



The Dranetz Series 626 Universal Disturbance Analyzer...

3

The Only Modular System Capable of Monitoring All Environmental Disturbances in Computer Installations, Industrial Control Systems, Telecommunications Equipment, and Medical Instrumentation.

Computers and computer-related systems now operate everywhere—from clean-room data processing centers, office environments, telephone central offices and power rooms, communication centers, and medical facilities to harsh industrial atmospheres. Common to all these applications is the need to supply AC and DC power to sensitive equipment that is free of sags, surges, under and over-voltages, and impulses. Temperature and humidity must be controlled and maintained within acceptable limits. Alarms, relays, and transfer switches must be monitored and correlated with other disturbances. Future sites must be evaluated for suitable environmental conditions. Test results must be capable of being stored, communicated, analyzed, and recorded.

The Series 626 Universal Disturbance Analyzer, with its versatile system of a portable mainframe and a series of interchangeable, plug-in monitoring modules, together with stand-alone remote monitors, accomplishes all these tasks with high accuracy, resolution, and reliability. The unique distributed processing system architecture of the Series 626, including its ability to fully

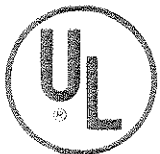
communicate with external devices, permits an operator to configure the exact analysis system required. Yet, the total system remains at all times extremely easy to use, owing to such advanced features as single-button preset programming, prompted setup of custom programs, and retention of all setups until changed by the operator—even if the system is turned off.

Each plug-in module may be added or deleted independently of others. Each is programmed and operated independently of the others. A plug-in may be located in any available mainframe slot—up to a total of five plug-in modules per mainframe—and will identify itself to the mainframe, and the operator, indicating its location and setup procedure. All plug-ins are linked to the mainframe's real-time clock for easy correlation of disturbance events using a common timebase.

In the following pages, the operating convenience and versatility of the Series 626 are fully described, along with detailed specifications and application information. For specific applications, refer to the Selection Guide.

Selection Guide

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The Dranetz Series 626 Universal Disturbance Analyzer...

Easy to Use, Easy to Understand, and Easy to Talk To.

The Series 626 is designed for use by engineers and non-engineers alike. No programming skills are required. Standard factory preset or custom factory preset conditions are entered by a single pushbutton. Manual programming of threshold limits is accomplished by a series of pushbuttons and prompting LEDs. All settings, including the real time clock, are saved even when the Series 626 is turned off.

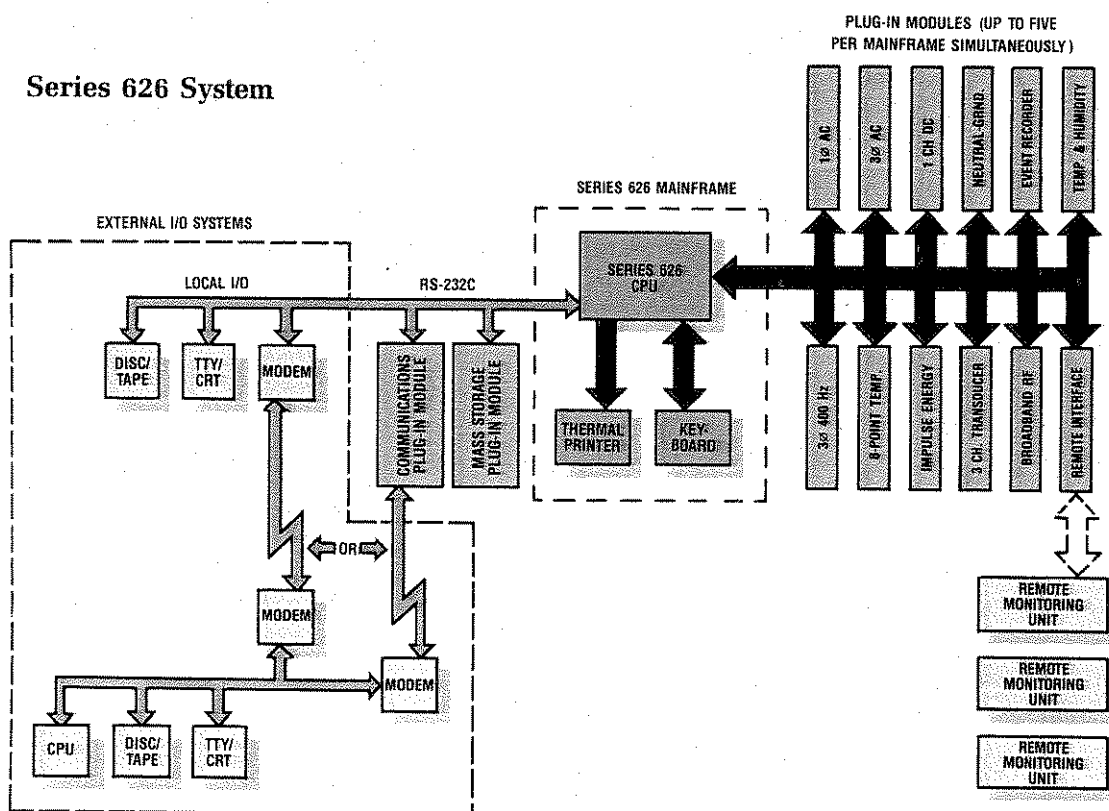
The integral thermal printer displays all time-related conditions and disturbance results with as little or as much detail as desired. Daily summary reports are automatically provided every midnight to include a summary of the entire day's data.

An integral RS232C port allows auxiliary recording of disturbance data on an external (local or remote) printer and operation of the Series 626 from an external (local or remote)

keyboard. Furthermore, by using the 626-PA-6013 Mass Storage Module (see page 17), the results of many weeks of monitoring can be easily reduced by a computer to a manageable report for formal evaluation. Alternatively, the 626-PA-6012A Communications Module (see page 17) with its built-in, auto-dial/auto-answer modem can be added to make all disturbance data instantly available at a central site for continuous or periodic monitoring.

Each plug-in module is an analysis system in its own right (sometimes under individual microprocessor control), and may be added or deleted independently of others. Each is programmed and operated independently of the others without any sort of limitation from the mainframe. A plug-in may be located in any available slot, and will identify itself to the operator (and the mainframe), indicating its location and setup procedure.

Series 626 System



PRINT Pushbutton

A momentary pushbutton which alternately disables or enables the thermal printer. This pushbutton is active only when the RS232C port is connected and active, and may be used to send disturbance data at high speed to an external device connected to the RS232C port. With each depression of this pushbutton, the printer will echo either "PRINTER OFF" and time/date, or "PRINTER ON" and time/date. In the former case, further printout is inhibited unless one of the following occurs:

1. Device connected to RS232C port is lost.
2. Power is lost.
3. End of day produces daily accumulated summary.
4. FUNCTION switch is turned off or on.

Programming Pushbuttons

A series of 28 pushbuttons, including numeric keypad and 10 prompting LEDs, for programming and real-time clock entry.

1 Through 5 Pushbuttons

When depressed and with FUNCTION switch in PROGRAM position, selects plug-in channel for programming.

CLOCK Pushbutton

When depressed and with FUNCTION switch in PROGRAM position, enables operator to set time and calendar date.

Key-protected FUNCTION Switch

OFF: Turns off instrument.

OPERATE: Normal operating position. Programming keypads are disabled and key may be removed to prevent unauthorized tampering with instrument. However, top row of pushbuttons (ALARM, PRINT, etc.) are active.

PROGRAM: Enables user to program real time and date or thresholds of selected channel.

CLEAR DATA: Clears all daily accumulators, removing all data obtained that day, but does not affect real time, date, or program conditions.

RESET: Activates system initialization routine in the same manner as the POWER ON function. Clears all daily accumulators, but does not reset time, date, or program conditions.

