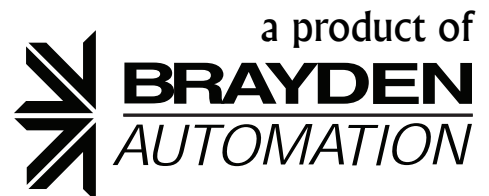


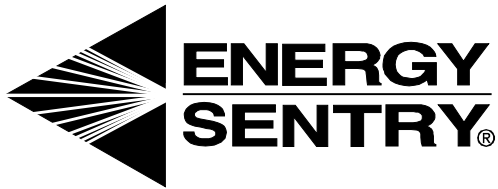
ENERGY SENTRY®

9320 Series

Demand Monitors

**Installation &
User's Manual**





9320 SERIES INSTALLATION AND USER'S MANUAL

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NOTICE TO USERS

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient the receiving antenna.
2. Relocate the computer with respect to the receiver.
3. Move the computer away from the receiver.
4. Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington D.C. 20402, Stock No. 0004-0000-00345-4.

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1. Introduction

Thank you for your recent purchase of a 9320 Series Demand Monitor. This state-of-the-art, low-cost demand monitoring instrument can help you pinpoint when demand peaks are occurring in your facility and thus achieve lower electric bills.

There are three different models of demand monitors in the 9320 Series:

- Model 9321A allows power monitoring using pulses supplied from the utility's electric meter up to 1000 KW (1 MW).
- Model 9321M allows power monitoring using pulses supplied from the utility's electric meter up to 10000 KW (10 MW).
- Model 9322A allows power monitoring of single phase services with current transformers up to either 40 KW (200 Amps) or 80 KW (400 Amps).

Models in the 9320 Series are able to monitor demand on regular or "straight" demand rates as well as on Time-Of-Use rates. This allows monitoring during On-Peak and Off-Peak periods and at two different demand alarm setpoints.

All models contain an RS-232 type interface that can be used with Brayden Automation's EnergyAccess® for Windows software. This software allows you to monitor power real time in numerical and graphical form on your PC. In addition, logged data may be graphed, viewed, and printed at a later time.

2. Mounting the Unit

You will find two mounting flaps on the top and bottom of the monitor. Each flap has two 1/4" mounting holes for easy mounting to any wall or surface. Use appropriate hardware (not supplied) to mount the unit to the wall.

3. Connecting the Power Supply

The 9320 Series is powered by a 12 Volt AC wall transformer. If a wall transformer has not been provided, use a 120 VAC to 12 VAC power transformer. If other input voltages are required, contact Brayden Automation Corporation or your Energy Sentry® representative for further details.

- A. Remove the two 6-32 x 1/2" screws on the right side of the enclosure.
- B. Swing the cover door open to provide access to all terminal connections.
- C. Locate the 12 VAC power input labeled "P9" in Figure 3 or 4 of this manual. Connect the yellow pigtail leads with molex plug (enclosed) to the 12 VAC transformer.

Note: If the unit is supplied with a 12VAC wall transformer and the molex plug is already installed on the 12 VAC transformer wires, you do not need the yellow wire pigtail.

- D. Attach the 12 VAC supply to the 12 VAC power input labeled "P9."

4. Connecting the Pulse Electric Meter to the 9321A or M

Note: If your unit is a Model 9321A or 9321M, read this section; otherwise go to Section 5.

The 9321X is configured as shown in Figure 1. It supplies 6 to 9 VDC to the meter and receives pulses back as the meter's KYZ switch toggles back and forth. Each pulse or change of state of the KYZ switch represents the consumption of a number of watt-hours, determined by the meter. The rate at which the KYZ switch changes is proportional to the demand.

Connection of the pulse meter to the 9321X is simple:

- A. Turn off power to the Energy Sentry® 9321X Demand Monitor.
- B. The Pulse Electric Meter should have a "Dry Contact" KYZ output. This means there is no sourced voltage from the electric meter.
- C. Run a single pair of #18 AWG wire from the "K" and "Y" terminals of the electric meter to the monitor. Connect either wire of the pulse meter to terminal J2 as shown in Figure 3. Connect the remaining wire to the remaining wire of the pulse meter in the same manner to the remaining J2 terminal. Leave about 6" extra.

NOTE: Avoid running pulse meter leads parallel to high-voltage (Class I) wiring.

5. Connecting Single-Phase Current Transformers to the 9322A

The 9322A is configured as shown in Figure 2. The current transformers are placed around the incoming power line conductors after the meter and read power directly.

Model 9322A is equipped with a pair of one of the current transformer options listed in Table 1 for single-phase power measurement.

Installing and Wiring Current Transformers

Note: You may need to coordinate installation of current transformers with the local utility company.

Mounting Toroidal (Solid Core) CT's

- 1) Disconnect main power to the load center panel by turning off the main disconnect removing the meter in direct (non-CT) metered applications.
- 2) When power is off, install current transformers around main feeder cables between the meter and the main breaker as shown in the wiring diagram on monitor or in Figure 2. The current transformers must be installed in the same direction.

Note: Ensure that all of the current transformers are mounted in the same direction, i.e., red polarity dots on the CT are on the same side—either both up or both down.

Table 1. 9322A Single-Phase Current Transformers

Core Type	Current Transformer Part #	Size	Current Transformer I.D.	Service Size
Solid	8420-3028	Standard*	1.4"	200 AMP
Solid	8420-3029	Large	1.8"	400 AMP
Solid	8420-3030	X-Large	2.8"	400 AMP
Split	8420-3039	Standard	1.0"	200 AMP
Split	8420-3040	X-Large	2.5"	400 AMP
Split	8420-3041	Large	1.5"	400 AMP
Split	8420-3043	Small	.75"	200 AMP

*Supplied with Standard Unit

Note: Custom current transformers are available in many sizes and options, including split-core and clamp-on types. Call your Energy Sentry® dealer or the factory for details.

