User Manual available on the Powermonitors.com website



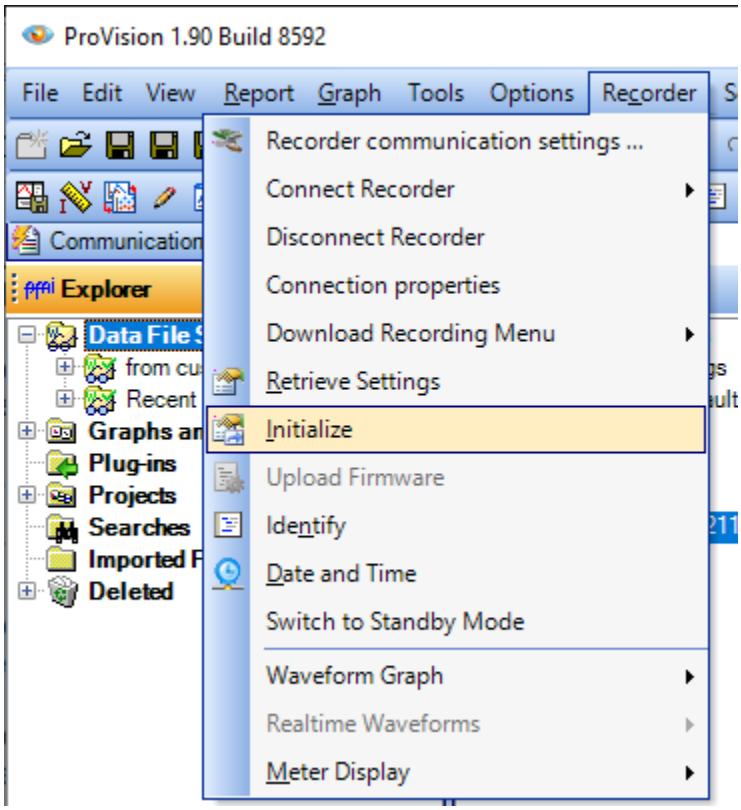
Initialization

The iVS-3S PQ recorder must be initialized with ProVision prior to using.

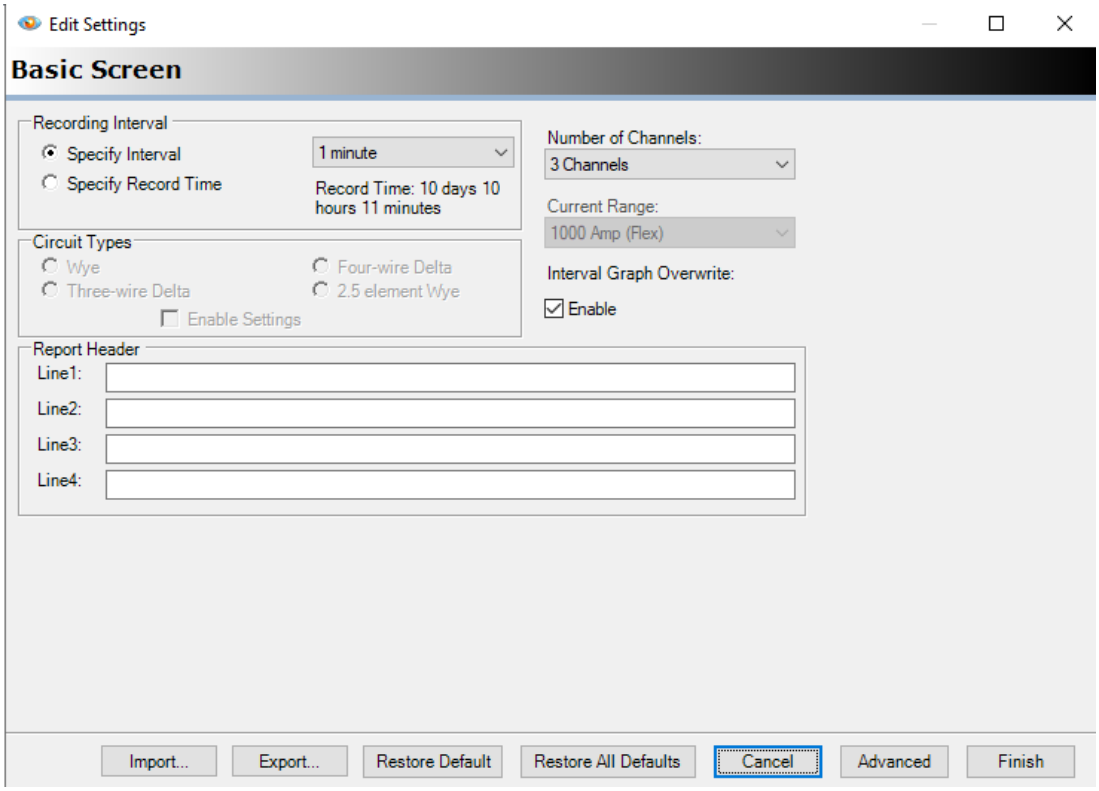
Select the settings in the initialization screens to enable the iVS-3S to record the correct information for your trouble site. It is best to initialize whenever the iVS-3S is moved to another site, so you have separate data files for each location. If you do not initialize, the data will append to the previous data.

