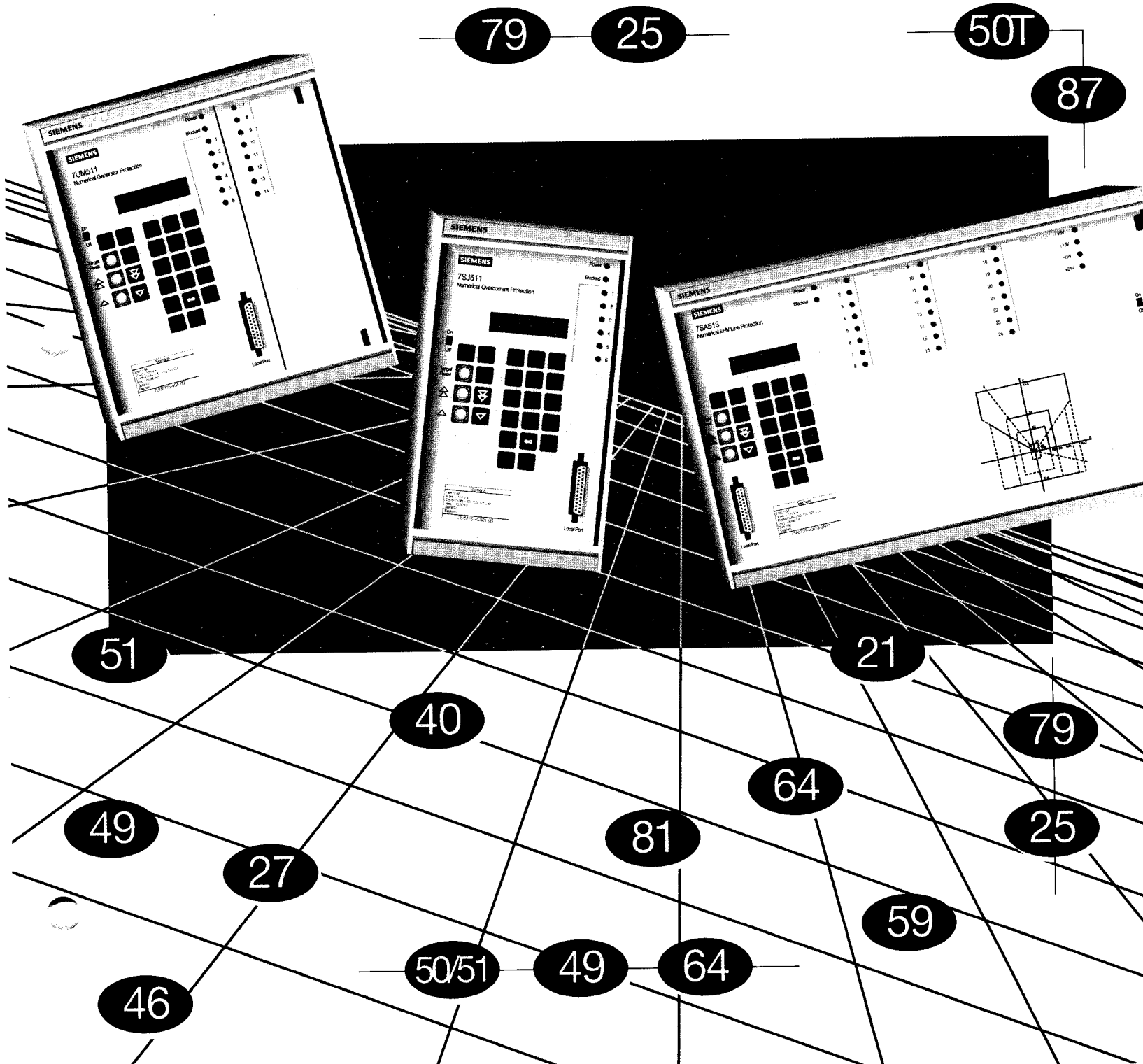
SIEMENS

Numerical Protective Relays



Siemens' Relay Background

Siemens is one of the oldest and most respected names in electric power technology and manufacturing. On every continent around the world, wherever the limits of science and engineering are being challenged, you'll find the Siemens name.

49 Siemens has been a protection pioneer since the early days of electric power generation, transmission and distribution technology development. As early as 1902, Siemens attracted armature-type trip devices were providing overcurrent protection.

By 1910, Siemens had designed a differential characteristic with an attracted armature device. In 1920, Siemens offered an induction disk directional relay, and in 1928 an induction disk distance relay was added to the line. 50/51

A separate Relay Department was formed in 1929, dedicated solely to meeting the growing need for sophisticated, high-quality circuit protection equipment and coordination. With this move, Siemens firmly established itself as a leader in relay technology.

87T Siemens began developing hybrid relays in the early 1950s. These combined electromechanical technology with emerging solid state electronic 27 technology to yield a relay with superior accuracy and performance characteristics. Not long after that, Siemens began manufacturing all-electronic relays.

Siemens used its experience in the 1970s with process computer-based relaying to develop some of the world's first microprocessor-based relays in 1978. By 1986, Siemens had pushed the frontier of technology yet again with the introduction of its new numerical protective relay line. More than 25,000 numerical protection units are currently in the field.

To meet the needs of today, 81 Siemens offers a complete line of numerical protection relays covering overcurrent, distance, differential and generator protective relays that is unmatched in the industry. These protective relays are ISO 9000 certified and meet ISA 9001 and 9004 standards for software quality. At Siemens, we stand ready to support your needs now and in the future.

Siemens Energy & Automation

These relays are made available through the Electrical Apparatus Division of Siemens Energy & Automation in Raleigh, North Carolina. SE&A is a U.S. company with approximately 6,500 employees and 18 manufacturing plants. We also have 100 sales and service locations throughout the United States. 21

Through this organization, your relay needs are supported not only with superior technology but also with the expertise of a company that has years of experience in protective relay application.

SE&A is a major manufacturer of high, medium and low voltage transmission and distribution electrical equipment and, as such, understands your requirements and concerns when it comes to selection and reliability issues. SE&A is also a leader in electrical system automation and power system information networks. We recognize that complete system support is critical to your overall satisfaction. 79

We are confident that through this combination of exceptional protective relays and a strong supporting organization, you will appreciate the commitment Siemens continues to make in this area. Siemens recognized long ago that user-driven designs and user-focused service are keys to relaying installations in which we all can have confidence and pride. 25