Figure 1. Model 9321x Pulse Meter Monitoring Application

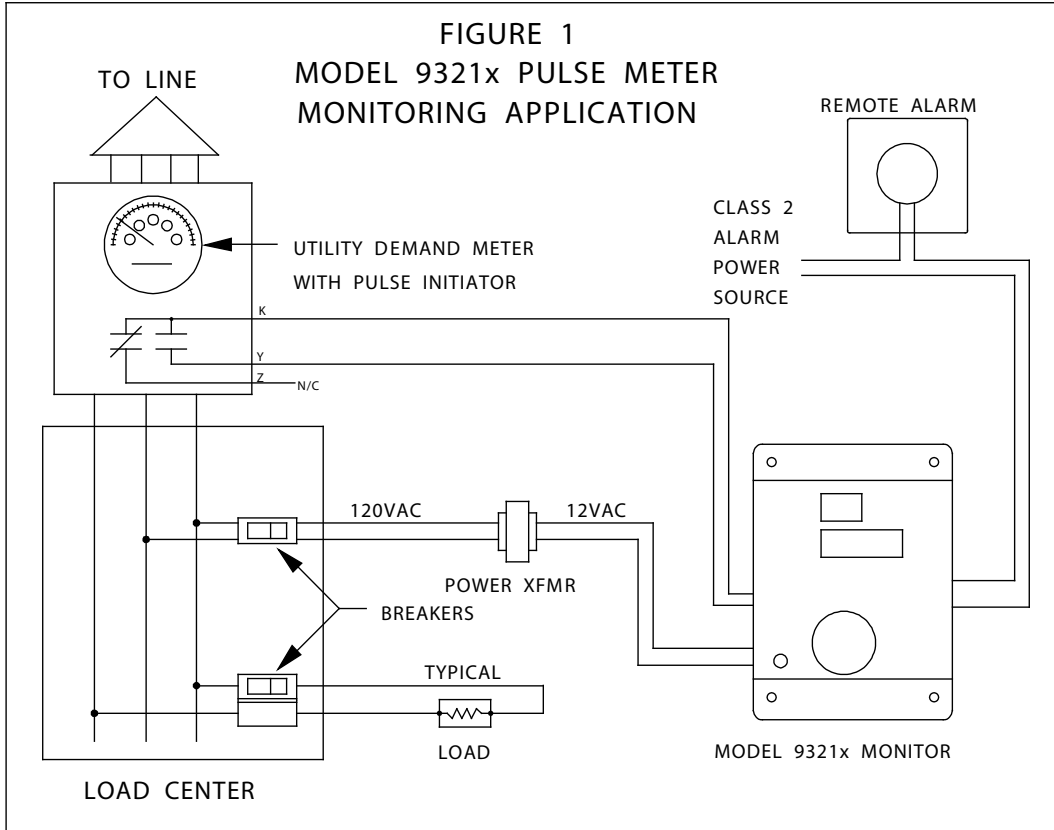


Figure 2. Model 9322A Single-Phase Monitoring Application

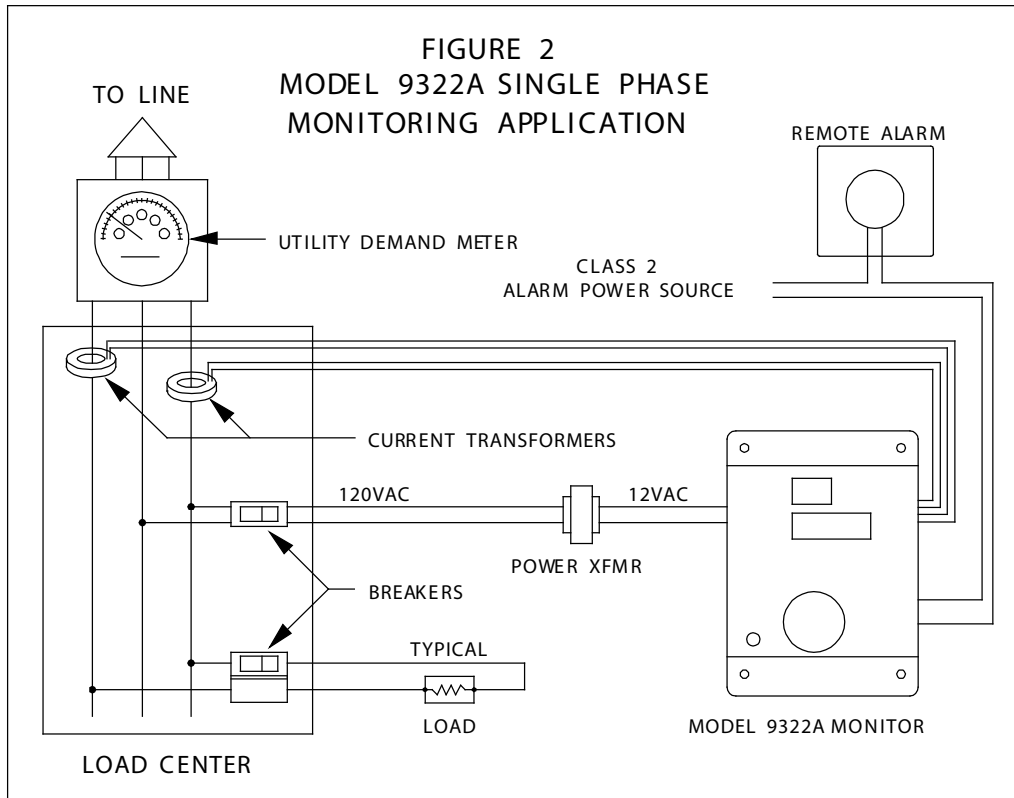


Figure 3. Pulse Meter Connections

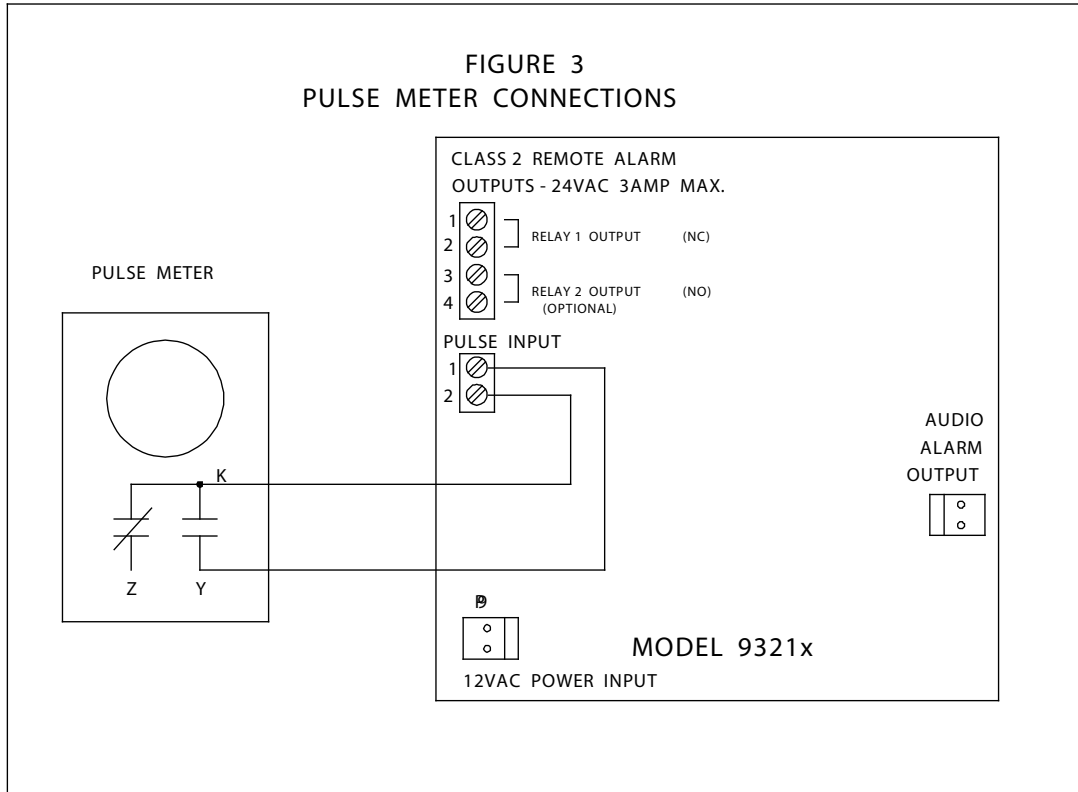
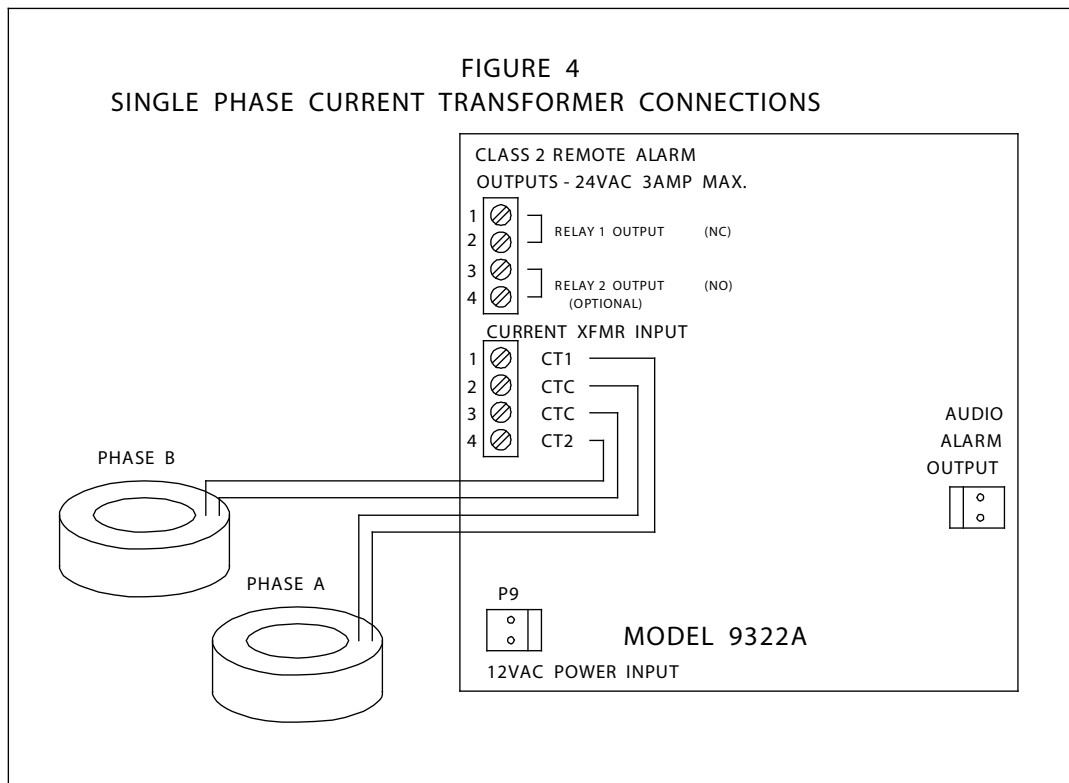


Figure 4. Single-Phase Current Transformer Connections



- 3) Run current transformer leads into monitor enclosure via the knock-out or conduit. Cut the black/white twisted pair of each to a sufficient length to connect to the 4-position terminal block on the left hand side of the 9322 printed circuit board as shown in Figure 4. Leave about 6" extra.
- 4) Strip each conductor back 1/4".
- 5) Connect black and white wires to 4-position terminal block as outlined in Table 2.

Mounting Split Core CT's

- 1) Run current transformer leads into monitor enclosure via the knock-out or conduit. Cut the black/white twisted pair of each CT to a sufficient length to connect to the 4-position terminal block on the left hand side of the 9322 printed circuit board. Leave about 6" extra.
- 2) Strip each conductor back 1/4".
- 3) Connect black and white wires to 4-position terminal block as outlined in Table 2.
- 4) Remove nylon screws from split core CT's and remove the "I" piece of the split core CT. Slip the CT around the main power conductor. Replace the "I" piece of the split core CT. Replace the nylon screws. Repeat for the other CT.