ProVision has the ability to 'join' several files into one for easier data analysis of long term recording

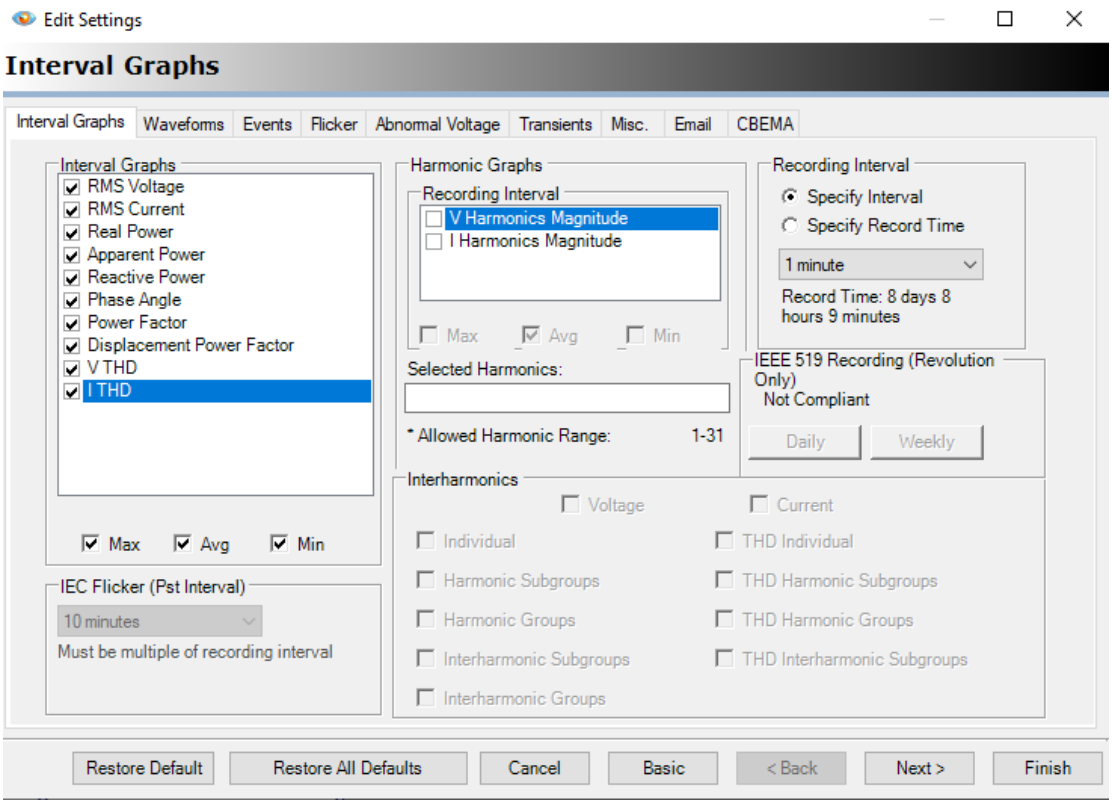
Right click on the iVS-3S entry, or select the Recorder tab at the top of ProVision and then select Initialize. You could also select 'Retrieve Settings' to pull the current settings from the iVS-3S to view or modify the settings