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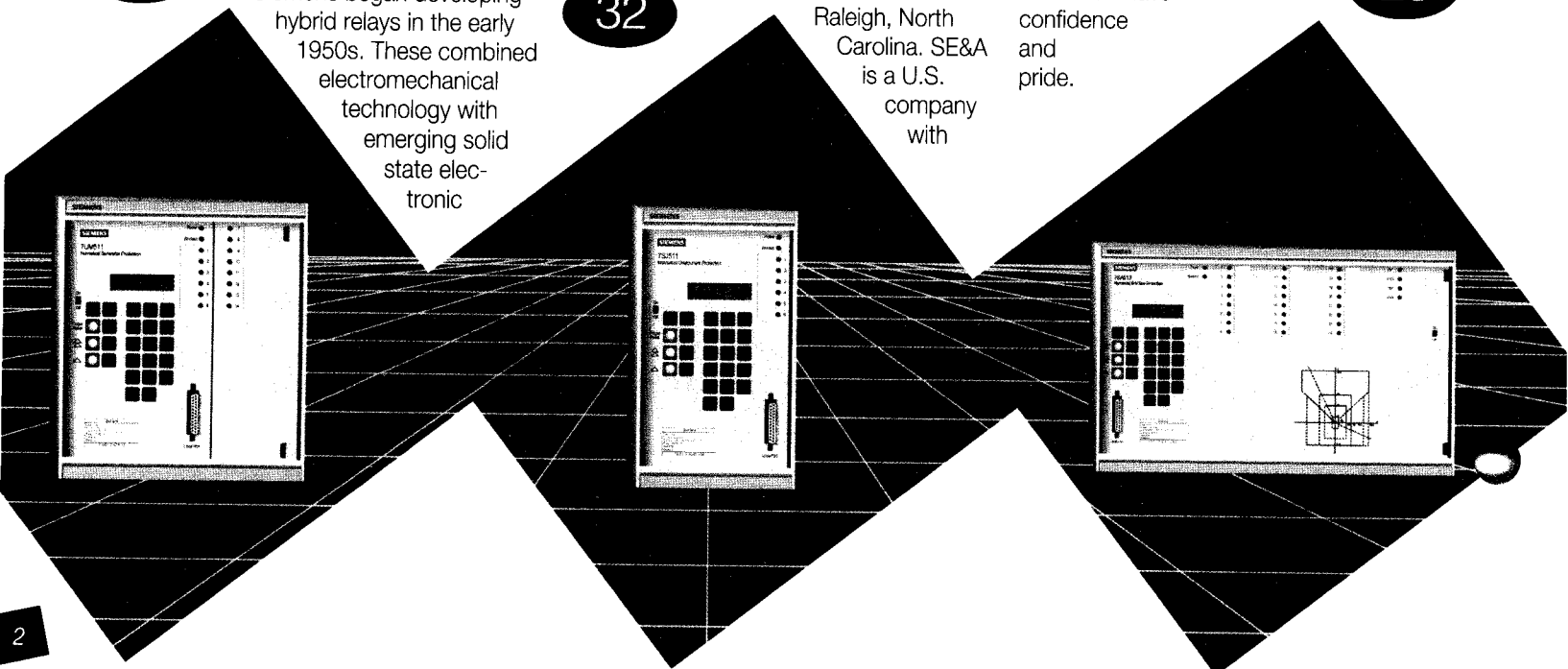

Numerical Protection Technology

At Siemens Energy & Automation, "Technology that serves the customer" is more than a slogan. It's a commitment we make to our customers every day. Our complete line of numerical protective relays is just one example of that commitment.

Numerical protection is our way of describing how we combine powerful microprocessors with digital signal processing techniques and protection algorithms. This combination allows us to use standardized function blocks (both hardware and software) that can be installed in different relays as required for autonomous tasks.

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For example, overload protection is the same basic package whether it's in a transformer differential relay, like the 7UT51, or in a current comparision relay, like the 7SD51. This technique yields a more reliable product as proved in thousands of real life applications every day.

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Numerical protection starts with the CT and VT signal inputs (refer to the figure below). Siemens recognizes your need for relays that accept standardized voltage and current signal levels, and our relay line is directly compatible with your relaying application needs. All of these inputs have superior galvanic isolation from the rest of the circuitry and each other.

The analog input signals are conditioned, sampled and then converted to their digital equivalents. Once converted, these data points are available for analysis and/or storage.

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The digital nature of this data is the key to many of the features of the Siemens relay line. Specific data are available for use in an assortment of different protective function modules. They are even stored in such a manner that, in the event of a tripping action, the data immediately before and after the fault can be retrieved and analyzed.

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Most data resides in non-volatile memory, so that the fault events are not lost when power is temporarily interrupted. Likewise, any programming you do during setup also is safely stored until you decide to change it.

The microprocessor has the speed and power to perform all calculations needed by each function module. It also controls the serial communications interface available on every Siemens relay. Using this serial communications port, the relays become an integral part of the command and control equipment for your power system.

Digital programming also allows you to input commands and choices into the relay through a simple keypad and LCD display arrangement. To simplify the set-up, an RS-232 port is provided on the front panel into which you can connect a personal computer to down load the setting information or retrieve stored relay data. The LCD display can be used to view detailed data, such as phase currents and targets. Completing the front panel display are LEDs that can be custom programmed to indicate any protection trip or alarm condition.

All relays in the Siemens numerical protection line accommodate discrete inputs (on-off) that enable you to monitor other types of protective devices, such as a sudden pressure contact on a transformer.

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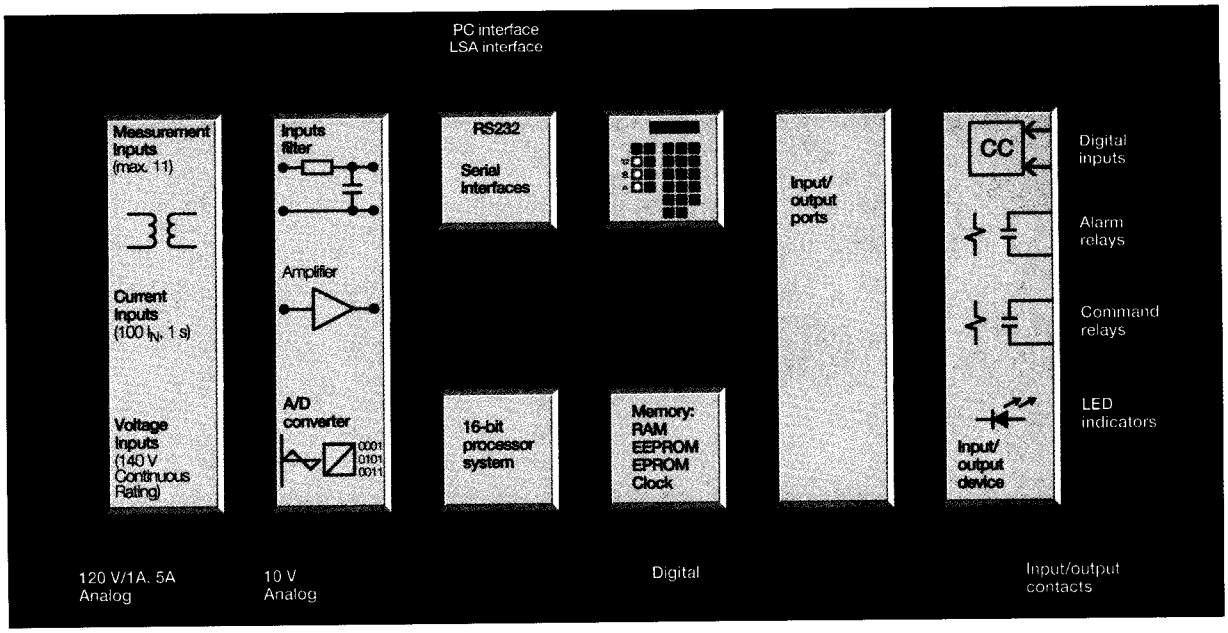
Siemens relays also have user programmable alarm relays and trip relays that give you complete freedom to configure the protection system in the way that best suits your needs.