Note: *Ensure that all of the current transformers are mounted in the same direction, i.e., black indexing arrows on the CT are pointed in the same direction—either both up or both down.*

6. Connecting a Remote Alarm to a 9320 Series Monitor

You can connect a remote alarm to a 9320 Series Monitor in two different ways using either the normally-closed or the normally-open contact as shown in Figure 5. These are "dry contact" relay outputs that must use an external power source for an alarm. Do not exceed a voltage of 40 Volts DC or 30 Volts AC so that the 9320 monitor complies with UL Class II Wiring Requirements.

Normally Closed Contact

Upon system power up, the normally closed contact is opened and remains open until the alarm is activated or power is lost. This way, if power is lost to the monitor or a demand alarm occurs, the external alarm connected to this relay and powered by an external power source will be activated.

When the alarm is activated, the contact closes and remains closed until the over-limit alarm conditions are eliminated. This contact functions as both a demand alarm and a power fail detect.

Normally Open Contact

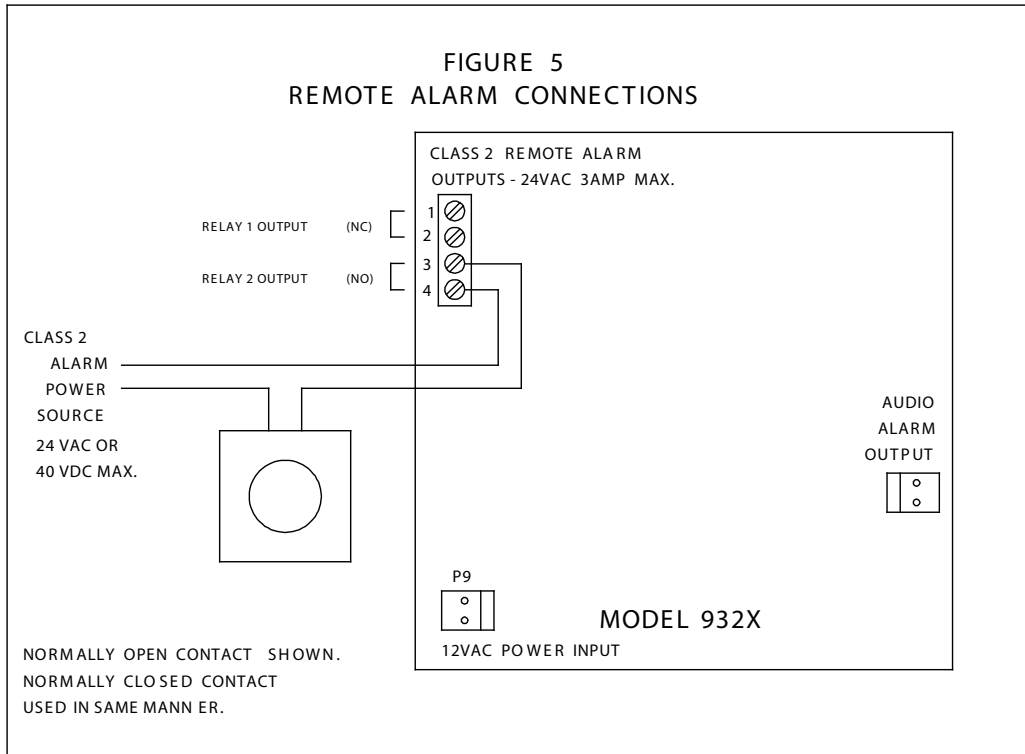
If the normally open contact is used, it will close when the demand alarm is activated and remain closed until the over-limit alarm condition is eliminated. This relay does not activate the external alarm upon loss of power to the unit.