ALARM Pushbutton

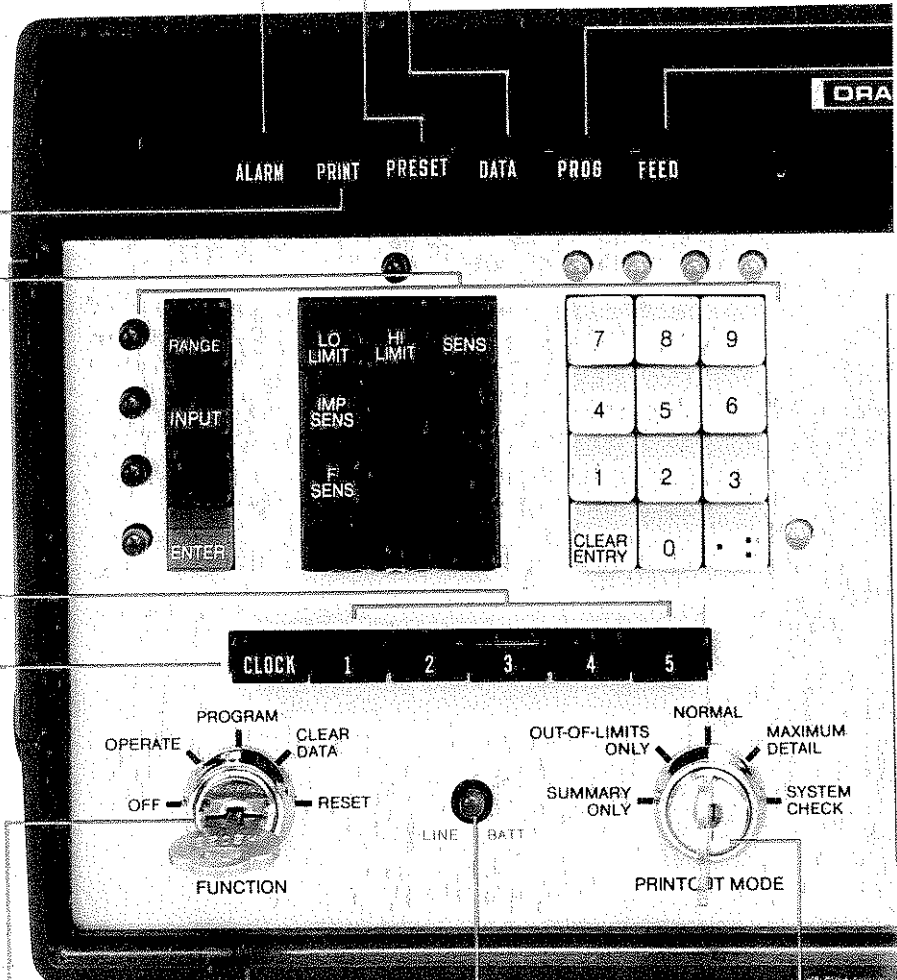
When depressed, enables alarm circuit. Disturbance events cause a 1-second audible tone.

PRESET Pushbutton

When depressed, and with FUNCTION switch in PROGRAM position, enters the factory programmed conditions for the selected plug-in.

DATA Pushbutton

When depressed, and with FUNCTION switch in OPERATE position, unit prints out a DATA SUMMARY including date, time, and contents of daily accumulators for each plug-in in sequence (1-5).



LINE-BATT Indicator

Green LINE indicator lights when instrument is operating from normal AC power. Red BATT indicator lights when power is lost and unit is automatically switched to its internal battery source.

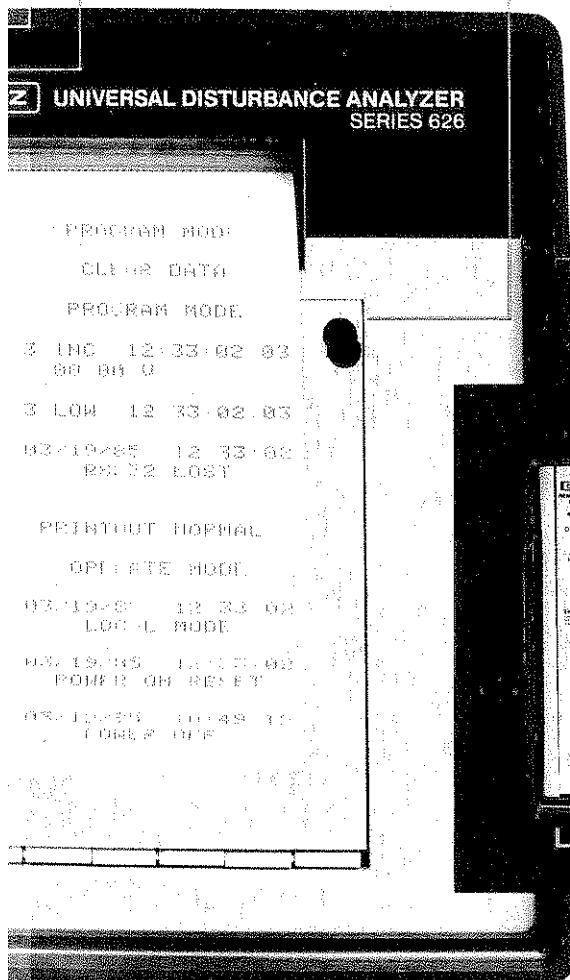
PROG Pushbutton

When depressed, and with FUNCTION switch in OPERATE position, unit prints time, date, and a listing of the programmed conditions for each plug-in in sequence (1-5).

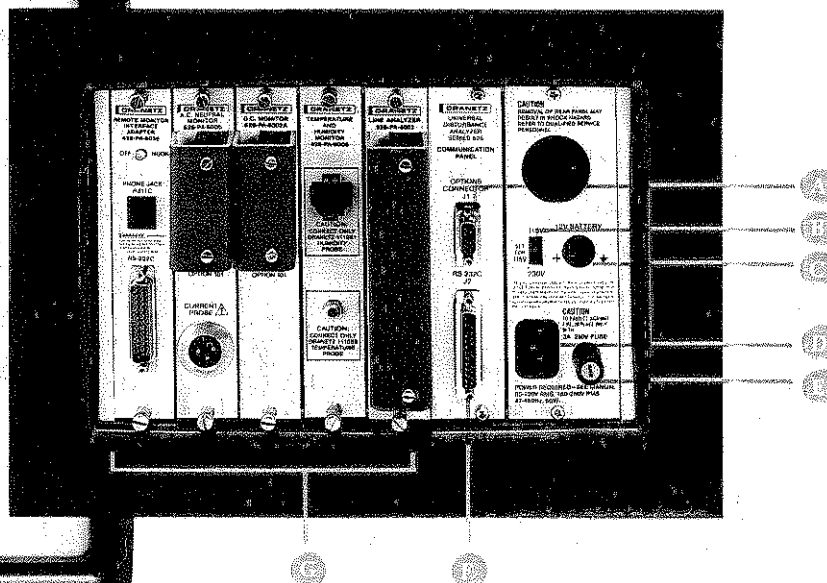
FEED Pushbutton

When held in depressed position, causes paper to feed out of thermal printer.

Thermal Printer



- A. Alarm Relay and Event Timemark Input Connector
- B. Line Voltage Selection Switch
- C. External 12 V Battery Connector
- D. Power Receptacle
- E. Fuse
- F. RS232C Compatible Port, DCE Configured
- G. Space for Five Plug-in Modules



Key-protected PRINTOUT MODE Switch

The level of printout detail decreases as switch is rotated counter-clockwise. Key may be removed in any position.

SYSTEM CHECK: Puts all channels in system check mode to verify proper operation. Printout (in sequence) is produced as response to self-contained reference signals.

MAXIMUM DETAIL: Produces detailed printout of limit crossings and variations in the measured parameters.

NORMAL: Produces detailed printout of limit crossings and variations in the measured parameters only when outside limits.

OUT-OF-LIMITS ONLY: Prints disturbance data only when a limit is crossed.

SUMMARY ONLY: Printer is inhibited. All data is still loaded into daily accumulators. Provides Daily Summary automatically at midnight.

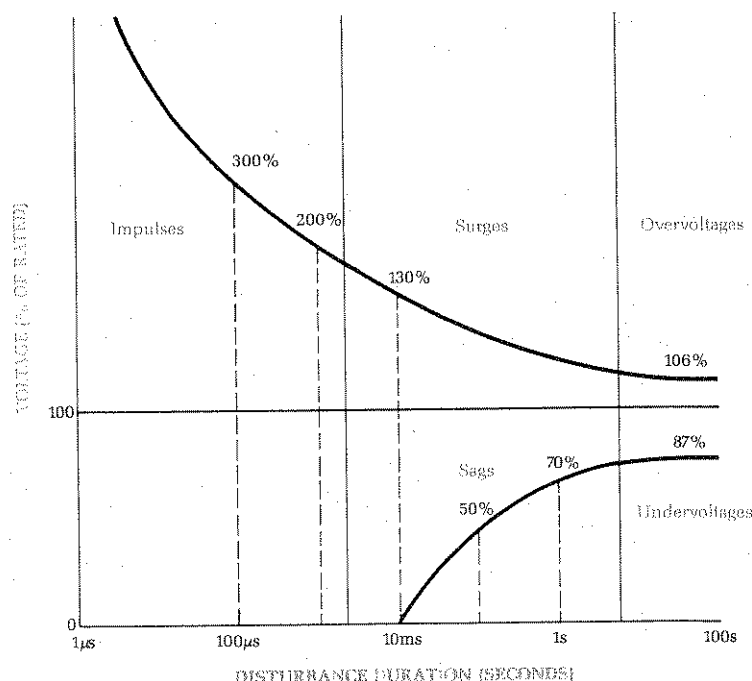
AC Voltage Monitors

Detailed, accurate, and comprehensive analysis of AC power line disturbances is essential for pre-installation site surveys, correlating malfunctions of electronic equipment with power line disturbances, specifying corrective equipment, and monitoring the effectiveness of power line conditioning equipment. Only by assuring the overall quality of the AC power before sensitive equipment is installed, taking early corrective action if necessary, and continually monitoring to detect changes in the AC power distribution can operational problems due to power line disturbances be permanently avoided.