The Basic and Advanced Initialization pages contain the settings for the Interval ‘Stripcharts’, both graphs and reports. A 1-Minute Interval will show the lowest cycle, the highest cycle and the average of the samples (128 samples per cycle) for each minute of recording. A 1-Minute interval is a good setting for most recordings.

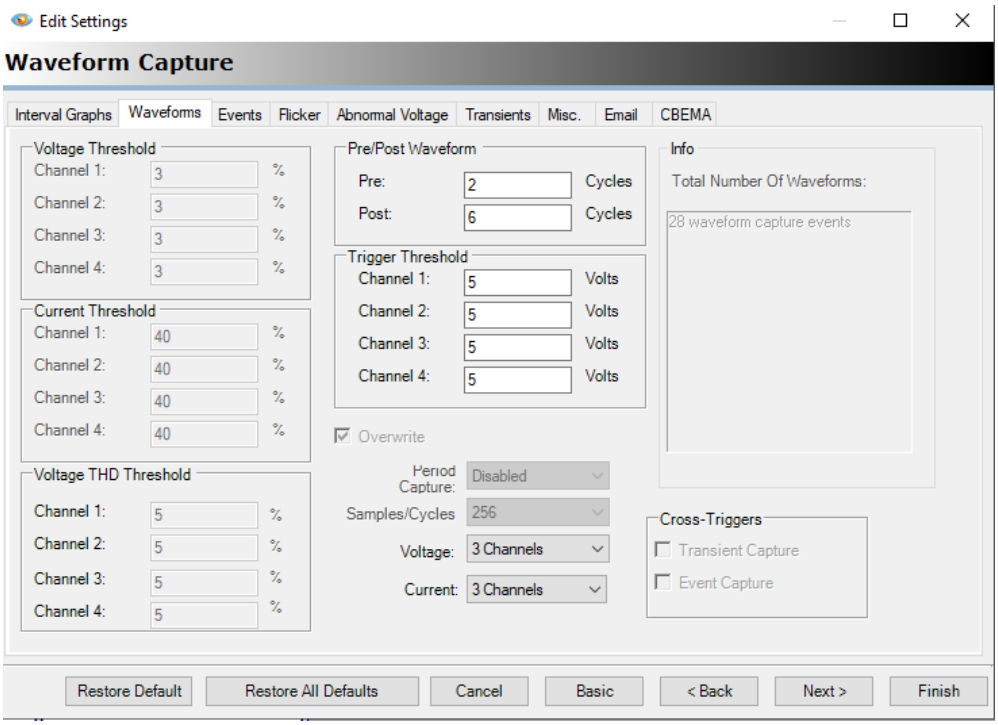


Check the Interval graphs you want to record. Harmonics can be added also.