Product Range

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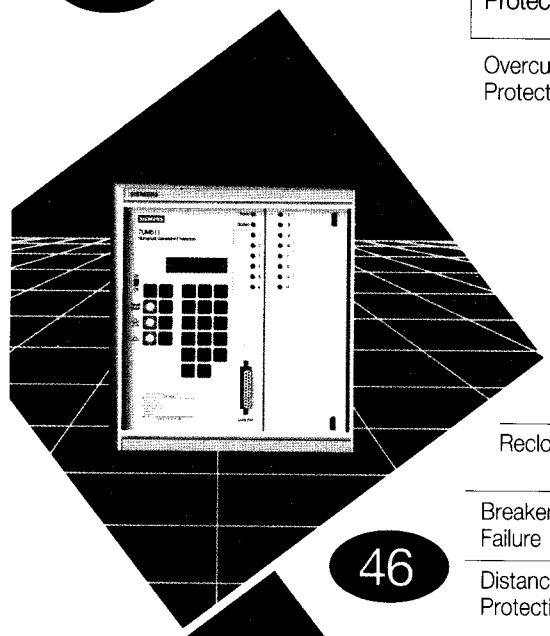

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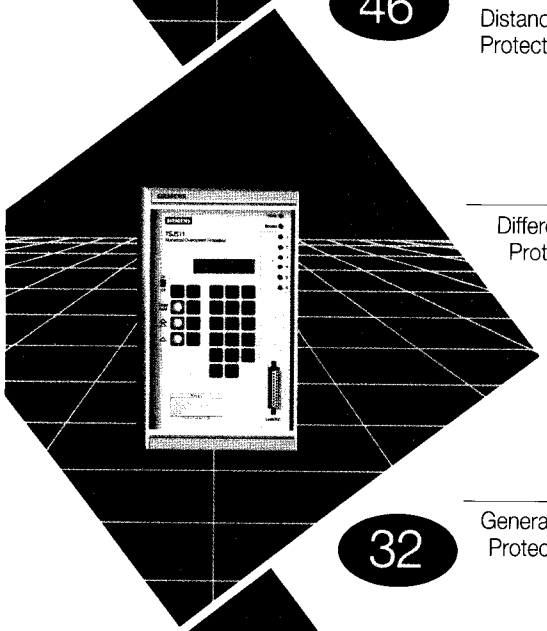

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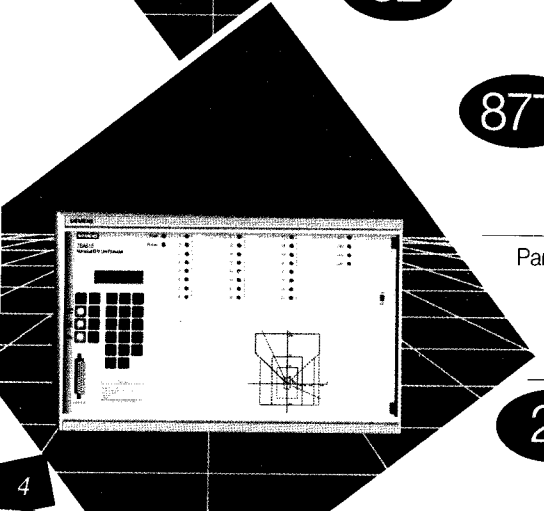

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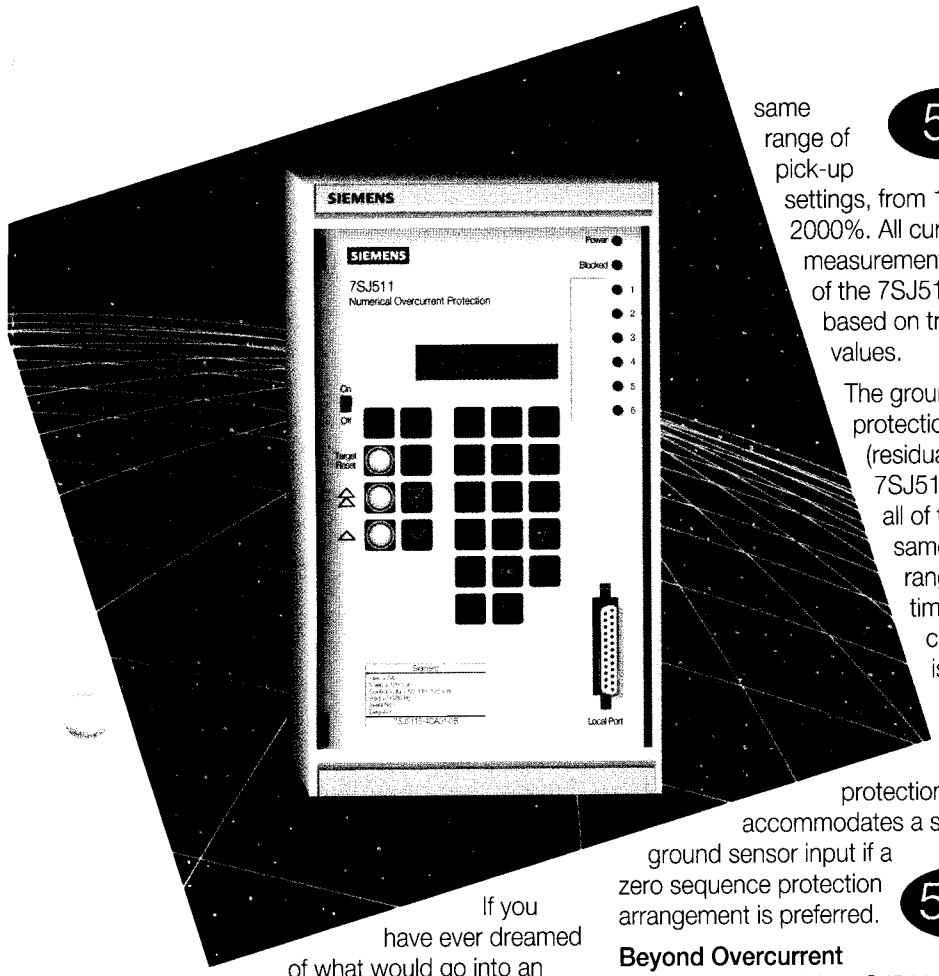
Protection	Type	Function
Overcurrent Protection	7SJ50	Overcurrent protection with common annunciation for all phases. This relay provides instantaneous, definite time and a choice of normally inverse, very inverse or extremely inverse time-current characteristics. No serial communications interface available. Directional performance can be added through the use of the 7SP20 Directional Relay.
	7SJ511	Overcurrent protection with instantaneous, definite time or a choice of normally inverse, very inverse or extremely inverse characteristics. This relay also offers ground fault and breaker failure protection.
	7SJ512	Overcurrent protection with, instantaneous, definite time and a choice of normal inverse, very inverse and extremely inverse. Optional directional element and/or multishot reclosing. Includes breaker failure protection.
	7SK511	Motor protection relay with rotor overload, starting time supervision, load unbalance/dead-pole protection and wattmetric directional ground fault relay.
Reclosing	7VK51	Autoreclose relay, 1 or 3 pole, multishot, with or without check synchronism. 2 voltage inputs for sync.
Breaker Failure	7SW51	Breaker failure relay (1 or 3 pole) with pole discrepancy. 4 current inputs
Distance Protection	7SA511	Distance protection with three optional fault detecting methods, pilot logic, fault locator, ARC (1 & 3 pole), power swing blocking, back-up ground fault protection and 1 or 3 pole tripping.
	7SA513	EHV line distance protection with pilot logic, fault locator, ARC (1 & 3 pole) with sync. check, 1 or 3 pole tripping, power swing blocking and back-up ground fault protection. This relay uses multiprocessor techniques and Digital Signal Processing (DSP).
Differential Protection	7SD51	Current comparison protection with phase segregated measurement, fiber-optic communications, transmission monitoring, breaker intertripping and overload protection.
	7SS51	Busbar differential protection, phase selective, disconnect position input; includes breaker failure protection.
	7UT512	Differential protection for 2-winding transformers and generators, with integrated phase shift and ratio adaptation. Relay provides overload protection with thermal characteristics and has fault recording capabilities.
	7UT513	Differential protection for 3-winding transformers, with capabilities and characteristics similar to the 7UT512.
Generator Protection	7UM511	Definite time overcurrent protection with overload protection, reverse power protection, forward power protection, underexcitation protection, rise-in-voltage protection, undervoltage protection, frequency protection.
	7UM512	Definite time overcurrent protection, load unbalance protection, ground fault detection, rotor ground fault detection, rise-in-voltage protection and frequency dependent undervoltage protection.
	7UM515	100% stator ground fault protection, rotor ground fault protection, overexcitation protection, interturn protection, frequency protection and rise-in-voltage protection.
	7UM516	Distance protection with out-of-step protection and load unbalance protection.
Paralleling	7VE51	For paralleling of Generators and Networks: Option: calibration of frequency and voltage.

