3640
Power Line Monitor

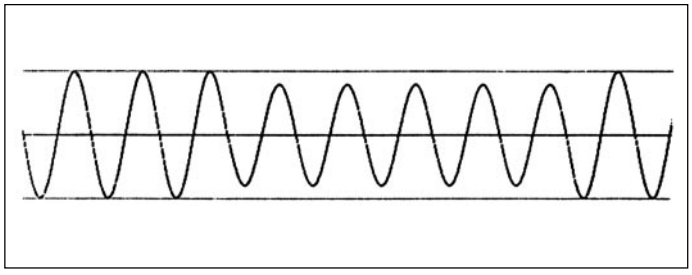
364012 (1ch, AC voltage/current measure)
260 × 199 × 400mm 11kg
(10-1/2 × 7-7/8 × 15-3/4" 24 lbs)

Digital equipment represented by computers and robots is likely to be affected by a voltage drop for a very short duration, momentary power failure, mixing of impulse noises, etc., and thus the "quality" of power supplies has been emphasized.

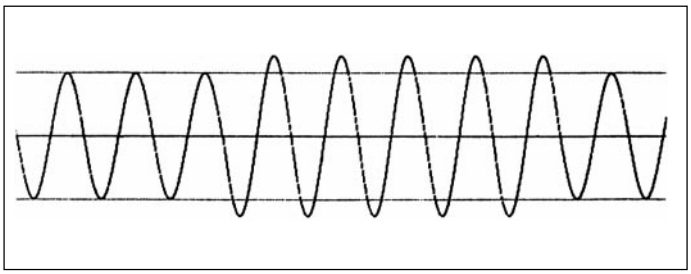
Model 3640 Power Line Monitor exercises its power to closely examine the causes of a power anomaly because it monitors unpredictable failures (changes) in power lines and records waveforms of the power line failures as well as computes and prints out the maximum and minimum values, distortion factor, frequency, and harmonics.

FEATURES

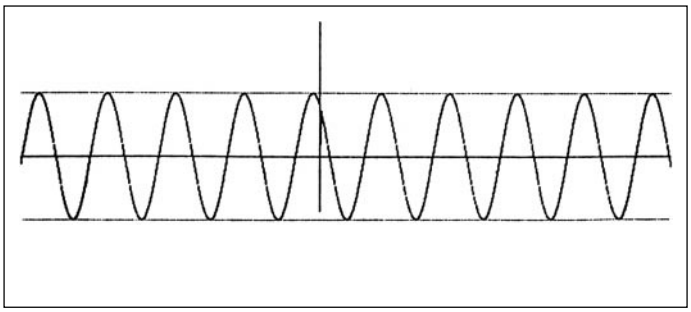
● **Voltage decrease**
Voltage decrease (a voltage sag) is the most common phenomenon caused by a power or load anomaly. The 3640 catches a voltage sag by detecting a lower voltage limit based on the true RMS value.
* By detecting waveform comparison is available too.



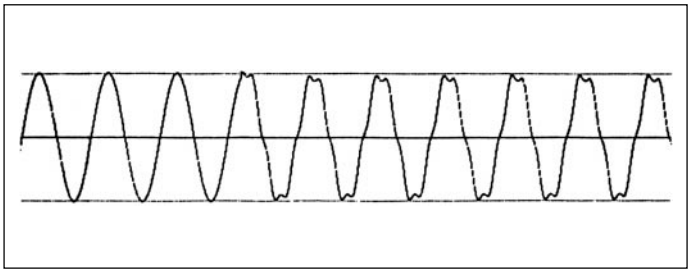
● **Over-voltage or over-current**
Both a vulnerable power supply or heavy load cause voltage fluctuations.
In particular, when a voltage or current increases excessively, major equipment and peripheries may be seriously damaged.
To monitor over-voltage or over-current, the 3640 applies an upper limit on voltages/current* using RMS value.
* An upper limit detection for currents is provided only in the 364022.



● **Impulses**
Impulses in a power line may lead to malfunctions of electronic equipment. To monitor or detect fast rise-time impulses, an instrument that can sample them at a high speed is necessary.
The 3640 measures at a sampling frequency of 204.80 kHz*. This allows the 3640 to catch impulses down to a pulse width of about 5 µs.
* This is for a monitored 50 Hz power supply. For a monitored 60 Hz supply, it is 245.76 kHz.