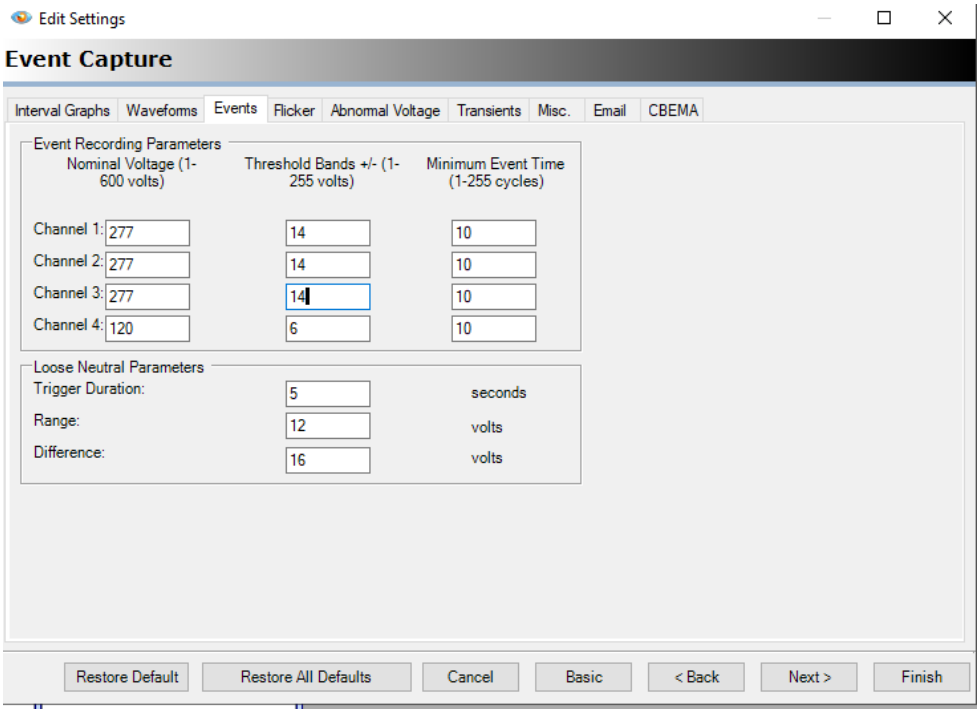


The number of selected Interval Graph recording options will change the Record Time (the time it takes to 'fill up' the iVS-3S's memory and start to over write the earlier data)

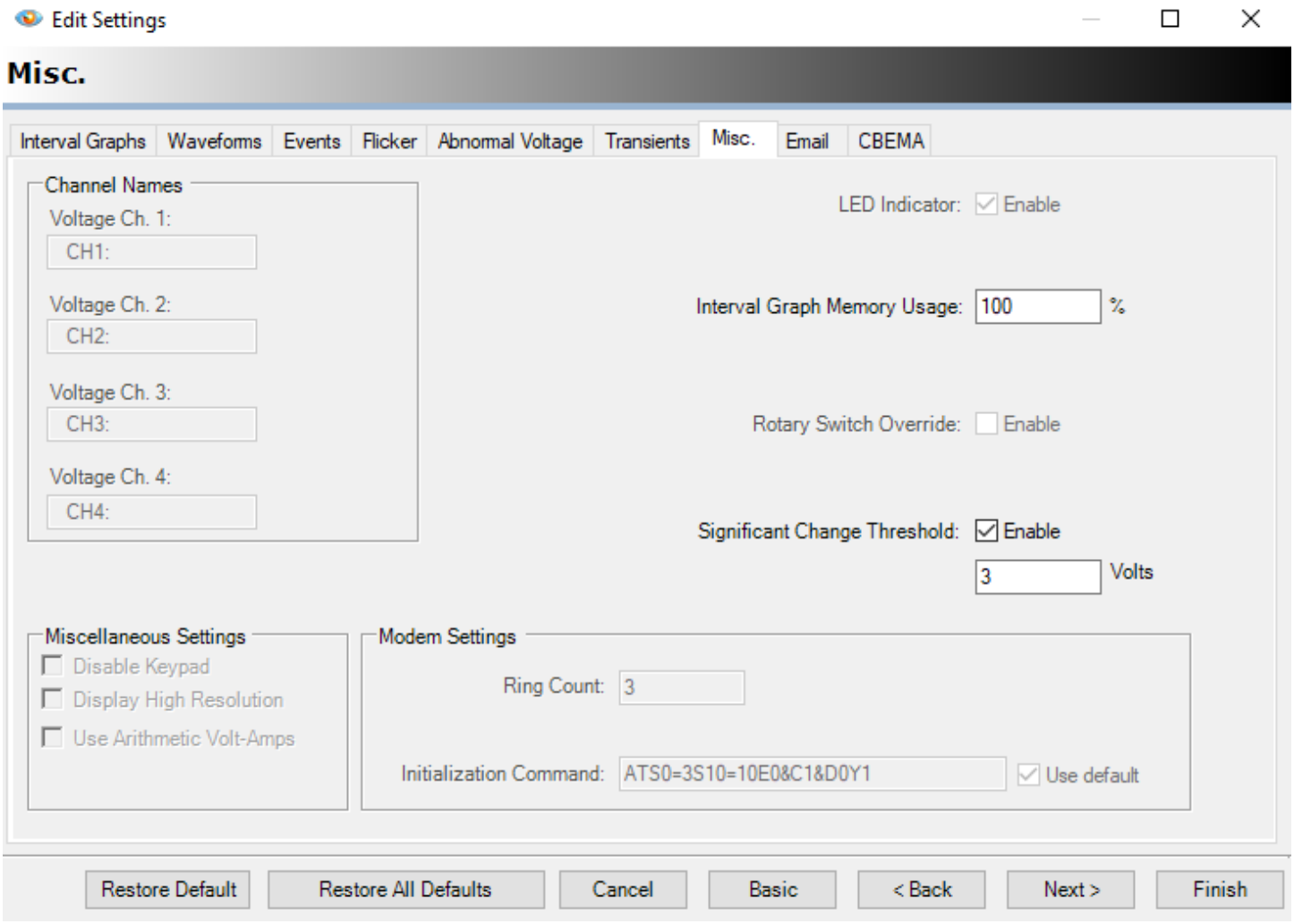
The other tabs such as Waveforms or Events, have their own memory and do not change the Interval Record Time. In the Waveform Capture page, set only 3 channels for the voltage and current section.
Waveform captures trigger on the voltage chosen (cycle to cycle change), and displays 9 cycles (default)