Overcurrent Protection



If you have ever dreamed of what would go into an ideal overcurrent relay, then you probably have a good idea of the features of the Siemens 7SJ511.

Time-Current Performance 50/51

The time-current characteristics of Siemens 7SJ511 put access to definite time, inverse, very inverse and extremely inverse curves right at your fingertips. Do you need a wide range for pick-up settings? The 7SJ511 allows you to choose from 10% to 2000% of the input current rating. And the input current ratings are available as either 1A or 5A. Your definite time delay can be anywhere between 0 and 60 seconds in steps of 10 ms.

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The instantaneous function has the same range of pick-up settings, from 10% to 2000%. All current measurement displays of the 7SJ511 are based on true RMS values.

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The ground fault protection (residual) of the 7SJ511 has all of the same pick-up ranges and time-current characteristics as the phase fault protection. It also accommodates a separate ground sensor input if a zero sequence protection arrangement is preferred.

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Beyond Overcurrent

The capabilities of the 7SJ511 go far beyond overcurrent protection. The 7SJ511 also monitors the flow of current after a trip command is issued and will produce a breaker failure signal that can be used for back-up protection.

In addition, the 7SJ511 allows an operator to perform a Trip Circuit Test through a front panel command or through the serial communications port. This feature utilizes password protection for enhanced system safety.

For even tighter coordination control with downstream devices, the Siemens 7SJ511 relay allows for blocking signal interconnections. This "reverse interlocking" means that the overcurrent time protection can be set to

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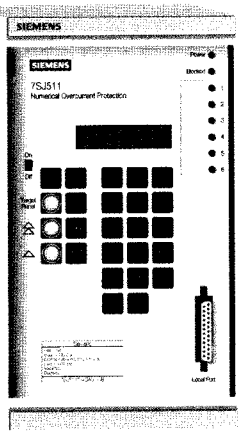

trip in a shorter time (independent of the time-current curve) depending on whether a blocking signal is received or not.

The 7SJ511 has both waveform capture and event recording capabilities built in. These two features assist in resolving power system problems quickly. In addition, load current values can be displayed on the relay's front panel or via the communications port.

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Numerical Relay Advantages

The 7SJ511 has two digital inputs that you can use to extend the protective coverage of the relay. These can start waveform capture or disable the instantaneous overcurrent function. Digital processing enables the relay to provide indication and/or make this data available through the digital communications interface.

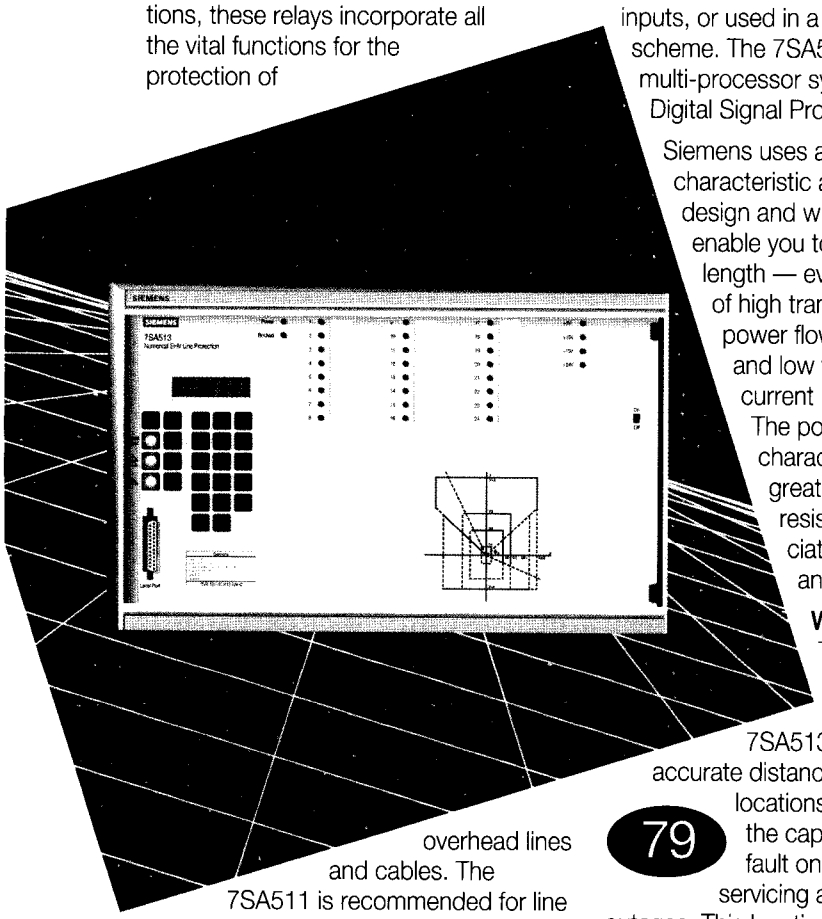
Up to six LEDs can be individually programmed to provide indication of various system status points.