Four AC plug-in modules are available to provide the most complete, accurate, and reliable monitoring of any electrical distribution system up to 600 VAC, including single-phase, split-phase, three phase wye or delta, 45 to 65 Hz or 370 to 450 Hz. Impulses, sags, surges, undervoltages, overvoltages, and frequency variations can all be detected, compared with user-selectable thresholds, and recorded with the amplitude, duration, and exact time of occurrence. For 50/60 Hz power systems, options are available to determine impulse direction (Source or Load) and strength (volt-seconds). Impulse direction measurements on an incoming power line will determine whether the impulses originated outside of the facility or internally. If internal sources are detected, movement of the monitor probes among various points in the distribution system can pinpoint the offending equipment.

The 626-PA-6003 Three-Phase AC Monitor analyzes three channels of 50/60 Hz AC voltage. It is normally connected phase to phase or phase to neutral. The 626-PA-6001 Single Phase AC Monitor analyzes a single channel of 50/60 Hz AC voltage. The 626-PA-6006 Neutral-Ground Monitor is recommended for use whenever a neutral is present in the distribution system. The 626-PA-6006 is used to detect common mode impulses and can identify improper grounding conditions. Both the 626-PA-6001 and the 626-PA-6006 plug-in modules are capable of determining impulse direction when equipped with Option 101 or 102. Finally, the 626-PA-6009 Three Phase 400 Hz Monitor is available to analyze disturbances in shipboard, aircraft, large CPU, and other 400/415 Hz power systems. Since all plug-in modules share a common time base, they can be easily configured for integrated disturbance analysis on virtually any AC electrical distribution system.

Although there are no firm industry standards to define "acceptable" AC power, various equipment manufacturers have developed internal guidelines for the design and reliable operation of computer and other microprocessor-based equipment. The plot shown is a typical susceptibility profile for a particular piece of electronic equipment. Power line disturbances outside of the boundaries are "unacceptable" and can be expected to cause equipment malfunction or damage.



AC POWER SUSCEPTIBILITY PROFILE



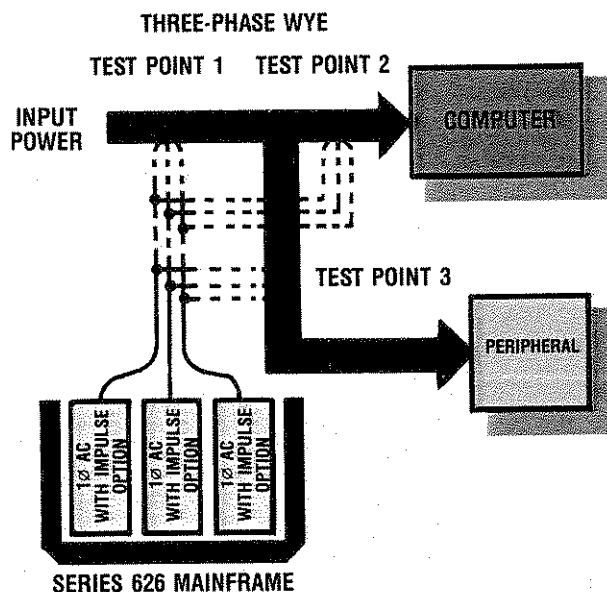
Impulses represent disturbances lasting less than 2 milliseconds. Sags and surges are disturbances with durations from several milliseconds to 2.5 seconds. Undervoltages and overvoltages have durations greater than 2.5 seconds. Impulses, also commonly known as transients, spikes, noise, and sometimes surges, are the most troublesome and potentially damaging types of power line disturbance. Impulse voltages may occur between phases or between phase and neutral. Such impulses are generally described as normal, differential, or transverse mode. Impulse voltages, referenced to earth ground, which are common to all phase lines or

common to phase and neutral lines, are known as common or series mode. Both types of impulses must be analyzed to provide a complete picture of power integrity.

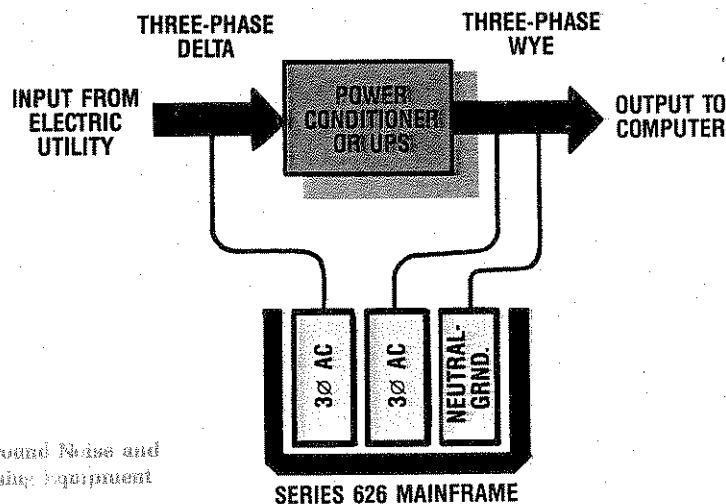
For further information concerning AC voltage disturbances, ask for our three application bulletins as follows:

| | |
|--|-----------|
| <i>Understanding Power Line Disturbances</i> | TP-103955 |
| <i>How to Identify Power Line Disturbances</i> | TP-103956 |
| <i>How to Correct Power Line Problems</i> | TP-103957 |

Modular Construction Provides Application Versatility



Locating the source of impulses

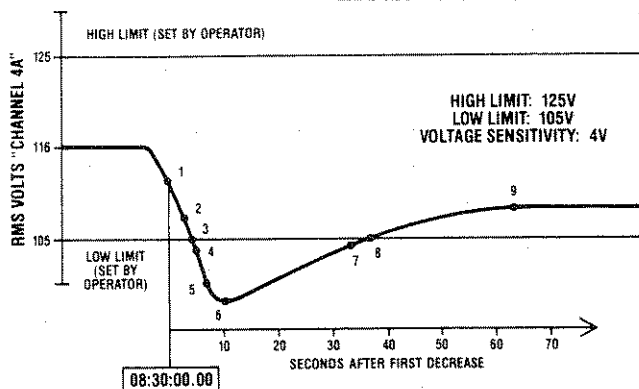


Monitoring Ground Noise and Line Conditioning Equipment



Typical AC Disturbances and Printouts

Choice of Printout Detail



Depending on a user's requirement, the appropriate degree of printout detail can be selected from MAXIMUM DETAIL, NORMAL or OUT OF LIMITS ONLY Modes. Referring to the above graph, corresponding printouts for each mode are illustrated below. Note that MAXIMUM DETAIL calls out all points, while in NORMAL, the events occurring within the high and low limits are omitted. Only the limit crossings and worst case voltage are recorded in OUT OF LIMITS ONLY.

MAXIMUM DETAIL

4A RMS 08:31:05.23 9
116.0 V
4A RMS 08:30:30.00 8
105.0 V MIN
4A RMS 08:30:23.47
104.0 V
4A RMS 08:30:00.00 7
100.0 V
4A RMS 08:29:03.04 5
100.0 V
4A RMS 08:28:09.10 3
100.0 V
4A RMS 08:26:02.16 2
100.0 V
4A RMS 08:25:00.00 1
100.0 V

NORMAL

4A RMS 08:30:00.00 8
100.0 V
4A RMS 08:28:09.10 3
100.0 V
4A RMS 08:26:02.16 2
100.0 V
4A RMS 08:25:00.00 1
100.0 V

OUT OF LIMITS ONLY

4A RMS 08:30:00.00 8
100.0 V MIN
4A RMS 08:25:00.00 3
100.0 V

↑ READ UP

↑ READ UP

Numbers refer to points labeled on above graph

↑ READ UP

System Check to Verify Operation

At 8:22:14 on 10/22/85 a System Check was done on a 626-PA-6003 3 Ø AC plug-in module in channel 1 of a 626. A 200 VAC, 60 Hz signal was applied to each phase, along with a negative 3000 volt impulse with a 400 µsec duration. Readouts for each phase are well within tolerances, so the plug-in is operating normally.