For the Event Capture page, enter your expected nominal voltage in the left column (channels 1-3) and for the center column enter 5% of that voltage



The Flicker, Abnormal Voltage, Transients, Email and CBEMA pages do not need changing.
For the Miscellaneous (Misc.) page, select 3 volts for 120v installation, 4 for 277v and 6 for 480v installation



When completed, choose Finish at the bottom right of the screen, then select Yes to initialize.

NOTE: After downloading a recording you will be asked to initialize the recorder, selecting Yes will use the same settings as the previous recording.

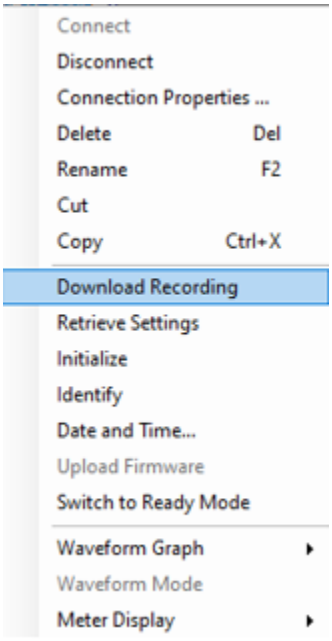
Recording Templates can be created to standarize the settings, this makes it easy to ‘drop’ the settings onto the recorder
Complete Initialization information can be found in the PoVision User manual.