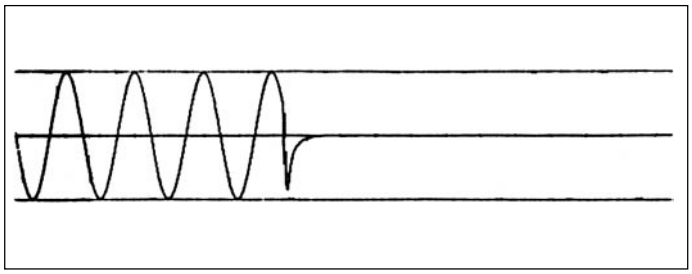
● **Harmonics (waveform distortion)**
Due to a rapid increase of non-linear loads such as by thyristors, impediment caused by the harmonics along a power line adversely affects not only on the load but also the power line.
The 3640 can monitor harmonics (only for selected orders) and distortion factors using level detection. Besides, it can analyze the harmonics (up to the 63rd harmonics) in the recorded data.



● **Momentary power failure**

Momentary power failures or impulses along the power line are causes of computer impediment in FA or OA .

The 3640 quickly catches a voltage drop for a very short duration or momentary power failure which human beings can recognize only as a flicker. When the power is restored after a power failure, the 3640 backup function provides a printout of both the data which were in the middle of printing and the measurement data at the time of power failure.



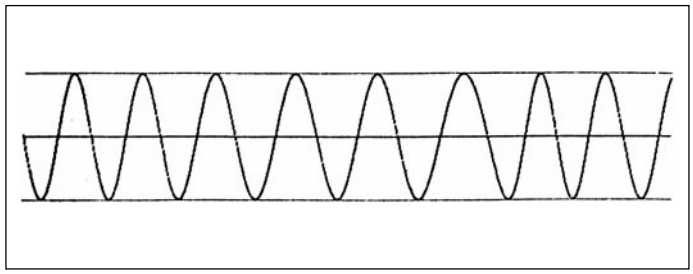
● **Frequency fluctuation**

To monitor the frequency is effective for managing the power flow.

The frequency fluctuates if the generator cannot follow up the load changes.

The 3640* can also quickly catch fluctuations in the frequency.

* A significant change may not be recognized as a fluctuation in the frequency if it is observed by comparing voltage or current waveforms with changes in waveform distortion or impulse. Confirm the change by numerical data at the same time.



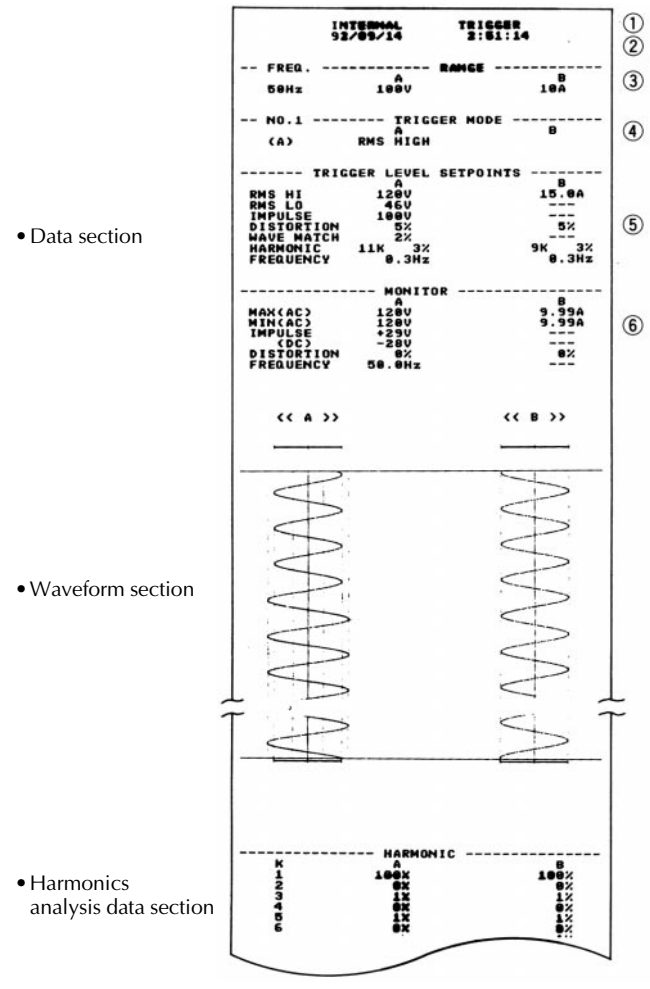
FUNCTIONS

■ **PRINT OUTPUT**

Printing can be started by manual command or by detecting a trigger.