All of these features of the 7SJ511 are further enhanced by the availability of a serial data communications port. Through this port, an operator can monitor real time data and retrieve all events, fault data and waveforms.

Siemens 7SJ511 relay is truly the ideal solution to all of your overcurrent and overload protection needs.

Distance Protection

Nowhere else is the full power of numerical techniques in protective relaying so apparent than in the Siemens 7SA511 and 7SA513 distance relays. From basic protection modes to lightning quick distance-to-fault calculations, these relays incorporate all the vital functions for the protection of



overhead lines and cables. The 7SA511 is recommended for line protection applications where 2 cycle relay operating times are acceptable. For more critical and complex applications or those requiring 1 cycle operating times, the 7SA513 is recommended.

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Siemens Goes the Distance

The 7SA511 and 7SA513 relays give the user three independent zones for distance protection. Two overreach zones and one underreach zone cover your line. Each of these zones has independent resistance and reactance settings for phase and ground

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and can be set to look forward, reverse or be non-directional. In addition to the three independent zones, there are two controlled zones which can be activated by logical conditions, such as reclose or binary inputs, or used in a zone extension scheme. The 7SA513 relay is a multi-processor system utilizing Digital Signal Processing (DSP).

Siemens uses a modern polygonal characteristic along with a modular design and wide setting range to enable you to adapt to any line length — even under extremes of high transmission power flows and low fault current levels.

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The polygonal characteristic allows greater coverage of high resistance values associated with arcing faults and ground faults.

Where's the Fault?

This same resolution is used by the 7SA511 and 7SA513 relays to provide accurate distance to the fault locations. These relays have

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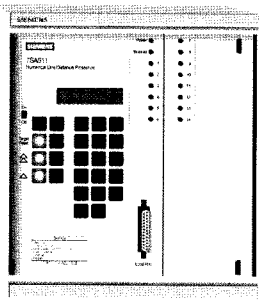
the capability to locate the fault on the line for quick servicing and shorter power outages. This location can be read from the relay's front panel display, or it can be accessed remotely through the serial communications port. In either case, the location can be given in a percentage of the line length or in miles or kilometers and in primary or secondary ohms. The choice is yours.

The 7SA relays give you both single phase and three phase tripping capabilities that can be coupled with the additional integrated single or three phase auto reclosing function. The



7SA513 includes bus and line voltage logic and a synch check function. These features help minimize the extent of power outages and quickly re-energize the circuit.

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The 7SA511 and 7SA513 relays come complete with close into fault protection and loss of potential blocking. These relays also provide time overcurrent protection in the event of loss of potential.

Both relays provide universal pilot logic schemes and interfaces for blocking, unblocking, POTT, PUTT and zone extension to provide high speed operation at both ends of the line. Transient blocking and echo keying logic is included.

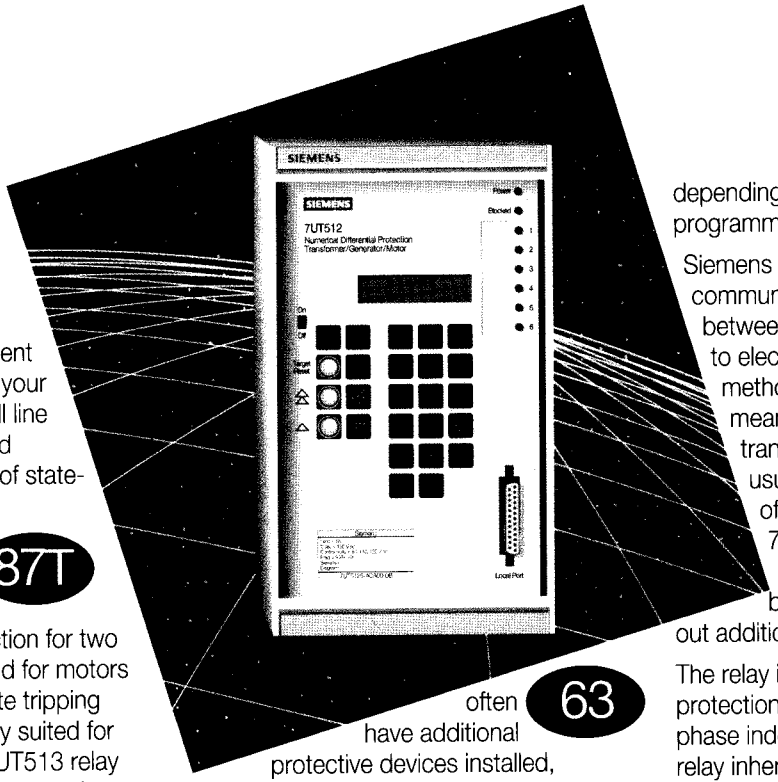
These Numerical Advantages Add Up

The Siemens numerical line protection relays are available with many more standard and optional features. For instance, these distance relays measure the rate-of-change of measured impedances to provide you with Power Swing Blocking/Tripping. Plus, there are digital inputs available that can be programmed to provide alarms, tripping output signals or alter settings. In addition, an optional parallel line ground input is available to improve fault locating on mutually-coupled, multi-circuit lines

Siemens relays continuously self-monitor their circuitry from the DC circuits, through the current and voltage transformer inputs, and to the tripping relay, thus achieving maximal availability and a more corrective (rather than preventive) maintenance strategy.

And, of course, the 7SA511 and 7SA513 relays are available with a serial communications port so that they can be tied into your overall control system.

Differential Protection



Transformers, Motors and Generators

Transformers and large rotating machines represent some of your largest electrical equipment investments. To protect your investment, Siemens' full line of microprocessor-based relays features a variety of state-of-the-art safeguards.

The Siemens 7UT512 relay gives you selective high speed differential protection for two winding transformers and for motors and generators. Separate tripping characteristics are ideally suited for each application. The 7UT513 relay covers your three winding transformer needs as well as those motors and generators where more than two tripping relays are required.

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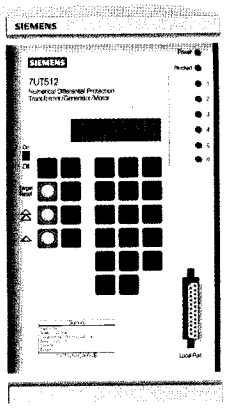
Transformer protection by these outstanding relays begins with a Fourier analysis routine to determine the harmonic content of the currents. The second harmonic component is used as a restraint during inrush conditions while the fifth harmonic component is used as a restraint during momentary overexcitation due to sudden load loss. These restraints prevent erroneous tripping and keep your customers on-line.