Downloading the Recorded Data

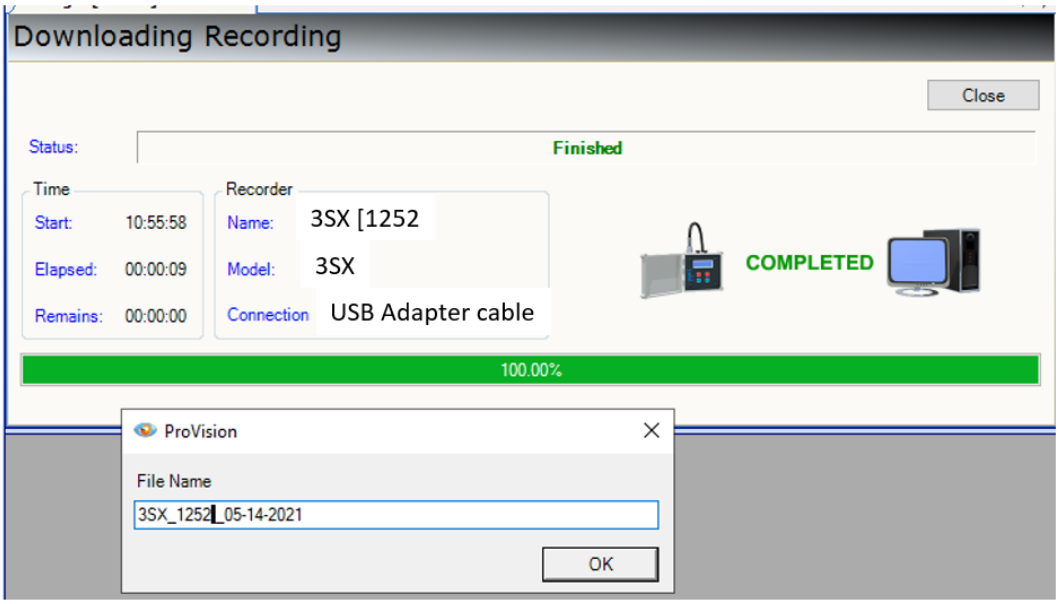
Once you have complete the recording, the iVS-3S will need the data downloaded into ProVision for analysis.

To start the download procedure, connect the iVS-3S to ProVision.

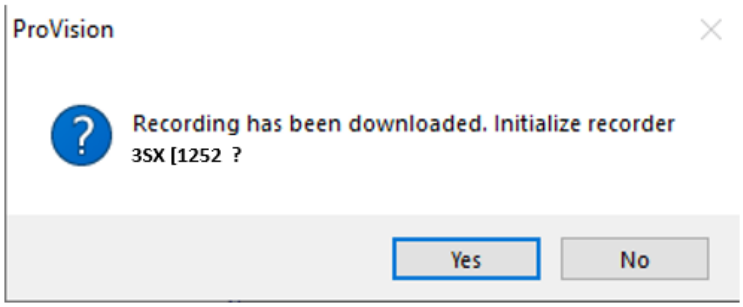
Right click on the iVS-3S listed in the Devices pane and select Download Recording or select Download Recording from the Recorder menu



When the recording has finished downloading, you will be asked to name the recording and then asked to initialize. Choosing Yes will initialize the iVS-3S with the same settings as the previous recording. You can choose 'no' and initialize the recorder at a later time.



Choose ‘Yes’ to initialize the recorder



The data in memory will not be removed until the iVS-3S is powered on AC power

Double-clicking on the saved data file will bring up the Header Report which has quick links to the selected graphs and reports.

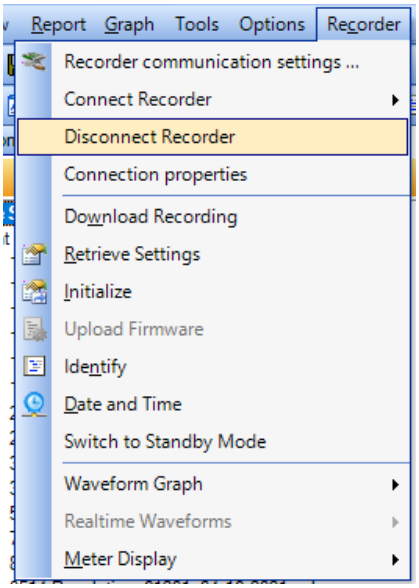
See the ProVision User manual for details on viewing the different graphs and reports stored in your data file.

Disconnect the Recorder

Always perform a disconnect recorder before removing the USB cable.

To remove the recorder from Provision, select the Recorder menu tab and then select ‘Disconnect Recorder’

You can now unplug the USB and AC wall adapter cables



The iVS-3S is ready to install at another site.