This contact can be used to shed a single load through a suitable auxiliary relay if desired. It also can be used to signal another control system such as a Programmable Logic Controller (PLC), SCADA System or Building Automation System.

Table 2. Current Transformer Connections to 9322A Monitor

Terminal #	Terminal Name	Wire Color
1	CT1	White - from CT1
2	CTC	Black - from CT1
3	CTC	Black - from CT2
4	CT2	White - from CT2

Figure 5. Remote Alarm Connections



7. Start-up

- A. Once all connections are made to the demand monitor, close the demand monitor cover, making sure all wires are inside before closing. Secure cover in place by replacing 6-32 X 1/2" screws.
- B. Turn on power to the 9320 Series Demand Monitor by plugging in the wall transformer (or turning on the breaker for the circuit to which the 9320 is attached). The display should immediately light up. The internal audible alarm (if installed) should beep once to indicate that the unit has powered up.
- C. The 9320 Series Demand Monitor powers up in the instantaneous demand (id) mode. If the CT's or Pulse Meter are correctly connected, you should see some power reading in the lower display. This may not be correct until the monitor is correctly programmed.

8. Programming

You may use 9320 Series Demand Monitors with regular or straight demand rates, or with Time-Of-Use (TOU) demand rates.

The 9320 monitors contain two display sequence loops: the top level or Main Loop, and the lower level or System Programming Loop. The Main Loop contains display modes normally used in daily operation. The System Programming Loop is used to set up system parameters during installation or when there have been changes in the monitor's operation or the facility it is monitoring.

To step through these displays, turn the Rotary Control Knob to the right (clockwise) to move down the list in this section to the proper display. To step to the preceding display, turn the control knob to the left (counter-clockwise).

To change the value in the display, hold down the push-button switch and turn the control knob until you reach the desired value on the display. Settings are automatically saved as soon as they are changed.

Main Loop Settings & Definitions

Display Mode	Data
(id)	Instantaneous Demand
(Ad)	Average Demand
(Pd)	Peak Demand
(dL)	Demand (Alarm) Limit
(bP)	Alarm Percentage
(CL)	Clock

Instantaneous Demand (id) The current demand presently being drawn by the electrical service of the building or facility.

Average Demand (Ad) The average demand that has accrued over the last 15-, 30- or 60- minute interval, as set by the averaging period "AP" in system programming mode of the 9320 monitor. This should be the same as the averaging period of the utility's demand meter. The 9320 Series uses a continuous "sliding window" demand averaging method, not a resetting or block interval demand averaging method.

Peak Demand (Pd) The highest average demand (Ad) that has occurred (since last reset) during the On-Peak periods. This is the peak demand that will have been set on the electric meter and consequently, the demand that you will be billed for. To reset, set display to "Pd" mode, press push-button switch and turn knob one "click" counter-clockwise.

On-Peak Demand Alarm Limit (dL) The current demand alarm limit in effect. It is adjustable up to 990 KW (9900KW in the 9321M), in 5 different full scale ranges. During the On-Peak period(s), the On-Peak demand limit will be displayed and can be changed. During the Off-Peak periods, the Off-Peak demand will be displayed. You can check the On-Peak demand limit while Off-Peak by simply pushing the push-button system switch. See Tables 3 and 4.

Alarm (buzzer) Percentage (bP) The percentage of the demand limit that the average demand must be equal to or greater than to initiate an alarm if the conditions defined in the "bi" and "bA" settings are also met. The valid range is 50% to 99%, with the default being 75%.

Clock (CL) The current time (military) between midnight (0:00) and 11:59 PM (23:59) of the next night. The clock must be set to the accurate time of day to be in sync with the utility meter when used with TOU rates.

System Programming Loop Settings & Definitions

To enter System Programming Mode, depress the push-button switch and hold for 5 seconds. The display will change from the Main Loop display mode to the first setting of the System Programming mode: "dE".

Display Mode	Data
(dE)	Temperature (used for factory calibration only)
(do)	Day of Week
(dA)	Date
(Yr)	Year
(dS)	Auto Daylight Savings Time Adjust
(S1)	Summer Period 1 Start
(S2)	Summer Period 1 Stop
(S3)	Summer Period 2 Start
(S4)	Summer Period 2 Stop
(Sd)	Summer Start Date
(A1)	Winter Period 1 Start
(A2)	Winter Period 1 Stop
(A3)	Winter Period 2 Start
(A4)	Winter Period 2 Stop
(Ad)	Winter Start Date
(SS)	Saturday/Sunday On/Off Peak
(Hx)	Holidays 1-9 where x=1 through 9
(oP)	Off-Peak Peak Demand
(oL)	Off-Peak Demand Limit
(bi)	Buzzer Instantaneous
(bA)	Buzzer Average
(AP)	Averaging Period
(dr)	Demand Range (does not appear in 9321M version)
(FS)	Full Scale (appears only if the "dr" setting is set to "PULS" or "3P")
(PC)	Pulse Constant (appears only if the "dr" setting is set to "PULS")
(Fi)	Fast Instantaneous (appears only if the "dr" setting is set to "PULS")

Temperature (dE) The current temperature in (dE)rees Fahrenheit inside the monitor's enclosure. Used for factory calibration only.

Day of Week (do) The current day of the week. 1=Sunday, 2=Monday, 3=Tuesday, 4=Wednesday, 5=Thursday, 6=Friday, 7=Saturday.

Date-Month & Day (dA) The current month and day of the month. Setting range from 1/1 to 12/31.

Year (Yr) The current year.

Auto Daylight Savings Adjust (dS) Allows the monitor to be programmed to automatically adjust the clock (CL) for daylight savings time. Set to ON in states (or provinces) where daylight savings time is used. Set to OFF in states (or provinces) where daylight savings time is not used.

If set to ON, the time will be adjusted back one hour in the fall and forward one hour in the spring on the appropriate Sundays.

Summer 1 On-Peak Time (S1) The start time of the first daily peak period and when the On-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Summer 1 Off-Peak Time (S2) The end time of the first daily peak period and when the Off-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Summer 2 On-Peak Time (S3) The start time of the second daily peak period and when the On-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Summer 2 Off-Peak Time (S4) The end time of the second daily peak period and when the Off-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Summer Start Date (Sd) The date that the summer rates go into effect, and the date the above summer timers S1 through S4 are effective. A setting of 0/0 causes summer times S1 through S4 to be ignored.

Winter 1 On-Peak Time (A1) The start time of the first daily peak period and when the On-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Winter 1 Off-Peak Time (A2) The end time of the first daily peak period and when the Off-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Winter 2 On-Peak Time (A3) The start time of the second daily peak period and when the On-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Winter 2 Off-Peak Time (A4) The end time of the second daily peak period and when the Off-Peak demand limit is initiated. Setting range from 0:00 to 23:59.