● **Example of Printing**

(Output by Model 364022 using the internal trigger)



• Data section

• Waveform section

• Harmonics analysis data section

● **Items in Data Section**

1. **Trigger method**
   REMOTE TRIGGER ..... Internal trigger
   EXTERNAL TRIGGER .. External trigger
   MANUAL PRINT ..... Manual trigger
2. **Date and time of failure detection**
3. **Measurement range**
   FREQ ..... Frequency of monitored power supply
   RANGE ..... Measurement range of each input channel
4. **Trigger mode (printed only with the internal trigger)**
   No. 1 ..... Input channel where a failure is first detected
   TRIGGER MODE ..... The first element to satisfy the startup conditions in Approx. 25 cycles after trigger is printed for each channel.
5. **Trigger level setting**
   (Present settings are printed for each channel.)
   RMS HI ..... Channel A: Upper voltage limit setpoint
   Channel B: Over-current setpoint
   RMS LO ..... Lower voltage limit setpoint (only for channel A)
   IMPULSE ..... Impulse setpoint (only for channel A)
   DISTORTION ..... Distortion factor setpoint
   WAVE MATCH ..... Waveform comparison setpoint (only for channel A)
   HARMONIC ..... Harmonics setpoints
   FREQUENCY ..... Frequency fluctuation setpoint (only for channel A)
6. **Monitor**
   (The voltage and current after trigger are printed for each channel.)
   MAX(AC) ..... Channel A: Maximum (rms) value of the voltage in Approx. 25 cycles after trigger
   Channel B: Maximum (rms) value of the current in Approx. 25 cycles after trigger
   MIN(AC) ..... Channel A: Minimum (rms) value of the voltage in Approx. 25 cycles after trigger
   Channel B: Minimum (rms) value of the current in Approx. 25 cycles after trigger
   IMPULSE(DC) ..... Instantaneous maximum values in both the positive and negative directions in Approx. 25 cycles after trigger
   DISTORTION ..... Distortion factor at trigger
   FREQUENCY ..... Frequency at trigger (only for channel A)

● **Waveform Section**

The record lengths are as shown follows.

Trigger method	Waveform to be recorded
Internal trigger/ Manual print	30 cycles: 5 cycles before trigger 25 cycles after trigger
External trigger	60 cycles: 50 cycles before trigger 10 cycles after trigger

3640

The 3640 Power Line Monitor is a monitoring and recording instrument dedicated to power line management. It incorporates an input circuit, memory function, waveform anomaly monitoring function, harmonics analyzing function, frequency monitoring function, data logging function, clock function, and printer. The data logging function allows continuous observation of the voltage, current*, frequency, distortion factor, active power*, power factor*, and harmonics. Besides, automatic recording of the maximum and minimum values, average values (the integrated value for active power), etc. of the observed results at fixed times are possible. These data can be used as basic data for daily management of the power supply.

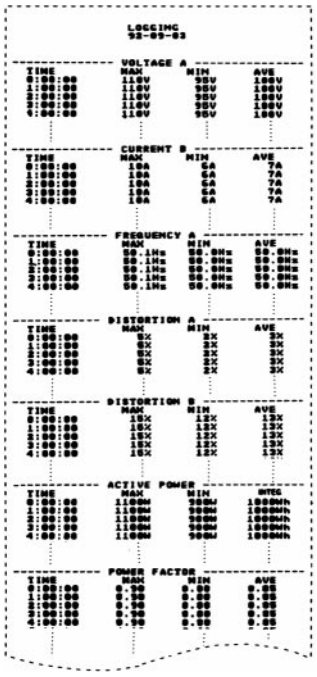
* Current, active power and power factor data are available only in Model 364022.

■ DATA LOGGING FUNCTION

The data logging features two functions.

1. RMS values of the voltage and current, frequency, distortion factor, active power and power factor of a monitored power supply are calculated every cycle; their average values for one second are determined; the maximum, minimum, and average values of the voltage, current, frequency, distortion factor, and power factor and the integrated value for active power for every hour are recorded based on the above results; and the averaged and integrated results are printed once every day or every hour on the hour.
2. One cycle (from the fundamental to the 63rd) harmonics of a monitored power supply are analyzed and printed out every hour on the hour.

● **Example of Printing (1)**



1.
2.

1. **Date**
2. **Maximum, minimum, and average values every hour**

●VOLTAGE A (rms value)
●CURRENT B (rms value)
●FREQUENCY A
●DISTORTION A
●ACTIVE POWER
●POWER FACTOR

● **Example of Printing (2)**

3.
4.
5.