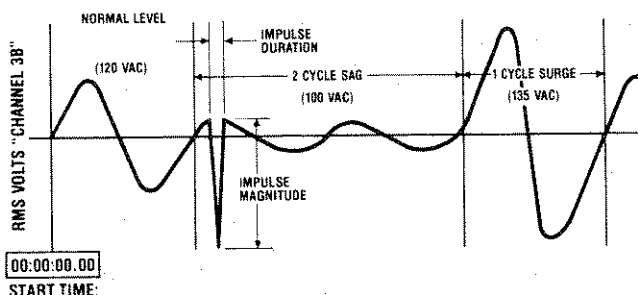
↑ READ UP

How Large, How Often and How Long

The cycle-by-cycle analysis capability of the 626 AC plug-ins enables them to accurately track extremely fast changes, since each consecutive cycle is individually measured and recorded.

If data from the 626 printout were replotted, the disturbances shown in the following graph could be recreated just as they originally occurred. The same analysis speed is available in the DC plug-ins, so that DC disturbances can be accurately analyzed.

Impulses are detected by filtering out the AC sine wave. The impulse magnitude, duration and polarity are shown in the tape below the graph.



Interpretation

08:30:00.00 100.0 V
08:30:00.00 100.0 V
08:30:00.00 100.0 V
08:30:00.00 100.0 V
08:30:00.00 100.0 V
08:30:00.00 100.0 V
08:30:00.00 100.0 V

OUT OF LIMITS ONLY

← ONE CYCLE SURGE ENDS

← SURGE BEGINS

← 2 CYCLE SAG ENDS

← IMPULSE

← SAG BEGINS

↑ READ UP

DAILY SUMMARY

In addition to printing each disturbance as it occurs, the 626 will provide a summary of all disturbances. By pushing the DATA button, a DATA SUMMARY of all disturbances occurring since midnight is provided. Also, a DAILY SUMMARY is automatically provided every midnight to include the entire day's data.

Single-Phase 2 Ø Plug-In Module

Two top lines show present frequency and voltage. Below are minimum and maximum frequencies. Then there is a summary of impulses, sags, and other disturbances.

← Date and time at which data summary was requested.

↑ READ UP

10/22/85 08:22:14
DATA SUMMARY

| Description | Three-phase AC, 480 V ¹ | Three-phase AC, 480 V ¹ | AC Neutral-ground, 1000 Hz | Single-phase AC, 50/60 Hz |
|----------------------------|---|--|---|--|
| Part Number | 626-PA-6003-() ¹ | 626-PA-6009 | 626-PA-6006-() ¹ | 626-PA-6001-() ² |
| Function | Monitor and record impulses, sags, surges, undervoltages, overvoltages, and frequency variations (channel A only) on three channels of AC voltage. Impulse duration measurement included as standard. | | Monitor & record impulses, surges & overvoltages between neutral & ground on an AC power system. Measurement ranges & functions optimized for neutral-to-ground monitoring, including common mode transients. Factory installed options (see below) also record impulse direction & duration or strength. | Monitor and record impulses, sags, surges, undervoltages, overvoltages, and frequency variations on a single channel of AC voltage. Factory installed options (see below) also record impulse direction and either impulse duration (Option 101) or impulse strength (Option 102). |
| Voltage Input Type | 2-wire differential | | | |
| Impedance | 40 MΩ with 40 pF (each side to ground) | | | |
| Range | 50-600 VAC, 45-65 Hz | 50-600 VAC, 370-450 Hz | 2-50 VAC, 45-65 Hz | 50-600 VAC, 45-65 Hz |
| Full Scale | 600 V | | 50 V | 200, 400 & 600 V, selectable |
| Selectable Thresholds | 51-600 V | | 3-30 V | 21-200 V, 200 V fs 42-400 V, 400 V fs 84-600 V, 600 V fs |
| Upper Limit | | | | |
| Lower Limit | 50-599 V | | Not Applicable | 20-199 V, 200 V fs 40-398 V, 400 V fs 80-596 V, 600 V fs |
| Sensitivity | 2-60 V | | 1-9 V | 1-15 V, 200 V fs 2-30 V, 400 V fs 4-60 V, 600 V fs |
| Line Voltage Accuracy | ± 1% rdg ± 0.2% fs | | | |
| Resolution | | | 0.2 V | 0.2 V, 200 V fs 0.4 V, 400 V fs 0.8 V, 600 V fs |
| Impulse Voltage Range | 50-4000 V peak | | 25-4000 V peak | |
| Full Scale | 4000 V | | 1000, 2000 and 4000 V, determined by threshold | 1000 V, 200 V fs 2000 V, 400 V fs 4000 V, 600 V fs |
| Selectable Thresholds | 50-4000 V | | 25-4000 V | 25-1000 V, 200 V fs 50-2000 V, 400 V fs 100-4000 V, 600 V fs |
| Duration Range | 1-2000 μsec | 1-100 μsec | 1-2000 μsec | |
| Accuracy | ± 10% rdg ± 1% fs for half sinewave impulses 5-50 μsec, typically -50% at 1 μsec and 2 msec. | ± 10% rdg ± 1% fs for half sinewave impulses 5-25 μsec, typically -50% at 1 μsec and 100 μsec. | ± 10% rdg ± 1% fs for half sinewave impulses 5-50 μsec, typically -50% at 1 μsec and 2 msec. | |
| Line Frequency | 45-65 Hz | 370-450 Hz | Not Available | 45-65 Hz |
| Range | | | | 0.1 Hz |
| Resolution | 0.1 Hz | | | 0.2-3.0 Hz in 0.1 Hz increments |
| Selectable Limits | 0.2-3.0 Hz in 0.1 Hz increments | 1-9 Hz in 1 Hz increments | | ± 0.2 Hz |
| Accuracy | ± 0.1 Hz | | | |
| Load Rating* | 4 | | 2 (3 with Option 101 or 102) | |
| UL Listed | Yes | | | |
| Factory Installed Options | Not Available | | Option 101: Impulse Duration and Direction. Option 102: Impulse Strength (Volt-Sec.) and Direction. | |
| Duration Measurement | Standard | | Option 101 Required | |
| Range | 1-2000 μsec | 1-100 μsec | 1-1023 μsec | |
| Accuracy | ± 10% rdg ± 1% fs, 5-50 μsec, >100 V | ± 10% rdg ± 10% fs, 5-25 μsec, >100 Vpk | ± 6% rdg ± 0.3% fs for half sinewave impulses 1-100 μsec and greater than 10% of fs impulse voltage. | |
| Strength Measurement Range | Not Available | | Option 102 Required 0.0002 to 0.2046 V-Sec. | Option 102 Required 0.0002 to 0.2046 V-Sec, 200 V fs 0.0004 to 0.4092 V-Sec, 400 V fs 0.0008 to 0.8184 V-Sec, 600 V fs |
| Accuracy | | | ± 10% rdg ± 0.1% fs for half sinewave impulses 1-100 μsec and greater than 10% of fs impulse voltage. | |
| Direction Measurement | | | Option 101 or 102 Required | |
| Indication | Not Available | | Source or Load | |
| Minimum Impulse Current | | | 1 Amp for 0.1 μsec before and after measurement | |
| Optional Cables | P/N 110, 480-G2: Eight ft. (2.4 m) mating cable with connector at one end & three battery clips at the other. | Not Available | P/N 110, 487-G2: Eight foot (2.4 m) mating cable with connector at one end and three battery clips at the other. | P/N 110, 480-G2: Eight foot (2.4 m) mating cable with connector at one end and three battery clips at the other. |

Notes: 1. Specify suffix 1 or 2

1. Terminal strip (barrier type) input
2. Connector input (includes mating cable)

*Mainframes with 30 W power supplies (manufactured prior to January, 1983) will support up to 13 load units at one time. Mainframes with 50 W power supplies manufactured after January, 1983 will support up to 20 load units at one time.

2. Specify suffix 1, 2, 3 or 4

1. 60 Hz Calibration with terminal strip input
2. 60 Hz Calibration with connector input
(includes mating cable)
3. 50 Hz Calibration with terminal strip input
4. 50 Hz Calibration with connector input
(includes mating cable)

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DC Voltage Monitors

Since electronic circuitry operates from DC voltage levels, it is important to monitor and record DC voltage disturbances. Simultaneous monitoring of the AC input and DC output of equipment power supplies provides direct correlation between AC power line disturbances and disturbances to the DC logic bus. The 626-PA-6002A Low Range DC Monitor records impulses, sags, surges, undervoltages, and overvoltages on a single channel of DC voltage. When used with AC voltage monitoring plug-ins, the 626-PA-6002A proves useful for troubleshooting power supplies and correlating AC input disturbances with DC output disturbances.

Higher DC voltage levels (50-600 V DC) may be monitored with the 626-PA-6002C High Range DC Monitor. These DC voltages are found in uninterruptible power supplies

(UPS) and station batteries used by telephone and electric utilities. The 626-PA-6002C measures and records impulses, sags, surges, undervoltages, and overvoltages on a single channel of DC voltage.