Winter Start Date (Ad) The date that the Autumn/winter rates go into effect, and the date the above autumn/winter timers A1 through A4 are effective. A setting of 0/0 causes winter times A1 through A4 to be ignored.

Saturday/Sunday On/Off Peak (SS) Sets weekends to On-Peak or Off-Peak depending on the local utility's rate. If your utility has On-Peak periods on weekends, set to ON. If weekends are Off-Peak, set to OFF.

Holiday X (HX) Where "X" is Holiday 1 through 9 and is set by date (month and day of month) and can be in any order. The first three holidays are New Year's Day (1/1), Fourth of July (7/4) and Christmas Day (12/25). These are the only holidays that fall on the same date each year.

Each January 1st, set the dates of the other holidays that the utility considers as Off-Peak. All unused holidays are set to 0/0.

Off-Peak Peak Demand (oP) The highest average demand (Ad) which has occurred (since last reset) during the Off-Peak periods. To reset, set monitor to "oP" mode, press push-button switch and turn knob one "click" counter-clockwise.

Off-Peak Limit (oL) The demand limit during the time the monitor is in an Off-Peak period. Adjustable in 1% increments of full scale, "FS", or to OFF. If your utility does not meter demand during Off-Peak periods, set this to OFF. The monitor will not alarm during Off-Peak periods when set to OFF.

For proper monitor operation, the Off-Peak demand limit should be greater than the On-Peak demand limit. The demand limit set here will be displayed in the "dL" setting in the Main Loop only during Off-Peak periods.

Alarm (buzzer) Instantaneous (bi) When this setting is set to ON, the alarm will sound only if the instantaneous demand is above the demand limit. When set to OFF, the alarm will sound in response to the bA and bP setting (if applicable) regardless of the value of the instantaneous demand. This setting works in combination with "bA" and "bP".

Alarm (buzzer) Average (bA) When this setting is set to ON, the alarm will sound only if the average demand is increasing. When set to OFF, the alarm will sound in response to the bi and bP settings (if applicable) regardless of the status of the average demand. This setting works in combination with "bi" and "bP".

Averaging Period (AP) This setting sets the demand averaging interval of the monitor to 15, 30 or 60 minutes. This should coincide with the utility's averaging period of its demand meter.

If the demand averaging period of your electric meter is different than that shown on the display, press the push-button switch and rotate the knob clockwise or counter-clockwise until the correct averaging period is reached. Release the switch.

Most demand averaging periods are 15 minutes. However, some utilities use 30- or 60-minute demand averaging.

Demand Range* (dr) Sets the demand range and type of input to the monitor. There are four input options to select from:

- "40" (KW) for 200 Amp CT's Single Phase (9322A only)
- "80" (KW) for 400 Amp CT's Single Phase (9322A only)
- "PULS" for Pulse Input
- Do not use the "3P" setting

* This setting does not appear in the 9321M

Full Scale (FS) When the "dr" mode above is set for "PULS", the Full Scale (FS) setting appears. This mode selects the maximum demand alarm limit and demand limit resolution, which is set in increments of 1% of the full scale chosen, from 4% to 99% of full scale. See Setting the Demand Limit for further information on how to set this setting.

The full scale *must be greater than* the maximum instantaneous demand. Otherwise you will get erroneous demand readings. Changes in the Full Scale will change the scaling of the instantaneous demand, average demand, peak demand and the demand alarm limit.

Pulse Constant (PC) When the "PULS" setting is selected in the "dr" mode above, this setting follows the "FS" mode. This setting tells the monitor how many watt-hours each pulse received from the electric meter is worth and consequently, how to calculate instantaneous demand. See Appendix A for further information on how to set this setting.

Fast Instantaneous (Fi) If this setting is ON, the instantaneous will be updated every second. If this setting is OFF, the instantaneous reading will be updated every 8 seconds and reflect the average instantaneous reading for the last 8 seconds.

For a 30-minute averaging period, the instantaneous reading will be updated every 16 seconds. For a 60 minute averaging period, the instantaneous reading will be updated every 32 seconds.

Using the Fi=OFF (slow) is not recommended unless the Fi=ON performs poorly due to the way in which the pulse meter sends pulses to the 9320 monitor. The slow method has less display precision — it rounds the instantaneous value to the nearest 1% of full scale. This makes it easier to read.

Use the "slow" mode (Fi=OFF) when the pulse meter poorly simulates the KYZ operation of the mechanical pulse meter or when the Fi=ON gives false reading or fluctuates excessively.

Setting the Demand Limit

There is no single demand alarm setting that will be suitable for every application. The level of demand required to satisfy comfort, economy, convenience or required operation will vary — sometimes widely — with the uniqueness of each building or facility, its occupants and equipment, and the use profile.

The 9320A Series has a demand alarm limit setting range of up to 1000 KW in 1% increments of Full Scale. There are five Full Scale ranges: 50, 100, 200, 500 and 999.9 KW. This means that demand limits are changed in increments of .5 KW, 1 KW, 2 KW, 5 KW and 10 KW respectively. Table 3 summarizes the Demand Limit Ranges.

Table 3. Demand Limit Ranges 9321A

Full Scale (KW)	Minimum Demand Limit (KW) (4% of FS)	Maximum Demand Limit (KW) (99% of FS)	Demand Limit Increment (KW)
50	2	49.5	.5
100	4	99	1
200	8	198	2
500	20	495	5
1000	40	990	10

Table 4. Demand Limit Ranges 9321M

Full Scale (KW)	Minimum Demand Limit (KW) (4% of FS)	Maximum Demand Limit (KW) (99% of FS)	Demand Limit Increment (KW)
500	20	495	5
1000	40	990	10
2000	80	1980	20
5000	200	4950	50
10000	400	9900	100

The 9321M has a demand alarm limit setting range of up to 10000 KW (10 MW) in 1% increments of full scale. There are five Full Scale ranges: 500, 1000, 2000, 5000 and 9999 KW. This means that demand limits are changed in increments of 5 KW, 10 KW, 20 KW, 50 KW and 100 KW respectively. Table 4 summarizes the Demand Limit Ranges.

A good starting demand limit is 80% of your last month's billing demand (if you're staying on your current electric rate).

Read the demand on your last electric bill. Multiply this value by .8 or 80%. Set the "dL" setting to this value. Reset the peak demand "Pd" mode. You will be able to tell within a day or two, or perhaps within a few hours, whether this demand limit is appropriate. Adjust as necessary to fit your savings, comfort, convenience or budgetary goals. Each increment of demand is displayed in the data portion of the digital display.

If you are changing the type of electric rate that you're billed under, your starting demand may be dramatically less if your application is one which lends itself well to the new electric rate and demand control. Add up the size of all large electrical loads in the building. Add to that all other lighting, appliance and other equipment which will be running during the On-Peak or normal control times. Divide the total by two and compare this number to the 80% calculated above. Enter the lower of the two numbers in the demand monitor's demand alarm limit setting "dL". If this demand alarm limit still seems to be too high, continue to lower the "dL" setting until the alarm sounds. Gradually adjust the demand limit up until you find a balance between comfort, convenience and required demand.