Both 7UT51 relays come with built-in thermal overload protection. This feature uses an I^2R replica to determine the heating effects due to through current. In this way the thermal tripping time during an overload condition takes pre-loading into consideration and improves your transformer protection.

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Your large power transformers often have additional protective devices installed, such as sudden pressure relays. The 7UT51 relays have discrete inputs that allow you to connect directly to the relay LEDs and contact outputs and program them to alarm or trip the circuit breaker. This action also will initiate the event log, target data and waveform capture for a more complete analysis. The relays have alarm output relays and command (trip) output relays that can be custom programmed by you to best suit your specific protection needs.

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Current Comparison Protection for Lines

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Differential relaying for cables and overhead lines is accomplished using the Siemens 7SD51 current comparison relays. Like all other Siemens numerical protection relays, the 7SD51 is a complete, self-contained protection package including digital communications.

The 7SD51 gives you selective short-circuit protection when used with a second relay at the far end of the line. This current comparison relay system uses digital communications between relays, exchanging packets of data and commands. This means that a remote trip signal can be transferred to either end or both ends of the protected line, depending upon your set-up programming.

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Siemens provides direct digital communication via fiber-optics between relays to provide insensitivity to electromagnetic interference. This method does not require any extra means of isolation, such as the transformers and other equipment usually required for transmission of analog protection data. The 7SD51 also supervises the entire transmission path between protection units without additional equipment.

The relay is a phase segregated protection system which compares each phase independently. This makes the relay inherently phase selective and ideal for single pole tripping applications. Since it is a current only system, it is not affected by potential circuit failures or zero sequence mutual coupling.

This relay uses a unique change in current comparison technique. It takes the difference between the present value of current and the current from two cycles earlier and compares it to the change in current from the remote end. This eliminates the effect of through load and fault current from the comparison and is more sensitive to high impedance faults.

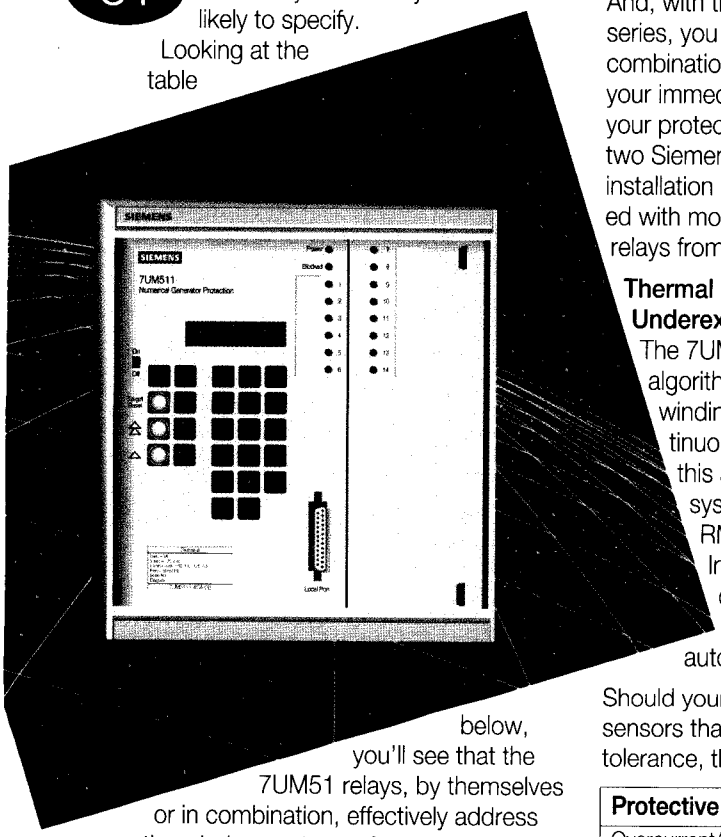
You also get overload protection with a thermal characteristic. This feature tracks the heat losses from the through currents and establishes a preload — which is considered in the trip times. You can use this feature to initiate an alarm prior to tripping if desired.

The 7SD51 relays can even display the through current values by phase, measured as true RMS amps. This feature is extremely useful as a commissioning aid. Combine this capability with a built-in package of user-programmable digital inputs, indicating LEDs, alarm output relays and trip/command output relays, and your power line has the best protection available anywhere.

Generator Protection

If you have a generator, Siemens has the best relay system to protect it. Siemens offers a complete package of generator protection relays that cover any condition you are likely to specify.

Looking at the table below, you'll see that the 7UM51 relays, by themselves or in combination, effectively address the whole spectrum of generator protection needs.



The Numerical Advantage

As with all the other relays in the Siemens line, numerical digital techniques give our relays a functional density that is unmatched. Once all of the voltage and current data are captured and measured, they are available to be analyzed in many different ways. No longer do you need separate relays for undervoltage, overvoltage or frequency protection.

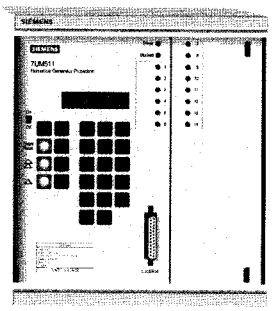
The advantage to you is obvious. You no longer have to make the tough cost decisions on where you draw the protection line. Even on smaller generator installations, you can have it all, from ground fault and phase unbalance to frequency and out-of-step protection.

And, with the 7UM51 series, you can select the combinations of functions best suited to your immediate needs. Since most of your protection will be included in one or two Siemens relays, you also avoid huge installation and wiring problems associated with mounting ten or more discrete relays from other manufacturers.

Thermal and Underexcitation Protection

The 7UM51 relays feature a thermal algorithm used to protect the stator winding from excessively high continuous overload currents. Driving this algorithm is a measurement system based on true RMS current levels. In this way, effects of third or fifth harmonics, for example, are automatically taken into account.

Should your installation require other sensors that signal if something is out of tolerance, the 7UM51 relays can accommodate these sensors through discrete inputs and the programming you enter when configuring the relay.

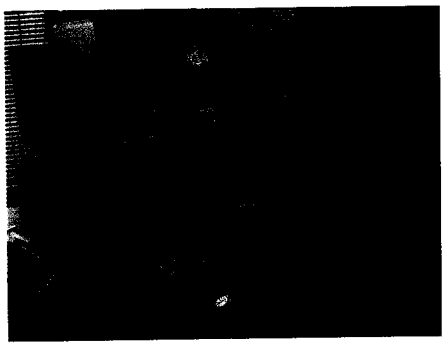


The Siemens 7UM516 relay calculates the load vector as a complex impedance from the currents and voltages in the stator. With this function, any widely fluctuating terminal voltages due to pole slippage are considered in the correct physical sense. Two criteria for monitoring the steady-state and the dynamic stability limits can be set and, in order to quickly recognize a complete excitation failure, the magnitude of the excitation voltage also is supervised.