3. **Date**
4. **Time when analysis is carried out**
5. **Results of analyzing from the fundamental to the 63rd harmonics**

SPECIFICATIONS

Model No.		364022	364023
●Input			
Input element	Voltage	1 ch	3 ch
	Current	1 ch	———
Measurement range (crest factor 2.5)	Voltage	120 V AC (50 Hz/60 Hz) 240 V AC (50 Hz/60 Hz) 480 V AC (50 Hz/60 Hz)	
	Current	1 A AC(50 Hz/60 Hz) 5 A AC(50 Hz/60 Hz) 10 A AC(50 Hz/60 Hz) 50 A AC(50 Hz/60 Hz)	———
Amplitude of waveform	Voltage	24 mm for rated input, 10 mm (200 V DC) or 5 mm (500 V DC) in the mode dedicated to impulse	
	Current	24 mm for rated input	
Input burden (PT/Clamp CT)	Voltage	[120 V range] Less than 0.03 VA; typically 0.015 VA [240 V range] Less than 0.10 VA; typically 0.05 VA [480 V range] Less than 0.40 VA; typically 0.20 VA	
	Current	[1 A range] 0.1 mVA or less	
Maximum input range	Voltage	500 V AC continuous (common to each range) 1500 Vpeak (pulse width, 1 ms or less; duty ratio, less than 1%)	
	Current	100 A AC continuous	
Maximum continuous in-phase voltage		500 Vrms	
●Startup Setting Function			
Upper voltage limit		[120 V range] 54 to 140 V AC, OFF (2 V step) [240 V range] 108 to 280 V AC, OFF (4 V step) [480 V range] 216 to 500 V AC, OFF (8 V step)	
Lower voltage limit		[120 V range] 44 to 126 V AC, OFF (2 V step) [240 V range] 88 to 252 V AC, OFF (4 V step) [480 V range] 176 to 500 V AC, OFF (8 V step)	
Impulse		[120 V range] 50/100/200*/500* V DC, OFF [240 V range] 50/100/200/500* V DC, OFF [480 V range] 100/200/500 V DC, OFF * Selection of this value changes the mode to the one dedicated to impulse	
Over-current		[1 A range] 0.1 to 2 A AC OFF, (0.1 A step) [5 A range] 0.5 to 10A AC OFF, (0.5 A step) [10 A range] 1 to 20 A AC OFF, (1 A step) [50 A range] 5 to 100A AC OFF, (5 A step)	———
Waveform comparison (with the waveform measured one cycle before)		±2 to 20 % of the measurement range and OFF (2 % step), (voltage only)	
Frequency Displacement		±5 Hz (0.1 Hz step) of the measurement range (voltage only)	
Distortion factor		1 % to 50 %, OFF (1 % step)	
Harmonics		Startup order: Selected from the third, fifth, seventh, ninth, and eleventh harmonics. Startup setting: 1% to 20% (1% step) 20% to 50% (5% step) 50% to 100% (10% step) off	
●Detection/Recording Accuracy (within one year after calibration)			
Voltage		±(2% of rdg + 2% of range)	
Impulse		[120 V range] ±(10 % of rdg +3 V) [240 V range] ±(10 % of rdg +6 V) [480 V range] ±(10 % of rdg +12 V) (At pulse width of 100 µs or more) Without including the mode dedicated to impulse	
Current		±(2 % of range)	———
Harmonics analysis		Computation error: ±0.3%; measurement error: ±0.5% of range (though input harmonics components are limited to 4 kHz)	
Frequency		±0.05Hz	
Distortion factor		±(0.5% of range)	
Active power		±(0.5% of range)	———
Power factor		±0.05	

Model No.	364022	364023
●Model Dedicated to Impulse (voltage only)		
If large pulse height impulses are to have priority in observation, the mode dedicated to impulse is used. This mode is obtained by taking the following impulse startup setting: In the mode dedicated to impulse, no other monitoring for that channel is carried out. But, the monitoring functions for other channels are not affected. However, the data logging function is not implemented including those in other channels.		
Impulse setpoint that gives the mode dedicated to impulse	[120 V range] 200/500 V DC [240 V range] 500 V DC [480 V range] No mode dedicated to impulse. (Maximum measurable value; 600 Vpeak for 200 V DC 1200 Vpeak for 500 V DC)	
Detection/ recording accuracy	[200 V DC impulse setting]: ±(10% of rdg + 6 V) [500 V DC impulse setting]: ±(10% of rdg + 12 V)	
●Waveform Memory		
Memory contents (waveform output)	For a remote trigger or manual print, 5 cycles before start up and 25 cycles after startup for each input (retains these in memory for two startups) For an external trigger, 50 cycles before startup and 10 cycles after startup for each input (retains these in memory for two startups)	
Sampling frequency for writing to memory	3200 Hz for 50-Hz monitoring, 3840 Hz for 60-Hz monitoring. **Note**: The sampling frequency is transferred to 204.8 kHz for 50-Hz monitoring or to 245.76 kHz for 60-Hz monitoring 64 samples are defined as one block; the maximum and minimum values within one block are detected; 3200sets of data (or 3840 sets) are written to memory for one second making these maximum and minimum values a set of data.	