It is important to remember that once the demand on the meter increases, it will not come down until it is reset to zero each month by the meter reader. Therefore, it will not benefit you to lower your demand setting below what is already registered on the meter.

Setting the Time-Of-Use Functions

The 9320 Series is designed to work with either regular (straight) demand rates or Time-Of-Use demand rates. The TOU functions of the 9320 permit wide flexibility in applying the demand monitor to all types of TOU rates.

The 9320 Series Demand Monitors are factory programmed for non-TOU rate applications. This means that if you intend to use the monitor with a TOU rate, the TOU functions of the 9320 Series monitors must be programmed.

Regular Demand Rates

To use the 9320 with regular demand rates, you must disable the Time-Of-Use functions (these are the default settings). Do this by entering a date of 0/0 in the summer start date (Sd), the winter start date (Ad) and all holiday settings H1 through H9. In addition, you must set the Saturday/Sunday setting "SS" to ON. This causes the monitor to be On-Peak full time, regardless of the date or day of the week.

Annual TOU Demand Rates

These rates typically have an On-Peak and Off-Peak schedule that is the same year around. To program the 9320 for this type of rate, simply program the On-Peak time(s) into the summer schedule settings S1 and S2. If two On-Peak periods are used, program the second On-Peak period into summer settings S3 and S4. Otherwise set S3 and S4 to 0/0. Set the summer start date to 1/1. Set the winter start date to 0/0. This causes the winter dates to be ignored and the summer schedule to be run year round. Make sure the Saturday/Sunday setting "SS" is set to ON if weekends are on-peak.

Seasonal Time-Of-Use Rates

These rates typically have one or two On-Peak periods per day with different schedules during the summer and winter seasons. Set the start and end times of each On-Peak period for the appropriate season, as well as the date each schedule goes into effect.

On-Peak (Full-Time Control) Seasons

If you desire to monitor 24 hours per day, seven days a week during one of the seasons of the year, do it by setting S1 through S4 (or A1 through A4, depending on the season desired) as follows:

Set S1 = S4.

Set to any time (S1 and S4 must be the same).

Set S2 = S3.

Set to any other time (S2 and S3 must be the same).

Off-Peak (No Control) Seasons

If you desire to not monitor at all during one of the seasons of the year, do it by setting S1 through S4 (or A1 through A4, depending on the season desired) as follows:

Set S1 = S2.

Set to any time (S1 and S2 must be the same).

Set S3 = S4.

Set to any other time (S3 and S4 must be the same).

Switching from TOU to Regular Demand Rates

If for any reason you wish to switch from TOU functions back to regular demand rates, you must disable the Time-of-Use functions. Do this by entering a date of 0/0 in the summer start date (Sd), the winter start date (Ad) and all holiday settings. In addition, you must set the Saturday/Sunday setting (SS) to ON. This causes the monitor to be On-Peak full time, regardless of the date or day of the week.

Setting the Programmable Demand Alarms

The 9320 Series contains three settings that allow you to tailor how the monitor implements a demand alarm. These alarm configuration modes are the Alarm Buzzer Percentage (bP) (see

description on Page 7), The Alarm Buzzer Instantaneous (bi) and the Alarm Buzzer Average (bA) (see descriptions on Page 8). Depending on how these modes are set, you can define the alarm to fit the application and the amount of warning time desired.

The alarm algorithm of the 9320 Demand Monitor uses the “bP” setting as the logical basis for the alarm. This setting is the percentage level of the demand alarm limit which the average demand must exceed to activate the alarm. For an earlier warning, use a lower percentage. For a later warning, use a higher percentage. With a later warning, you will have less time to react to keep your average demand from exceeding the demand limit. For large facilities, larger percentages are generally required.

You can combine the “bP” setting with either or both of the other alarm definition settings, “bi” and “bA”. If the “bi” is set to ON, then whenever the buzzer percentage condition is met and the instantaneous demand is greater than the demand limit, the alarm will activate. If the “bA” is set to ON, the alarm will activate if the average demand is increasing and the other alarm condition(s) are met. If both “bi” and “bA” are on, the alarm will activate whenever the average demand is greater than the percentage set in “bP” and the instantaneous demand is greater than the demand alarm limit and the average demand is increasing.

Auto-Limit — A Way to Automate Your Demand Alarm Limit Settings

The 9320 is equipped with the optional capability to set demand limits on a monthly, quarterly or seasonal basis. Up to 12 “setting pairs” (demand limits and start dates) may be set to automate your demand alarm limit changes.

The 9320 is shipped from the factory with this feature disabled. The 9320 will operate with the normal demand limit in the “dL” mode until the Auto-Limit feature is enabled.

Auto-Limit Settings & Sequences

Setting Pairs	Description
d1	Start Date - Period 1
L1	Demand Limit - Period 1
d2	Start Date - Period 2
L2	Demand Limit - Period 2
d3	Start Date - Period 3
L3	Demand Limit - Period 3
d4	Start Date - Period 4
L4	Demand Limit - Period 4
d5	Start Date - Period 5
L5	Demand Limit - Period 5
d6	Start Date - Period 6
L6	Demand Limit - Period 6
d7	Start Date - Period 7
L7	Demand Limit - Period 7
d8	Start Date - Period 8
L8	Demand Limit - Period 8
d9	Start Date - Period 9
L9	Demand Limit - Period 9
dA	Start Date - Period A (10)
LA	Demand Limit - Period A
dB	Start Date - Period B (11)
LB	Demand Limit - Period B
dC	Start Date - Period C (12)
LC	Demand Limit - Period C
nd	# of Days of Offset

Of the 12 setting pairs available, you may use all, some, one or none of these start dates and demand limits, depending on your particular needs. If you want to change your 9320's demand limit monthly to optimize your savings, set all 12 setting pairs. If you want to change your demand limit quarterly, simply set four setting pairs. You can also use just one setting pair to reset the demand limit to a lower level following the high-use season. The rest of the year you can use manual adjustments to the "dL" setting.

In addition to the 12 setting pairs, there is one additional setting called "nd" or number of days. This setting creates a "window" or target period that allows for the variation of the actual meter reading date to the target meter reading date. The "nd" setting determines the number of days before or after the target meter reading date that the demand limit will actually be changed. If the demand limit is increasing, the demand limit is changed "nd" days after the target date. Conversely, if the demand limit is decreasing, the change will be implemented "nd" days before the target date. This is necessary since the meter reader may or may not read your meter on the scheduled date. A five- to seven-day window usually allows enough time for this variation.

Accessing Auto-Limit and Programming the Settings

To access the Auto-Limit mode, you must be in the first level of the System Programming Mode. You may be in any setting of this first level except the last setting "dr." Press the push-button switch continuously for 5 seconds, just as you would to access the top level of System Programming. The setting "d1" will appear in the Mode Display. Press the push-button switch and turn the control knob to adjust the date (and limits) of each setting. To move to the next setting, simply turn the control knob. Each successive "click" of the control knob will step you through the sequence listed above. Following the last setting, one more "click" of the control knob will return you to "id," the first setting of the top-level display mode.