The 7UM51 relays have five independent tripping relays. These can be programmed by you to create a selective tripping matrix. In addition, each protection function can be switched on or off as desired.

Protective Functions	7UM511	7UM512	7UM515	7UM516
Overcurrent/time protection	✔	✔		
Thermal overload protection	✔			
Reverse power protection	✔			
Forward power supervision	✔			
Underexcitation protection	✔		✔	
Overvoltage protection	✔		✔	
Undervoltage protection	✔		✔	
Underfrequency protection	✔		✔	
Overfrequency protection	✔		✔	
Underbalanced load protection		✔		
Earth fault detection Uo>		✔		
Earth fault detection Io, directional		✔		
Rotor earth fault protection		✔	✔	
Undervoltage-or-overvoltage protection		✔		
DC voltage protection		✔		
100% stator earth fault protection			✔	
Interturn short-circuit protection			✔	
Distance protection				✔
Out-of-step protection				✔
Overexcitation protection			✔	

Relay Communications & Interface



The Siemens numerical protective relay requires initial set-up, just like any other relay. The difference is that Siemens relays are designed to be simple and direct.

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This set-up includes pick-up values, time delays, impedances, etc. And because Siemens relays are all equipped with programmable indicators and output relays, you'll want to program these to precisely fit your needs as well.

User Interface

There are two simple ways to program Siemens relays. The first method is via the user interface keypad and LCD display on the front of every relay. This method allows you to step through each function and input the necessary settings. This is a straightforward procedure and, once programmed, the relay will retain all settings in non-volatile memory.

The relay keypad also is used to view locally any or all of the settings, measured parameters and target data in that relay. This depends on the relay type and can be, for example, currents, voltages, frequency, power factor and thermal loading.

A second method for initial relay set-up is to connect a PC to the serial port on the front of the relay. Then, using a software package called DIGSI that is available through Siemens, you can make the task much easier. DIGSI leads you through the complete set-up routine in a graphics environment. It asks the proper questions and records all of your answers. When complete, the software will down load the proper information into the relay. You can even save all configuration and setting data to a disk and down load directly to the relay.

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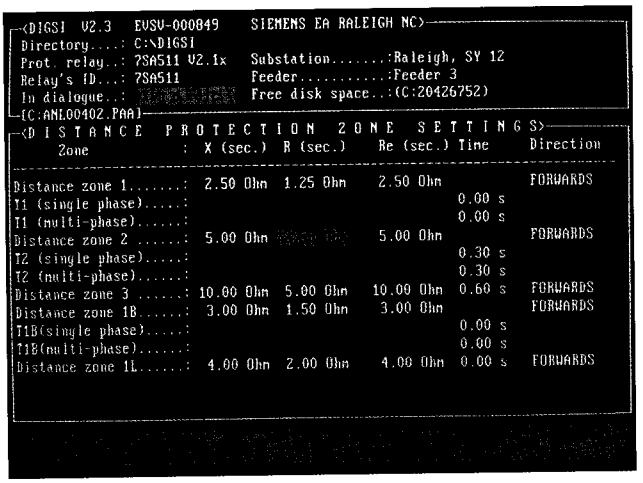
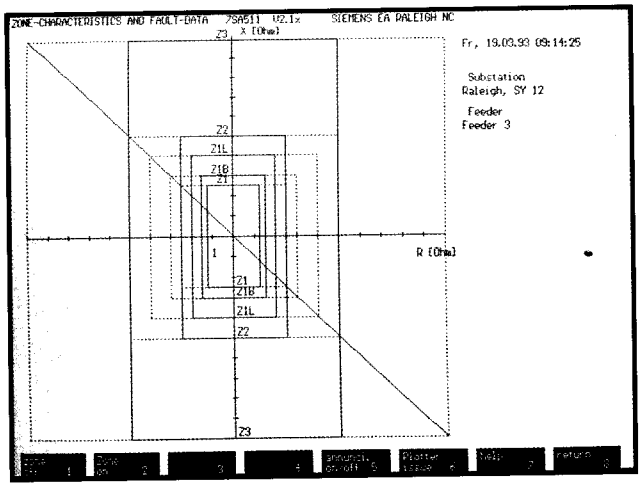
This serial port also can be used to gather data on the event history of the relay over a period of time. With a portable PC, you can collect the event log and fault waveform data for analysis. With this capability, a survey can be quickly taken from all of the relays in a substation or other remote location and be reviewed in an office environment.



The top screen shows distance relay settings. The screen below illustrates a graphical representation of distance settings.



The configuring functions enable the user to establish which integrated additional functions have been activated and which relay interfaces (input relay, alarm relay) to the system will be required. This provides a very flexible way of matching the equipment to the requirements of your application.

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Remote Data Communications

The ideal extension of the use of modern numerical protection is in the communication of the data to a central point. These Siemens protective relays include a serial communications port. This connection can either be hardwired or via an optical fiber.

Remote monitoring of currents, voltages, frequency, thermal loading, power factor, etc., from one control point saves operations time. In addition, when a fault occurs, the fault recording information stored in the relay can be accessed immediately, without sending a crew to the location. This ability can gain you precious time in power restoration and enable you to best direct your service resources in an emergency.

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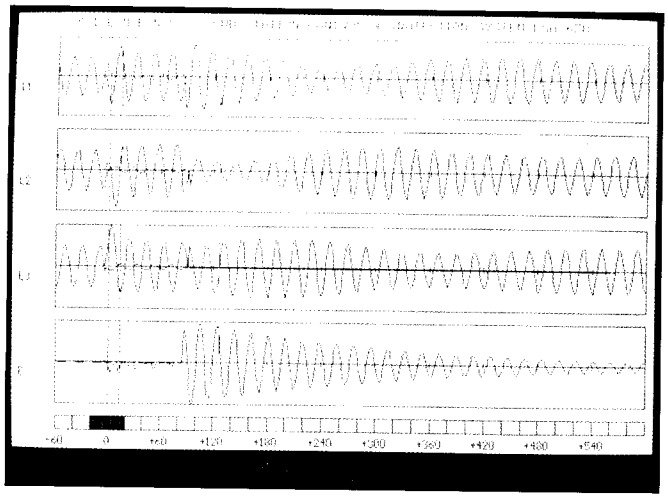
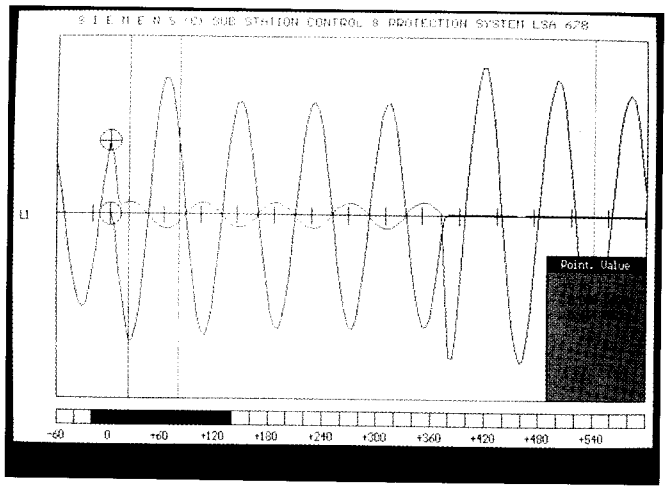
Waveform Capture & Fault Reporting

51G "What happened?" This is usually the first response to a fault event within your electrical system. The correct and timely answer to this question can save you precious moments when faced with a continuity





The top graph illustrates the three phase ground currents and voltages of a fault occurence with relay pickup and trip output indicated.
In the bottom graph, individual traces have been selected and zoomed in upon. Direct readouts of individual values are available by moving the cursor along the trace.

of service issue. It also can help in preventing a reoccurrence of the event.