When precision monitoring of multiple DC voltage levels is desired, the 626-PA-6015 Three Channel Transducer Monitor is a versatile and powerful tool. The 626-PA-6015 monitors and records changes in DC voltage levels on three 10 V DC channels. It is an excellent choice for monitoring multiple output power supplies. In addition, programmable scale factors and a choice of 20 commonly used engineering units enhance the plug-in's versatility by enabling it to monitor any transducer with a 0-10 V DC output.

| Part Number | 626-PA-6002A(-) ¹ | 626-PA-6002C | 626-PA-6015 |
|--|--|---|---|
| Function | Monitor and record impulses, sags and surges, under and over voltages on a single dc channel. Factory options (see below) record impulse duration (option 101) or impulse strength (option 102). | | Precisely monitor & record variations in up to 3 independent dc channels. Programmable scale factors & engineering units provide convenient monitoring of transducer outputs. |
| Voltage Input Type | 2-wire differential | | |
| Impedance | 10 MΩ with 500 pf (each side to ground) | 40 MΩ with 40 pf (each side to ground) | >10 MΩ |
| Range | 0.5-80 VDC | 25-600 VDC | 0-10.23 V, each of 3 channels |
| Full Scale | 20, 40 and 80 V, selectable | 150, 300 and 600 V, selectable | 10 V |
| DC Voltage Accuracy | ± 1% rdg ± 0.5% fs | | ± 0.2% rdg ± 0.3% fs |
| Resolution | 0.04 V, 20 V fs 0.08 V, 40 V fs 0.16 V, 80 V fs | 0.2 V, 150 V fs 0.4 V, 300 V fs 0.8 V, 600 V fs | 0.1% of fs |
| Decimal Point | Fixed | | User-selected, X.XX00 to XXX00, where XXX=9.99 V input |
| Engineering Units | Not Available | | User-selected; V, A, OHM, % RH, C, F, PSI, V/M, BTU, CFM, RPM, FTC, KG, LB, PPM, PH, FT, M, WHR, MV. |
| Selectable Thresholds Upper Limit | 0.6-20.0 V, 20 V fs 1.2-40.0 V, 40 V fs 2.4-80.0 V, 80 V fs | 25-150 V, 150 V fs 52-300 V, 300 V fs 104-600 V, 600 V fs | 0.1% to 99.9% fs |
| Lower Limit | 0.5-19.9 V, 20 V fs 1.0-39.8 V, 40 V fs 2.0-79.6 V, 80 V fs | 25-149 V, 150 V fs 50-298 V, 300 V fs 100-596 V, 600 V fs | 0.000 to 99.8% fs |
| Sensitivity | 0.1-20.0 V | 1-60 V | 0.001-9990 |
| Impulse Measurements Voltage Range (1-2000 μsec) | 0.5-80 V peak | 25-4000 V peak | Not Available |
| Selectable Thresholds | 0.5-20 V, 20 V fs 1.0-40 V, 40 V fs 2.0-80 V, 80 V fs | 25-500 V, 150 V fs 50-1000 V, 300 V fs 100-2000 V, 600 V fs | |
| Accuracy | ± 10% rdg ± 1% fs for half sinewave impulses of 5 to 50 μsec duration. Typically -50% at 1 μsec and 2000 μsec. | | Not Available |
| Duration | Factory installed Option 101 Required | | |
| Range | 1-1023 μsec | | |
| Accuracy | ± 6% rdg ± 0.3% fs for half sinewave impulses up to 100 μsec duration. Typically -10% at 200 μsec, -20% at 400 μsec, and -50% at 1000 μsec. | | |
| Strength (V-sec) | Factory installed Option 102 required | | |
| Range | 0.000004-0.016368 | 0.0002-0.8184 | |
| Accuracy | ± 10% rdg ± 0.1% fs for half sinewave impulses up to 100 μsec duration, typically -20% at 200 μsec, -50% at 500 μsec. | | |
| Load Rating* | 2 (3 with option 101 or 102) | | 4 |
| UL Listed | Yes | | |

1 Specify suffix: 1. Terminal strip (barrier type) input. 2. Connector input (includes mating cable)

* Mainframes with 30W power supplies, manufactured prior to Jan. 1983, will support up to 13 load units; Mainframes with 50W supplies, manufactured after Jan. 1983, will support up to 20 load units.



Temperature and Humidity Monitors

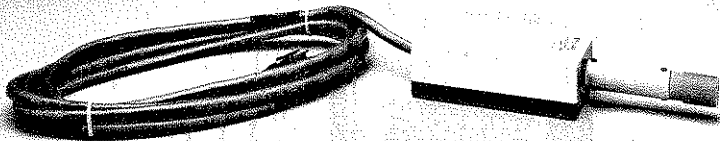
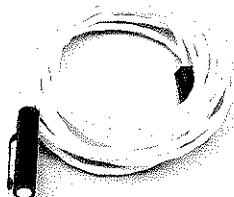
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Computers, peripherals, and other electronic equipment are highly sensitive to variations in temperature and humidity. Manufacturers typically recommend that ambient temperatures be held to 18 - 24°C and relative humidity to 40 - 60% RH. Excessive temperature variations can lead to component failures. Excessive humidity can result in damage to magnetic storage media and faulty printer operation. Low humidity increases static electricity, a major source of catastrophic and latent failures in electronic components.

Two plug-in modules are available to detect temperature and humidity problems. The 626-PA-6008 Temperature and Humidity Monitor analyzes the performance of air conditioning systems by monitoring one channel of temperature and one channel of humidity. Besides recording variations outside of user-selected limits, together with the exact time of occurrence, the 626-PA-6008 will accumulate and report total out-of-limit times over 24 hour periods. The 626-PA-6014 8-Channel Temperature Monitor records temperature variations at up to eight

points with individual high and low limits and sensitivities. It is ideal for analyzing temperature gradients among several pieces of computer related equipment, checking air distribution within equipment cabinets, and locating blocked air ducts.

Temperature Probe



Humidity Probe

| Designation | 626-PA-6008 | 626-PA-6014 |
|--|---|--|
| Part Number | 626-PA-6008 | 626-PA-6014 |
| Function | Monitor and record variations in one temperature channel and one humidity channel and accumulate times of over and under limit conditions. | Monitor and record variations in 8 temperature channels, each with individual high and low limits and sensitivities. |
| Temperature Range | 0-100°C | -50 to +150°C |
| Accuracy | ± 1°C | ± 2°C, 0-100°C |
| Response Time (typical) to 20°C change | 3 minutes to 90% of final value | |
| Cable Length | 10 ft. (3m) standard, 90 ft. (27m) extension cable available | |
| Cable Temperature | 105°C max. | 200°C max. |
| Temperature Thresholds | | |
| High Limit | 1-102°C | 1-150°C |
| Low Limit | 0-101°C | 0-149°C |
| Sensitivity | 1-20°C | 1-20°C |
| Humidity Range | 0-80% RH at specified accuracy. Useable to 100% RH at reduced accuracy. | Not Available |
| Accuracy | ± 3% ± 0.05% (T-20°C) ± 0.02% rdg | |
| Response Time (typical to 20% RH Change) | 2 minutes to 90% of final value | |
| Cable Length | 10 ft. (3m) standard, 90 ft. (27m) extension cable available | Not Available |
| Cable Temperature | 105°C max. | |
| Humidity Thresholds | | |
| High Limit | 1-100% RH | |
| Low Limit | 0-99% RH | |
| Sensitivity | 1-20% RH | |
| Load Rating* | 2 | 1 |
| UL Listed | Yes | |
| Included Accessories | Temperature Probe (P/N 111059) Humidity Probe (P/N 111061) | 8 Temperature Probes (P/N 111059) If fewer than 8 Temperature Probes are needed, specify 626-PA-6014A plus the quantity (1-8) of Temperature Probes (P/N 111059) desired. |
| Optional Accessories | P/N 111055: Humidity Probe extension cable for total length of 100 ft. (30m) P/N 111056-G2: Temperature Probe extension cable for total length of 100 ft. (30m) P/N 111058: Extension Cable Set (1 each of P/N 111055 and P/N 111056-G2). | P/N 111056-G2: Temperature Probe extension cable for total length of 100 ft. (30m) |



Event Monitors

Many computer-based systems feature internal system monitoring with provisions for alarm or warning output signals. These outputs, usually situated on the computer's backplane, may indicate AC power failure, DC power failure, diagnostic faults, CPU reset, or other occurrences. Besides monitoring internal system alarms, it is frequently desirable to monitor external alarms or event sequences. Alarm events could include fire, security, room entry, UPS bypass, or any parameter that can be converted to an ON/OFF signal. The 626-PA-6007 Event Monitor and the 626-PA-6011 Event Time Accumulator both provide eight channels for detecting alarm-type (ON/OFF) signals. By monitoring these signals while simultaneously monitoring power and environmental disturbances, cause and effect

relationships may be established, operation of conditioning equipment verified, and equipment malfunctions directly identified.