Form Factor Descriptions

POLY PHASE – DIRECTLY CONNECTED (1000:1 CT'S)

FORM	DESCRIPTION	# OF BLADES	VOLTAGE AND CURRENT CONNECTIONS	INPUTS MEASURED	600V RATED
12S+N	Three wire network (2 phases), 120/208V	5	P1-N (120V), P2-N (120V)	1-N, 2-N (120V)	YES
12S	3 Phase 3 Wire Delta (no neutral)	5	Three V phases > No Neutral; 1-2, 3-2 (120/240/480V L-L)	1-2, 3-2; 120, 240, or 480V L-L	YES
14S,16S	3 Phase 4 Wire Wye, 120/208V or 277/480V	7	Three V phases direct & Neutral; 1-N, 2-N, 3-N (120 or 277V)	1-N, 2-N, 3-N (120 or 277V)	YES
15S	3 Phase 4 Wire Delta, 240V L-L, 208V 3-N, 120V 1 and 2-N	7	Three V phases and Neutral, 1-N and 2-N (120V), 3-N (208V) 3 CT currents	1 and 2 to N (120V), 3-N (208V)	YES
16S	3 Phase 4 Wire Delta	7	Three V phases direct & Neutral, 1-N, 2-N (120V), 3-N (240V)	1-N, 2-N (120V), 3-N (240V)	YES

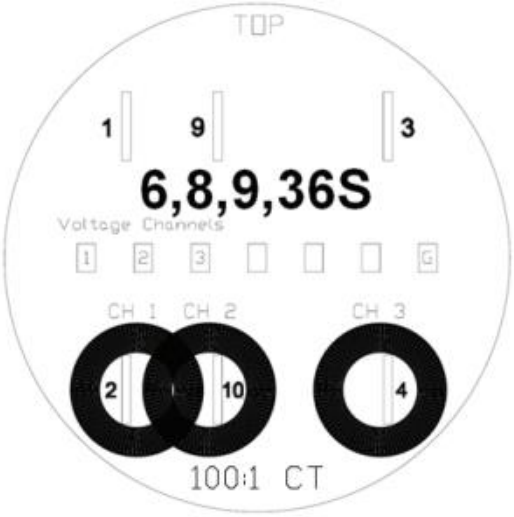
METERING POLY PHASE – INDIRECTLY CONNECTED THROUGH PT'S/ CT'S (100:1 CT'S)

FORM	DESCRIPTION	# OF BLADES	VOLTAGE AND CURRENT CONNECTIONS	INPUTS MEASURED	600V RATED
6S	3 Phase 4 Wire Wye 120/208V or 277/480V, with 3 CT's	13	Phase 1 and 3 direct; 1-N, 3-N (120 or 277V); 3 CT currents	1-N, 3-N (120 or 277V); 3 CT currents	YES
6S	3 Phase 4 Wire Wye 120/208V or 277/480V, with 3 CT's, and 2 PT's (120V)	13	Phase 1 and 3 through PT's; 1-N, 3-N (120V); 3 CT currents	1-N, 3-N (120V); 3 CT currents	YES
8S	3 Phase 4 Wire Delta, 240V L-L, 208V 3-N, 120V L1 or L2-N, with 3 CT's	13	All three V phases direct; 1-N and 2-N (120V), 3-N (208V); 3 CT currents	1-N and 2-N (120V), 3-N (208V); 3 CT currents	YES
9S	3 Phase 4 Wire Delta, 240V L-L, 208V 3-N, 120V L1 or L2-N, with 3 CT's	13	All three V phases direct; 1-N and 2-N (120V), 3-N (208V); 3 CT currents	1-N and 2-N 120V; 3-N 208V; 3 CT currents	YES
9S	3 Phase 4 Wire Wye 120/208V or 277/480V, with 3 CT's	13	All three V phases direct; 1, 2, and 3 to N (120 or 277V); 3 CT currents	1, 2, and 3 to N (120 or 277V); 3 CT currents	YES
9S	3 Phase 4 Wire Wye 120/208V or 277/480V, with 3 CT's, and 2 PT's (120V)	13	All three V phases thru PT's; 1, 2, and 3 to N (120V); 3 CT currents	1, 2, and 3 to N (120V); 3 CT currents	YES
36S	3 Phase 4 Wire Wye 120/208V or 277/480V, with 3 CT's, and 2 PT's (120V)	13	Phase 1 and 3 through PT's; 1-N, 3-N (120V); Neutral connected to 7th term. block position only; 3 CT currents	1-N, 2-N (120V); 3 CT currents	YES