Optimizing Auto-Limit Savings

Target Meter Reading Date is Critical

To optimize the savings by using the Auto-Limit feature, first review your electric bill or call your electric utility to determine the meter reading date. Make sure this is the date that service for the previous period ends and service for the next period begins, not the billing date, which is usually different.

Your utility will be able to tell you the date your meter should be read. Weekends, holidays, unexpected delays or absences affect the actual date the meter is read. Each year the start dates should be reviewed to confirm that the target meter reading dates are as expected.

You should notify your utility that the meter reading date is critical to you and that the meter should be read on the target date plus or minus "nd" days, the offset period set in the controller (see previous page for an explanation of "nd" or the number of days setting). Ask them to notify you in advance of any changes in the meter reading cycle which affect the meter reading date. When you receive your utility bill, check to make sure that the meter was read during the target period, that is, the target date plus or minus the number of days programmed in the "nd" setting.

The "nd" setting should be set conservatively to make the change as soon as possible but with a high level of confidence that the meter will actually be read within the target period. Five to six days is usually adequate for utilities that read meters on a repeatable basis. Eight or nine days may

be necessary for utilities that have a less-regular meter reading interval. Less than four days of offset time is usually inadequate, just because of weekends. Even if the utility can guarantee the meter reading date, an “nd” of 3 or 4 should still be used.

Review Target Dates and Demand Limits

If you use the Auto-Limit feature of the 9320, keep in mind that the demand limit will change automatically at the programmed dates this year, next year and each year thereafter. They will change without warning and may not be appropriate or adequate for future years' conditions. Even though the Energy Sentry 9320's Auto-Limit feature can make the job of adjusting your demand alarm limit effortless, you need to review the target dates and demand limits periodically (no less than annually) to make sure they are right for you and consistent with the utility's meter reading date.

If you enable the Auto-Limit feature, the current demand limit in effect is shown in the “dL” setting. If you change the “dL” demand limit setting in the Main Display Mode while the Auto-Limit feature is enabled, it does not change the demand limit programmed in the L1, L2, etc. settings. The “new” demand limit serves only as an override demand limit that is in effect only until the next scheduled demand limit change. For example, suppose the current date is August 12. The target dates you have set in the controller for d7 and d8 are July 15th and August 14th, respectively. You are currently in period 7 and the L7 setting is 70 KW. The L8 setting is 85 KW. You have decided that 70 KW is not enough so you change the “dL” setting from 70 to 75 KW. Everything seems to be fine with 75 KW. Two days later, August 14th, is the meter reading date and the target date you have set in the d8 setting. The “nd” setting is 4 days. Therefore, on August 18th, the demand limit changes from 75 KW to 85 KW, the demand level set in L8. (August 14th plus 4 days of offset after, since the demand limit is increasing.) The following year on July 15th (plus or minus “nd” days) the demand limit will again change to 70 KW.

Changing Demand Alarm Limit Seasonally

The Auto-Limit feature may be used to seasonally adjust the demand alarm limit with no consideration given to the meter reading date. This method will offer greater convenience and will simplify the use of Auto-Limit but will not yield the maximum savings which can be achieved.

To change the demand alarm limit seasonally, simply set the desired starting date and demand alarm limit. Set the “nd” to 1.

Disabling Auto-Limit

To disable the Auto-Limit feature of the 9320, set all dates d1 through dC to 0/0. Demand alarm limits L1 through LC are ignored when the start dates are set to 0/0, but will remain in memory if you decide to use them later.

9. Operation

Instantaneous Demand Mode

The instantaneous demand (id) mode indicates the current instantaneous demand in the building or facility. This display mode is provided primarily for your benefit and allows you to see the effect of loads turning on and off. It is updated once per second if the fast instantaneous mode is set to ON. Otherwise, the instantaneous mode is updated every 8, 16 or 32 seconds, depending on the averaging period.

Average Demand Mode

Turn the knob one click clockwise until “Ad” is displayed on the monitor. This setting shows the current average demand for the period set in the “AP” setting in the programming mode. For example, if the averaging period is set to 15 minutes, this display indicates the demand over the last 15-minute period.

Peak Demand Mode

Turn the knob one click clockwise until “Pd” is displayed on the monitor. This setting shows the “Peak,” or highest average demand “Ad,” that has occurred since last reset. This is the setting that will correlate to the demand on your electric bill. To reset this setting, hold down the push-button switch and turn the knob counter-clockwise. If the current average is zero, the peak will reset to zero. Otherwise, the peak will reset to the current average, which is now the highest average. The peak demand display will follow the average demand up as it increases. However, as the average demand decreases as power use decreases, the peak demand displayed in the “Pd” mode is “captured” to indicate the highest demand that has occurred.

Demand Limit Setting Mode

Turn the knob clockwise until the demand limit setting “dL” appears on the top display. This setting is the level of demand in KW that will activate the alarm when a preset percentage (50-100%) of this demand limit is about to be exceeded.

As a general rule of thumb, set the demand limit at about 20% less than your last month’s metered demand on your electric bill. If you find that at this level the alarm is sounding too frequently, move the demand limit up to a level that is more suitable for your use. If you find that the alarm never sounds and you wish to increase your monthly savings, decrease the demand limit setting until you reach the level that suits your needs and budget.

In cases where you will be put on a higher rate by the utility if you exceed a KW level determined by the electric rate, simply set the “dL” setting to a few increments of demand less than that KW level. If the alarm sounds, you will have one or two minutes to turn loads off to maintain the KW demand limit.

The range of the demand limit is from 4% to 99% of the Full Scale setting. See the section on Setting the Demand Limit for more detailed information on demand limit ranges.

Alarm Activation

When the average demand starts to approach the demand limit setting and the controller projects that it will exceed the demand limit within a few minutes and all of the conditions set in the bP, bi and bA modes have been met, the alarm will activate. The monitor’s internal audible alarm will sound at a frequency of approximately 3.6 KHz at an on-off interval of one second. The relays will also activate at the same time as the audible alarm, but they will remain continuously closed until the alarm is cancelled. Keep in mind that as you manually turn off loads to reduce demand and cancel the alarm condition, you may need to reduce KW demand (id) to below the demand limit (dL) value in order to silence the alarm.

10. Testing

- A. Power to the monitor should be on.
- B. Programming should be completed for system settings and the correct input type.
- C. Turn on a load of a known size. Compare the size of this load to the increase and decrease on the monitor in the “id” instantaneous display mode as the load is turned on and off. These readings should be very close. Differences may result from line voltage variations, component tolerances, etc.
- D. Decrease demand limit below the current instantaneous and average demand levels. The alarm should sound if the average demand is increasing. This may take a few seconds.
- E. Check remote alarms in the same manner.
- F. Return all system settings to normal.

11. Wrap-Up

- A. The 9320 should now be on and set with the proper system settings.
- B. Replace cover on the 9320.
- C. Record the following information in the spaces provided:
 - Unit serial number
 - Date of installation
 - Dealer/ Installer
- D. Complete warranty card and mail to Brayden Automation Corporation.

Note: Warranty card must be sent in for proper registration of unit and must include unit’s serial number. Warranty is not valid unless warranty card has been received and unit has been registered.