In other applications it may be useful to correlate utilization rates of equipment with environmental disturbances or accumulate utilization times to implement preventive maintenance procedures. In addition to monitoring eight channels of event state changes, the 626-PA-6011 Event Time Accumulator records accumulated ON/OFF times per day.

Both modules are TTL and CMOS-compatible and each input channel can be programmed to accept either the ON or OFF state as normal. Sensitivity, or minimum validation times, are also programmable over a wide range.

| Description | Eight Channel Event Sequence | Eight Channel Event Time Accumulator |
|---|---|--|
| Part Number | 626-PA-6007 | 626-PA-6011 |
| Function | Monitor and record the state and time of change of up to 8 event inputs. Provides accurate time sequence information from logic voltage signals or relay contacts. Series 626 Mainframe Option 102 enables operation from dry contacts. | Monitor and record the elapsed on/off times per day, state, and time of change of up to 8 event inputs. Provides accurate elapsed time information for logic voltage signals or relay contacts. Series 626 Mainframe Option 102 enables operation from dry contacts. |
| Voltage Input Type | 2-wire differential | |
| Impedance | 1 M Ω min., each side to ground | |
| "On" State | 2.30 V dc max. | |
| "Off" State | 1.80 V dc min. | |
| Hysteresis | 0.10 V dc min. | |
| Maximum Input | \pm 200 V dc to ground | |
| State Change Response Validation (Debounce) Times | 5, 10, 20, 40, 80, 160 or 320 msec, selectable | |
| Time Resolution | 10 msec | |
| Minimum Response Time | 1.2 msec | |
| On/Off Polarity | Normally open or normally closed, selectable | |
| Load Rating | 1 | |
| UL Listed | Yes | |
| Included Accessories | 8 connectors (AMP 1-350352-9), 24 connector pins (AMP 640545-1). Instruction Decal, P/N 110289 | |



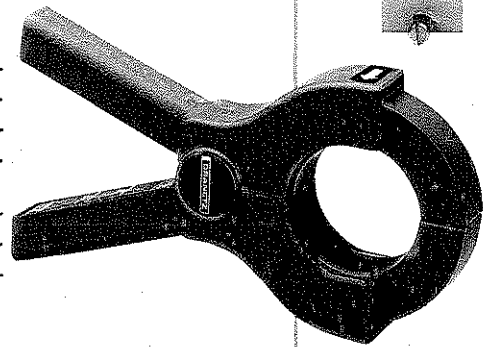
AC Current Monitor

15

The 626-PA-6005 plug-in module detects, measures, and records disturbances in AC current. Monitored disturbances include impulses, sags, surges, undercurrent, and overcurrent. All recorded measurements are true rms with the exception of impulses, which are measured in peak Amperes. The AC Current Monitor is ideal for monitoring inrush currents associated with switching of

inductive loads, recording current transients, monitoring neutral and ground currents, detecting 3-phase imbalance, and identifying faulty circuit breakers. The module connects to the monitored circuit with a clamp-on current transformer (300 A rms maximum), eliminating the need to break the circuit during installation.

| Description | AC Current Monitor |
|--|---|
| Part Number | 626-PA-6005 |
| Function | Monitor and record impulses, sags, surges, and high and low currents on a single channel of AC current |
| True RMS Ranges | 75, 150, and 300 A, selectable |
| Frequency Range | 45-65 Hz |
| Maximum Crest Factor (Peak/RMS) | 2 at 100% fs 4 at 50% fs 7 at 30% fs |
| True RMS Current Accuracy | $\pm 2\%$ rdg $\pm 0.5\%$ fs |
| True RMS Current Resolution | 0.2, 0.4, and 0.8 A |
| Impulse Ranges (2 μ sec to 1 msec) | 500, 1000, and 2000 A peak, selectable |
| Impulse Accuracy | $\pm 10\%$ rdg $\pm 1\%$ fs for half-sinewave impulses 5-50 μ sec, typically -50% at 2 μ sec and 1 msec durations |
| Load Rating | 2 |
| UL Listed | Pending |
| Included Accessories | Clamp-on Current Probe (TR-2019) with 2 in. (5 cm) diameter opening and 10 ft. (3m) cable, overall dimensions 8 in. x 4 in. (22 cm x 11 cm) |



TR-2019 Current Probe

Impulse Energy Analyzer

Impulse energy, in Joules, is the most critical parameter for determining the susceptibility of electronic equipment to damage by high energy, power line transients. The 626-PA-6018 Impulse Energy Analyzer records the energy content of impulse disturbance events. In addition, the plug-in module measures and records peak voltage, peak current, duration, direction, and time

of occurrence of the impulse disturbance. The Impulse Energy Analyzer is ideal for specifying and testing transient protection devices and for monitoring tests made with transient simulation equipment. A clamp-on current transformer, rated to 300 A rms, is included for connection to the monitored power line.

| Description | Impulse Energy Analyzer |
|----------------------|---|
| Part Number | 626-PA-6018 |
| Function | Monitor and record peak voltage and current, impulse energy, duration, and direction on a single AC power or ground line |
| Impulse Ranges | 1000, 2000, and 4000 V peak, selectable; 500, 1000, and 2000 A peak, selectable; 50, 100, 200, 400 and 600 Joules, 1-1000 μ sec |
| Impulse Thresholds | 25 to 2000 V; 12 to 1000 A |
| Nominal Input Range | 0-600 V rms; 0-300 A rms; 45-450 Hz |
| Accuracy Voltage | $\pm 5\%$ rdg $\pm 1\%$ fs for half-sinewave impulse >10 μ sec duration. Typical, -50% at 1 μ sec |
| Current | $\pm 5\%$ rdg $\pm 1\%$ fs for half-sinewave impulse >10 μ sec duration. Typical, -50% at 1 μ sec |
| Duration | $\pm 5\%$ rdg $\pm 0.3\%$ fs |
| Energy | $\pm 10\%$ rdg $\pm 1\%$ fs for half-sinewave impulse >10 μ sec duration. Typical, -50% at 2 μ sec |
| Load Rating | 4 |
| UL Listed | Pending |
| Included Accessories | Clamp-on Current Probe (TR-2019) with 2 in. (5 cm) diameter opening and 10 ft. (3m) cable, overall dimensions 8 in. x 4 in. (22 cm x 11 cm) |

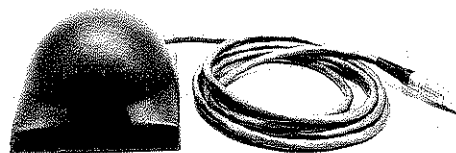


Broadband RF Monitor

Computer-based electronic equipment exhibits varying degrees of susceptibility to radio frequency interference (RFI). Significant RFI field strengths are commonly produced by handheld walkie-talkies, broadcast activity, faulty ignitions, etc. This RF energy couples into electronic equipment through the enclosure or power line, which acts like an antenna at radio frequencies, thereby creating equipment malfunction. The random, intermittent, and broadband nature of RF interference makes this form of environmental disturbance among the most difficult to identify as the cause of equipment malfunctions.

The 626-PA-6020 Broadband RF Monitor provides a convenient technique for correlating the presence of excessive levels of RF field strengths, including bursts as short as 1 $\mu\text{sec.}$, with malfunctions of computer-based electronic equipment. A broadband, omnidirectional antenna is used to measure electric field strength. If the RF field strength exceeds user-selected limits for continuous wave (CW) or burst signals, the

6020 module records the electric field strength, duration, and time of occurrence of the RF disturbance. RF disturbance events are also summarized for later printout with the Series 626 daily summary.



Antenna Unit

| Designation | Broadband RF Monitor |
|------------------------------|--|
| Part Number | 626-PA-6020 |
| Function | Monitor and record peak electric field strengths, CW or burst, above user-selected thresholds. |
| Frequency Range | 1 MHz to 1 GHz |
| Polarization | Vertical |
| Directivity | Omnidirectional |
| Accuracy | ± 1.5 dB at calibration frequency |
| Frequency Response | ± 6 dB, 1 MHz to 800 MHz |
| Minimum Burst On Time | 1 μsec |
| Field Strength Range | 0.5 to 8.0 V/meter |
| High Limit Thresholds | 0.6 to 8.0 V/meter |
| Burst Sensitivity Thresholds | 1.0 to 8.0 V/meter |
| CW Sensitivity Thresholds | 0.5 to 4.0 V/meter |
| Load Rating | 4 |
| UL Listed | Pending |
| Included Accessories | Antenna Unit with 10 ft. (3 m) cable, 6 in. x 6 in. x 4 in. high (15 cm x 15 cm x 11 cm) |



Communication and Mass Storage Modules

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Two plug-in modules are available to store disturbance data from the RS 232C communications port of the Series 626 mainframe for later use. The 626-PA-6012A Communications Module will store up to 960 disturbance events and transmit them, on demand, or at programmed time intervals, via a built-in, auto-answer/auto-dial modem. The 626-PA-6013 Mass Storage Module can store up to 960 disturbance events for later transmission to a terminal or printer or, via an external modem, to another site.