● Common Specifications

Printer	Recording method:	Thermal dot-line method
	Recording chart :	Roll 114 mm wide and 25 m long, Thermosensitive, black color development (color development temperature 70± 5°C)
	Printing speed:	Approx.41 mm/s
	Graphic recording speed:	Approx.5 mm/s
	Maximum recording width:	Approx.42 mm/s (Rated width 20 mm)
	Protection function:	Automatic stopping if break in recording chart is detected.
	Head life:	3×10^7 pulses (printing ratio 12.5%), equivalent to 150 rolls of chart paper
	Dot resolution:	6 dots/mm
	Chart feed pitch:	0.165 mm
Contact output	Operating signal output:	For 10 seconds from the start of waveform recording (for a remote or external trigger) Volt-free contact output 1a
	Alarm output:	For power shut off, printer head out of position, or end of roll. Volt-free contact output 1a
	Common contact rating: Current rating 1 A Cut-off rating	0.16 A (110 V DC resistive load) 0.08 A (110 V DC inductive load)
Clock	Clock function: Accuracy: Calendar function:	A.D. (lower two digits), year to second, 24-hour system Within difference of ±2 s per week (at 23±5°C) Auto-calendar
Power failure compensation	Backup time (with the cell fully charged):	Measurable until 1 s after failure (though no output to the printer).
	Measured data:	Retained for a week, Output to the printer after power recovery.
	Clock function and memory contents:	Retained for a week
	Backup method:	Lithium secondary cell (clock, settings), Nickel-cadmium cell (measurement functions)
	Charging method:	Trickle charge
	Charging time:	Maximum of 48 continuous hours to full charge
	Cell protection:	Over-discharge protection function

● General Specifications

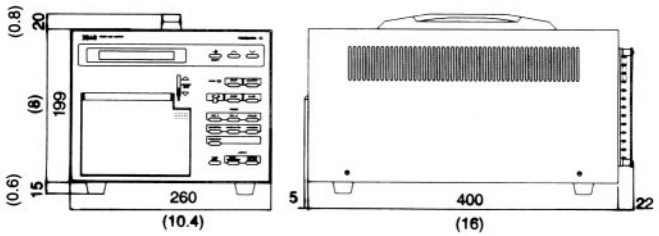
Power supply	100 V-system (85 to 132 V AC), 200 V-system (180 to 210 V AC), Frequency 50/60 Hz (48 to 63 Hz)
Power consumption	Maximum 150 VA
Dimensions	Approx. 260 (W) × 199 (H) × 400 (D) mm (10 - 2/5 × 8 × 16")
Weight	Approx. 11 kg (24.3 lbs.)
Operating temperature and humidity	0 to +40°C, 30 to 85% RH (non-condensing)
Storage temperature and humidity	–10 to +160°C (–10 to +40°C for chart paper) 30 to 85% RH (non-condensing)
Insulation resistance/ withstanding voltage	10 MΩ or more with a 500 V DC megger and 2000 V AC for 1 minute between any two of the monitoring input, external trigger input, operating signal output, power input, and case.
Standard accessories	One power cord, 3 fuses (one fuse is mounted to the monitor), 3 rolls of chart paper, one dust cover, 2 terminal board covers (mounted to the monitor), one clamp CT (used only in Model 364022), one copy of instruction manual.

AVAILABLE MODELS

	Model	Suffix Codes		Description
Single Phase	**364022**			1 ch, AC Voltage/Current Measurement
Three Phase	**364023**			3 ch, AC Voltage Measurement
Power Supply Voltage		**–1**		100 to 120 V AC, 50/60Hz
		–5		200 to 240 V AC, 50/60Hz
Power Cord			**–M**	UL/CSA Standard (with 2-prong-adaptor)
			–D	UL/CSA Standard
			–F	VDE Standard
			–R	SAA Standard
			–J	BS Standard

DIMENSIONS

Unit: mm (inch)



● Dimensions of Clamp CT

Unit: mm (inch)