Blade and Channel Diagrams

Below are the blade arrangements and channel assignments

The figures also show the location of the recorder's internal CT's



Socket Recorder Comparison

	SINGLE PHASE		POLY PHASE		METERING POLY PHASE
MODEL NAME	iVS-2SX PLUS	iVS-2SX PLUS N	iVS-3S, opt. 12S	iVS-3S, opt. 14S	iVS-3S, opt. 6S
					
PMI PART NUMBER	VSS20240251	VSS20240240	w/ tabs: VSS30600012 w/o tabs: VSS30600013	w/ tabs: VSS30600014 w/o tabs: VSS30600017	w/ tabs: VSS30600022 w/o tabs: VSS30600006
CONNECTION			Direct (1000:1 CT's)		Indirect through PT's/ CT's (100:1 CT's)
VOLTAGE CHANNEL	2	2	2	3	3
CURRENT CHANNELS	2	2	2	3	3
CT RANGE	200A	200A	200A	200A	25A
600V SUPPLY	NO	YES	YES	YES	YES
COMPATIBLE METER FORMS	2S	2S	12S, 12S Network	14S, 15S, 16S, 17S	6S, 8S, 9S, 36S
OPTIONS	Power, Harmonics	Power, Harmonics	None	None	None
GROUND WIRE	YES	NO	NO	NO	NO
Extra Features	NONE	Factory moveable neutral blade to switch between the 6:00 and 9:00 positions	Factory moveable neutral blade to switch between the 6:00 and 9:00 positions	None	None

Specifications

Inputs:

AC Voltage	0 to 600 VAC
AC Current	200 amps RMS (forms 12S, 14S, 15S, 16S, 17S) 25 amps (forms 6S, 8S, 9S)
Sample Rate	128 samples/cycle/channel

Channels:

Voltage	2 channels, or 3 depending on form
Current	2 channels, or 3 depending on form

Measured Quantities Per Cycle:

RMS Voltage	Volts
RMS Current	Amps
Real Power	Watts
Apparent Power	VAs
Reactive Power	VARs
Phase Angle	Degrees
Power Factor	Watts/VA
Displacement PF	cos (phase angle)
Power Usage	kWh, kVARh, kVAh

Accuracy:

Voltage	0.33% of full scale
Current	1.0% of full scale
Power	1.0% of full scale
Phase Angle	1.0°
Power Factor	±0.02
Displacement PF	±0.02

Harmonics:

Voltage	to the 31st
Current	to the 31st
Measures	magnitude, THD

Communications:

Local	RS232 port
Data Range	4,800 to 28,800 baud

Information Storage:

Interval graph	2.1 MB
Significant Change	1000 records
Flicker	1000 records
Waveform Capture	384 KB

Record Settings:

Interval Graphs	1 second to 4 hour interval User selected, stop-when-full, or wrap around memory modes
Significant Change	1V to 8V in 1V steps
Flicker Settings	User-defined, or conform to IEEE Std. 141
Waveform Capture	Voltage and current threshold

Power Supply Requirements:

Power Consumption	Less than 2.5 watts from Phase A

Environmental:

Operating Temp	- 20°F to + 135° F
Shock	60 Hz to 2kHz, Acceleration 25G
Vibration	10 Hz to 60 Hz, Amplitude 1.8 mm

Physical Dimension:

Size	4.625" X 6.75"
Weight	3.6 lbs

Power Fail Operation:

The recorder can operate without any input voltage for up to 30 minutes. This allows it to record down to 0 volts on all channels during power outages.

Technical Support

Help is always available if one needs additional assistance. The technical support team at PMI is widely considered to be the best in the industry. Use one of the following methods to obtain technical support.

Email Support

Send email to: techsupport@powermonitors.com

Web Support

Submit a support request via the web at https://powermonitors.com/support

Telephone Support

Contact us 24 hours a day, 7 days a week for live tech support by calling:
(800) 296-4120
Faxes should be sent to: **(540) 432-9430**

Postal Mail Support

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USA