Both modules use the Series 626 battery backup to prevent loss of data in the event of a power failure. Both modules can be programmed to transmit immediately upon the occurrence of any event, whenever an operator, on-site or remote, requests a transmission, on a periodic basis every X hours, or when memory is almost full. A rear panel LED indicates data transmission activity.

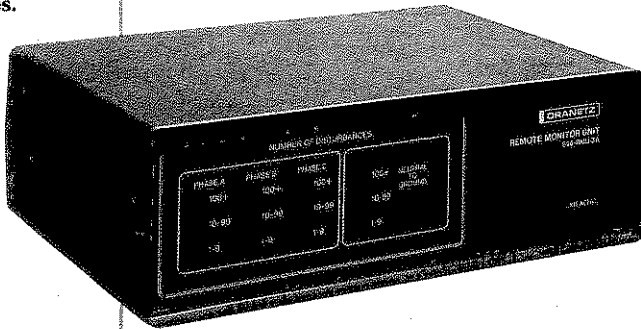
| Description | Communications Module | Mass Storage Module |
|---|---|--|
| Part Number | 626-PA-6012A | 626-PA-6013 |
| Function | Accepts and stores data from RS-232C port of Series 626 Mainframe for later transmission by built-in auto-answer/auto-dial modem. | Accepts and stores data from RS-232C port of Series 626 Mainframe for later analysis, printing, or transmission by computer or external modem. |
| Memory Capacity Event Capacity | 960 disturbance events at 32 characters/event | |
| Data Stack | 30 K, non-volatile | |
| External Communications Interface Type | Bell 103 compatible, RJ 11C connector | RS-232C, DCE configuration |
| Baud Rate | 300 | 300, 1200, 2400, 4800, 9600, selectable |
| Data Transmission Protocol | Asynchronous (ISO 1745), full duplex | |
| Internal Dialer Type | Pulse, 10 pps | Not applicable |
| Maximum Digits | 16 digits, including Wait for Dial Tone | |
| Maximum Wait for Dial Tone | 2 seconds typical | |
| Maximum Wait for Answer Back | 12 seconds | |
| Maximum Retries | 128, 2 seconds (typical) between retries | |
| Make/Break Ratio | 61% low, 39% high | |
| Programmable Features Memory Dump Mode | Upon Request, Every XX Hours, Every XX Hours or Overflow, Every Event, Stack Full, Never | |
| Station Identification | 0 to 99 | |
| Phone Number | 16 digits, including Wait for Dial Tone | Not applicable |
| Baud Rate | 300 | 300, 1200, 2400, 4800, 9600, selectable |
| Load Rating | 3 | 2 |
| UL Listed | Pending | |
| Included Accessories | P/N 110540: RS-232C interface cable to connect Series 626 Mainframe to Module | |
| | P/N 110709: 25 ft. (7.5m) telephone cable with RJ 11C jacks | Not available |
| Optional Cable | Not available | P/N 2212-0-1110: 12 ft. (3.6m) RS-232C interface cable with "D" connectors |



Remote Monitoring Units

Although designed for unattended operation, RMU front panel annunciators provide a summarized indication of stored disturbances.

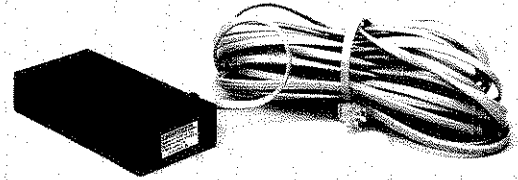
Inexpensive Remote Monitor Units (RMU) extend the basic power line disturbance analysis of the Series 626 to multiple unattended sites, remote or within a local network. RMUs can be used effectively to perform pre-installation site surveys by determining the adequacy of existing power lines intended to support critical electrical equipment. They can determine the effect of power system operation on equipment malfunction by storing time-referenced disturbance data which then can be correlated with equipment errors, outages, and damage. And they can be used for on-going, preventive maintenance. With their low cost, they can be permanently installed to record disturbance data in the event that intermittent power line problems are later suspected.



RMUs record power line sags, surges, high and low voltages, and impulses, as well as voltage peaks occurring between neutral and ground. The 626-RMU-1 is designed for single phase power line monitoring; the 626-RMU-3A is for three-phase lines, either line to neutral or line to line. The three-phase 626-RMU-3 adds the ability to monitor one DC voltage channel for high and low voltages and impulses, as well.

Each RMU relies on the Series 626 mainframe, equipped with a 626-PA-6036

Remote Interface Adapter, for programming and data readout. Programming can be accomplished from the Series 626 front panel by direct connection of the RMU to the 626-PA-6036 Remote Interface Adapter, or by telephone line using the DM-C15 Cartridge Modem and Option 101 of the 626-PA-6036



Cartridge Modem

Remote Interface Adapter. Once programmed, as many RMUs as required can be installed at various sites to monitor and record power line disturbances independent of the Series 626 mainframe. After disturbance data has been collected, each RMU again may be connected directly, or by telephone line, to the Series 626 mainframe for data printout.

RMU data is stored in a battery-backed, non-volatile memory and is available in three groupings. A sequential report lists the most recent 64 disturbances in chronological sequence. Stored information includes date and time of occurrence, type of disturbance, amplitude, phase and, for sags and surges, the duration. A summary report for each channel lists the total number of each disturbance type and individually describes the ten worst disturbances of each type with date and time of occurrence, type of disturbance, amplitude, and, for sags and surges, the duration. Finally, a unit history report is available to list the 32 most recent operator actions and errors, including the time of reprogramming, data clears, diagnostic failures, and power on/off.



Remote Interface Adapter

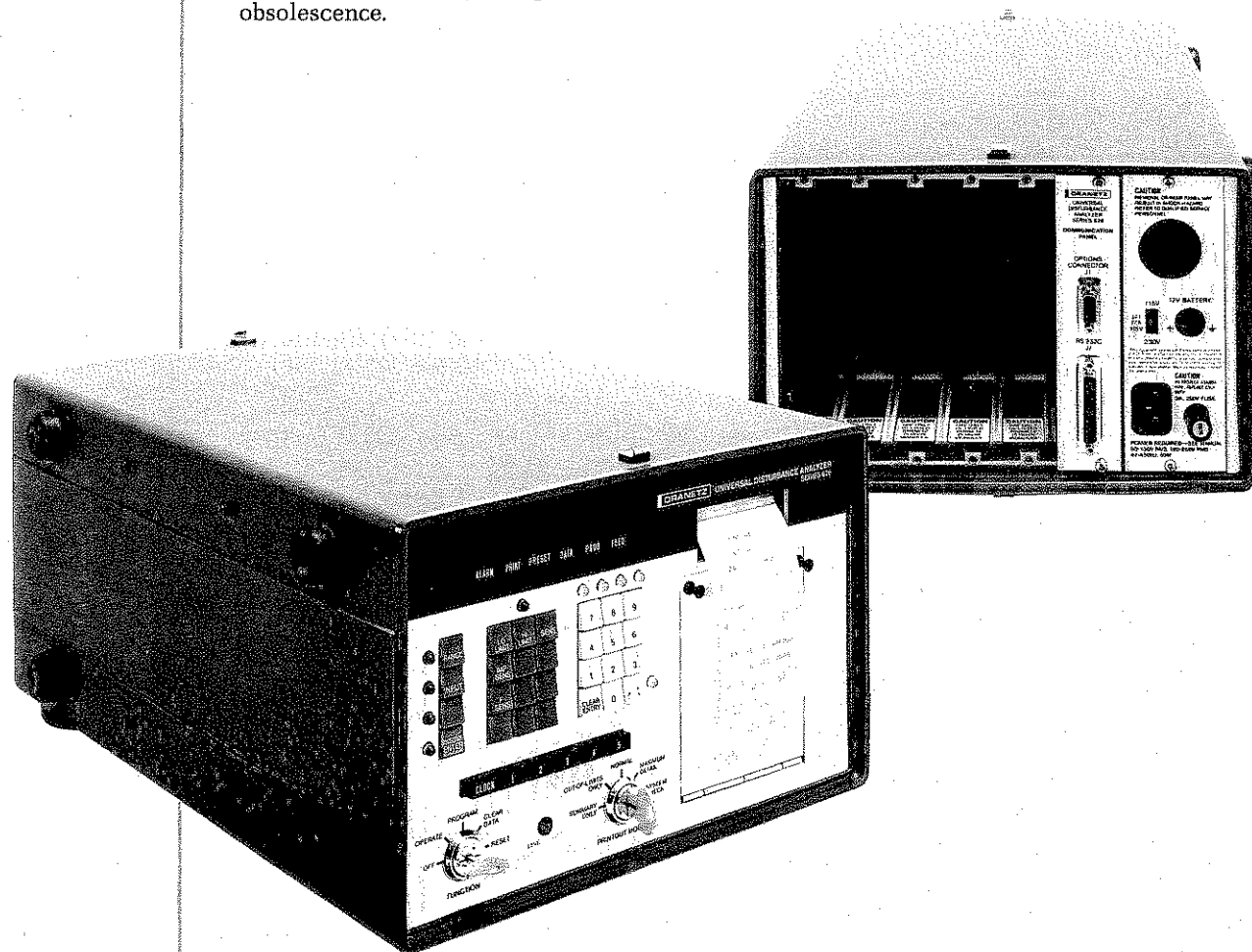
| Description | Remote Interface Adapter |
|--|---|
| Part Number | 626-PA-6036 |
| Function | Interfaces Series 626 mainframe with Remote Monitoring Unit(s) for programming and readout of disturbance data |
| Load Rating | 1 |
| UL Listed | Yes |
| Factory Installed Option Option 101 | Adds direct connect, 300 baud, Bell 103 compatible, auto-dial modem. Supplied with 25 foot cord for RJ 11 jack. |