- E. This concludes the installation of the Energy Sentry® 9320 Series Demand Monitor.

Thank you for choosing Energy Sentry!

Important Information

Unit Serial # _____

Date of Installation _____

Dealer _____

Installer _____

Appendix A

9321x Pulse Input Guidelines and Pulse Constant Programming

The 9321A can accept a Pulse Constant (PC) of .1 to 604.3 Watt-Hours/Pulse, while the 9321M can accept a Pulse Constant (PC) of 1 to 6043 Watt-Hours/Pulse (6.043 KWh/p).

The utility-metering industry defines a pulse as any change of state or transition. This differs from the classic definition of a pulse used in the electronics industry.

The 9321 used directly with a pulse output electric meter, is programmed for the same value as the 3-wire (Form C) pulse output of the meter. For example, if the meter has a pulse output of 10 wh/pulse, the 9321's pulse constant (PC) value should be set for 10.0 wh/pulse.

If the 9321 is used with a watt-hour transducer which has a 2-wire (Form A) pulse output, the PC value should be set for half the watt-hour value of the watt-hour transducer. This is due to the difference in definitions of a pulse. For example, if the watt-hour transducer has an output of 40 watt-hours/pulse, the pulse constant (PC) value should be set for 20.0 wh/pulse.

Utilities typically use a standard watt-hour/pulse value on meters within a particular size range. Generally, the pulse constant (PC) value should be kept as low as possible, as long as the pulse rate does not exceed 20 transitions per second at maximum instantaneous demand.

A good place to start is to have a pulse rate at about 1 pulse every 2 seconds at 50% of full load.

Problems arise when:

1. PC value is greater than 604.3 wh/pulse on the 9321A and 6043 on the 9321M.
2. Pulses to the 9321 exceed 20 transitions/second wh/p value of meter is too low.

Note: The 9321A and 9321M use a 3 wire KYZ pulse value, though only the K and Y or K and Z (2 wires) contacts are used.

9321x Pulse Constant Calculations

I. General

If Watt-Hours per Pulse information is not readily available, it can be calculated if the following information is known:

1. Kh meter constant (Watt-Hours per Revolution) of the electric meter.
2. Current Transformer ratio (CT).
3. Potential Transformer ratio (PT) (if used).
4. Number of Pulses per Revolution (PR) or the Revolutions per Pulse (RP) of the meter.

II. Calculating the CT x PT Ratio or "Multiplier"

Before plugging numbers into the formulas below to find the number of Watt-Hours per Pulse, the CT x PT ratio, or "M", must be calculated. The CT x PT ratio formula is as follows:

$$\text{Formula 1} \quad M = CT \times PT$$

"M" is actually the product of the CT ratio and PT ratio. For example, if your application has a meter that is driven by 600 Amp to 5 Amp Current Transformers and has a 2.4 to 1 Potential Transformer, M is calculated as follows:

$$M = 2.4(600/5) = 120 \times 2.4 = 288$$

If Potential Transformers are not used, then M = the ratio of the CT's only. In this case, M would be 120. If neither the CT's nor the PT's are used, M = 1.

III. Calculating Watt-Hours Per Pulse

Calculations for Pulses/Revolution (PR): Pulses per Revolution (PR) is merely the number of holes in the eddy current disk in the meter or the number of transitions per revolution of the KYZ pulse switches. Normally, meters have 2, 4, 5 or 6 holes (or Pulses) per Revolution. Some new meters have as many as 12 or 24 Transitions per Revolution.

Calculations for Revolutions per Pulse (RP): Revolutions per Pulse is usually used on the newer PDR's (Programmable Demand Register), or Pulse Meters. Typically, these can be programmed from between .1 to 10 Revolutions per Pulse.

Watt-Hour/Pulse Formulas: The following two formulas can be used depending on which information you have available:

Formula 2

$$\text{Watt-Hours/Pulse} = \frac{Kh \times M}{\text{Pulses/Revolution}}$$

Formula 3

$$\text{Watt-Hours/Pulse} = (Kh \times M) (\text{Revolutions/Pulses})$$

Example:

Suppose our application has a meter with a Kh (meter constant) of .9, and 4 pulses per revolution. Use the above numbers in Formula 2 as follows:

$$\text{Watt-Hours/Pulse} = \frac{(.9 \times 288)}{4} = 64.8 \text{ Watt Hours/Pulse}$$

You would enter 64.8 in the "PC" setting of the 9321's programming mode.

For Technical Support or Troubleshooting, call Brayden Automation Corp. at 1-888-BRAYDEN (888-272-9336).

Limited Three-Year Warranty

Energy Sentry® control products and their components are warranted by Brayden Automation Corporation against defects in materials and workmanship for three (3) years from the date of original installation, provided that the original date of installation is within one year from date of manufacture. This warranty is further conditioned upon the Energy Sentry® products being properly installed and used for their ordinary and intended purposes. During the term of this warranty, Brayden Automation Corporation, through its authorized representative, will repair, or at its option, replace at no charge an Energy Sentry® product or its components that proves to be defective, provided that you comply with the requirements set forth in this warranty.

Requirements and Conditions Warranty

- 1) The limited warranties contained herein extend exclusively to the original purchaser of the Energy Sentry® product. If you sell the building after installation of the Energy Sentry® product, this warranty is non-transferable to the new owner(s).
- 2) The controller must be installed by a duly qualified and licensed electrical contractor or authorized dealer representative. Any removal and/or reinstallation must be done by a duly qualified and licensed electrical contractor or authorized dealer representative.
- 3) Repairs or replacement shall be undertaken by duly authorized service dealers or Brayden Automation Corporation. If you or any member of your company or any other unauthorized person manipulates, moves, alters, damages or attempts to repair or replace the Energy Sentry® product, the warranty shall be void and of no effect.
- 4) Notification to Brayden Automation Corporation or its authorized dealer under this warranty must be received within one week after discovering any defect in materials or workmanship.
- 5) If the Energy Sentry® product is removed and returned to the authorized service dealer or Brayden Automation Corporation at 6230 Aviation Circle, Loveland CO 80538, for repair or replacement under this warranty, all shipping and handling charges must be prepaid by you. Transit damage is not covered by the warranty and Brayden Automation Corporation suggests you insure shipments to the service dealer or to the factory. Remember to send proof of date of installation as well as the serial number of the unit which is located on the inside of the monitor.
- 6) The warranty does not apply if the Energy Sentry® product has been damaged by accident, alterations, abuse, misuse, improper installation or act of God, or as a result of service or modifications by someone other than an authorized service representative.
- 7) In no event will Brayden Automation Corporation be liable for any lost profits, lost savings, incidental damages or other economic consequential damages, even if Brayden Automation Corporation has been advised of the possibility of such damages due to the proper or improper workings of the Energy Sentry® product.
- 8) This warranty is for factory service only. Brayden Automation Corporation will not be responsible for any field service expense for a licensed electrician or authorized service representative to service the Energy Sentry® product during or after the warranty period is in effect.

This warranty is expressly made in lieu of any other warranties expressed or implied specifically including any warranty of merchantability or fitness for a particular purpose.

This warranty is further conditioned on the return and receipt of the warranty registration card.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.



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