| Description | Remote Monitoring Unit | | |
|--|---|---|--|
| Part Number | 626-RMU-1 | 626-RMU-3 | 626-RMU-3A |
| Function | Monitors power disturbances at remote location. Records sags, surges, high and low voltages, and impulses occurring between line and neutral on single-phase AC power lines. Also records voltage peaks occurring between neutral and ground. | Monitors power disturbances at remote location. Records sags, surges, high and low voltages, and impulses occurring on three-phase AC power lines, either line to neutral or line to line. Records voltage peaks occurring between neutral and ground. Also records high and low voltages and impulses on one DC voltage channel. | Monitors power disturbances at remote location. Records sags, surges, high and low voltages, and impulses occurring on three-phase AC power lines, either line to neutral or line to line. Also records neutral to ground voltage peaks using separate differential input channel. |
| AC Voltage Range | 90-130 V, or 180-250 V rms, selectable | 50-320 V rms | |
| Frequency | 47-63 Hz | | |
| Accuracy | ± 1% of reading ± 0.5% fs | | |
| Resolution | 1 V | | |
| Input Impedance | 10MΩ and 100 pF, each terminal to ground | | |
| AC Impulse Voltage Range | 50-2000 V peak, 1-1000 μsec | | |
| Accuracy | ± 10% of reading ± 1% fs, 5-50 μsec, typically -50% at 1 μsec and 1 msec | | |
| Resolution | 2 V | | |
| Neutral-Ground Voltage Range | 5-200 V peak | | |
| Frequency | DC-250 kHz | | |
| Accuracy | ± 10% of reading ± 1% fs, dc-100 kHz; typically -50% at 250 kHz | | |
| Resolution | 1 V | | |
| Isolated Input Connection | No | | Yes |
| DC Voltage Range | Not Available | 1.0-25.0 V | Not Available |
| Accuracy | | ± 3% of reading ± 0.5% fs | |
| Resolution | | 0.1 V | |
| Input Impedance | | 10 MΩ and 100 pf, each terminal to ground | |
| DC Channel Impulse Range | | 1.0-25.0 V peak, 1-1000 μsec | |
| Accuracy | | ± 10% of reading ± 1% fs for half-sinewave impulse of 5-50 μsec duration. Typically -50% at 1 μsec and 1 msec | |
| Power Requirements Voltage | 90-130 or 180-250 V, switch selectable | | |
| Frequency | 47-63 Hz | | |
| Consumption | 20 W, maximum | | |
| Fuse | 3/16A, 250 V Slow Blow | | |
| Internal Battery Type | Rechargeable NiCd | | |
| Carryover Time | 1 month, typical | | |
| Charge Time | 2 days from complete discharge | | |
| Packaging Dimensions | 4 in. x 11 in. x 8 in. (10 cm x 28 x 20) | | |
| Weight | 6 lbs. (2.7 kg) | | |
| Environmental Temperature | + 10 to + 40°C, operating; -40 to +55°C, storage | | |
| Humidity | 10 to 90% RH, non-condensing | | |
| UL Listed | Yes | | |
| Optional Accessories Modem Cartridge DM-C15 | Direct connect, 300 baud, auto-answer, Bell 103 compatible. Plugs into the rear panel of any RMU. Supplied with 25 ft. cord for RJ11 jack. | | |
| Reuseable Shipping Container (P/N 111 223) | Heavy duty, polycarbonate case with custom foam insert for one RMU and related accessories. | | |

Series 626 Mainframe

The modular capability of the Series 626 Universal Disturbance Analyzer, as provided by the Mainframe and an ever growing number of plug-in monitoring modules, is the key to the versatility of the instrument. Plug-ins are available to monitor many different types of disturbance events. When these events are correlated by the common clock housed in the mainframe, cause and effect analysis becomes a simple task. Modular capability means the instrument can be configured, and reconfigured, to meet the requirements of many applications—whether these applications involve a computer environment, industrial control system, telecommunications equipment, or computer-based medical instrumentation, or any combination. In addition, modular capability means that as new plug-ins are developed, or special plug-ins designed, they can be added without compromising existing plug-ins. With its modular architecture, the Series 626 is easy to repair and defies obsolescence.

The mainframe houses up to five plug-in modules and provides all necessary supply voltages and operating controls. The mainframe CPU identifies the type of module installed in each slot and controls plug-in operation. An internal, rechargeable battery provides full operation in the event of a power failure for 10 to 40 minutes and maintains the mainframe's clock and memories for several months without AC power. The mainframe also contains an integral thermal printer for disturbance data recording and an RS 232C communications port for data output and remote programmability. Mainframe optional accessories include a rack mounting kit and a shipping container with extra room for paper, cables, and accessories.



| Description | Series 626 Mainframe |
|---|--|
| Function | Provides the mainframe, into which up to 5 plug-in modules can be installed, and all common functions, including microprocessor control, memory, time base, battery backup, and power for all plug-ins. All operating controls, a thermal printer, and RS 232C communications port are located on the mainframe. |
| Controls 6 Upper Pushbuttons | DATA summary, PROGram summary, PRINTer on/off, paper FEED, ALARM on/off, and PRESET thresholds |
| 28 Keypad Pushbuttons | Programming and real time setup, with numerical keypad |
| 6 Lower Pushbuttons | CLOCK position to set date and time; 1 through 5 selects individual plug-in for programming |
| 5-Position FUNCTION Keyswitch | OFF, OPERATE, PROGRAM, CLEAR DATA, and RESET. Keyswitch is locked by removal of key in OPERATE position. Programming keyboard only active in PROGRAM position. |
| 5-Position PRINTOUT MODE Keyswitch | Selects four printout modes, SUMMARY ONLY, OUT-OF-LIMITS ONLY, NORMAL, MAXIMUM DETAIL, and SYSTEM CHECK with calibration check and diagnostic routine. Removal of key locks keyswitch in desired position. |
| Clock | Crystal controlled, approximately ± 2 sec/day |
| Alarms | Audible alarm, 1 second, plus contact closure on rear panel |
| Event Timemark Input | Accepts 5-12 VDC signal indicating occurrence of external event. Pulse (100 μ sec. min.) received causes printout of asterisk followed by time. |
| Data Output | On-board thermal printer, 2 1/4" x 140' paper roll with paper-low sensor. RS 232C interface with control capability. |
| Temperature Range Operating Storage | +10 to +40°C -40 to +55°C |
| Power Requirements | 90-130 V or 180-250 V, switch selectable, 47-450 Hz, 50 W nominal. Rear panel terminals to accept 3 A at +12 VDC for extended battery operation without AC power. |
| UPS Capacity | 10-40 minute operation internal battery, rechargeable in 6-10 hours. |
| Dimensions | 7 1/2 in. x 11 x 15 1/2 (190mm x 280 x 390) |
| Weight | 20 lbs. (9 kg) approximate. |
| Included Accessories | 8-foot line cord, mating connectors for 12 V battery input and Option 102 connector, 3 rolls of printer paper, and printer cleaning paper |
| Factory Installed Option 102 | Isolated field contact voltage supply provides 5 VDC to enable use of 626-PA-6007 and 626-PA-6011 with dry contacts |