Each relay in the Siemens numerical protection family can record and store fault data from up to three events.

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This storage includes the tripping unit, key measured parameters and time stamping.

87T In addition to this fault event data, actual waveforms of the last event are recorded for your review. The chronological sequence leading up to the fault is particularly well recorded with a time resolution of approximately 1 ms. The waveform capture starts approximately 60 ms before the fault and can go up to approximately 3 seconds after the fault. This data either can be evaluated locally, using the Siemens DIGSI software, or on a master unit using Siemens LSAMASS software.

A Picture Is Worth A Thousand Words

The old saying "a picture is worth a thousand words" has special meaning in fault analysis. Critical relationships between the currents and voltages are available for immediate review and, when power continuity is at issue, analysis time needs to be efficient and short.

This level of fault information gathering would be almost impossible to duplicate using traditional monitoring equipment. In addition to the thousands of dollars such instrumentation costs even to monitor one circuit, you would have to know where the fault was going to occur. This method, obviously, is only of use for a recurring problem on a particular circuit. With the fault recording and waveform capture built into the Siemens relays, all of your critical circuits can be monitored all the time.

If your relay system is tied into a central monitoring system through the remote communications feature, all the analysis for a complete substation or location can be time synchronized. A central monitoring point also will allow you to archive event reports and review them in chronological order.

49 The remote software also includes a Fourier analysis routine which allows you to perform harmonic analysis of the captured waveforms. The user friendliness lets you select traces and zoom in and out. Figures can be printed or stored and imported to make complete and precise reports.

The levels of fault current at the time of interruption can be used to track wear on the circuit interruption devices. A maintenance program can be fine tuned based on this interruption history. Replacement or retrofit services can be directed to the equipment most in need.

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LSA Substation Control Arrangements

Your Siemens numerical relays will provide you with the best protection available. Using the full potential of digital technology, these relays are designed to exceed your expectations and fully match your system's needs.

78

Centralized Control

Every relay in this Siemens family is available with a serial communications port. This is your entry into centralized monitoring and control of the power system at a level not possible with older generations of protective relays.

The LSA678 Substation Control and Protection System from Siemens will give you that monitoring and control power. The LSA678 system employs a uniformly and technically coordinated system for all secondary circuit tasks.

Using older methods for telecontrol and monitoring requires extensive engineering, wiring and cabling, installation, a large amount of space and a high degree of maintenance. The use of LSA678 makes all of this a thing of the past.

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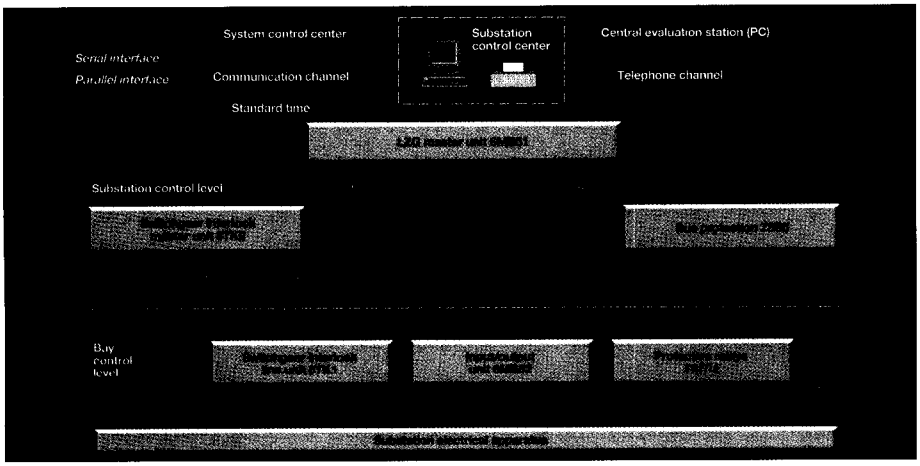
Configurations

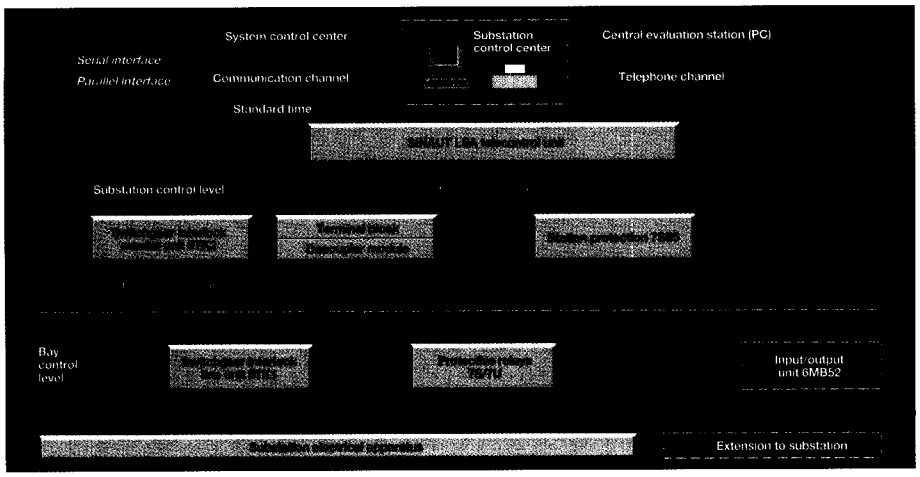
Siemens offers you a choice of two system configurations — both give you superior performance.

The 6MB Substation Control configuration requires only one serial connection (preferably a fiber-optic cable) for all the data and control information in your power system. The input/output devices (located in a low voltage compartment) are connected in a star-configuration network via fiber-optic cables to the LZG master unit, to which they communicate using a polling procedure.

64

The SINAUT LSA Substation Control configuration is based on the same hardware and software modules as the 6MB configuration. The difference is that the functions of the input/output devices have been relocated to the station control level. To accomplish this, special control and process signal acquisition modules are used. These devices communicate via the standard bus with control modules that are also used in the LZG master unit. This system is used where the cabling from the switchgear to the station control level has already been laid in parallel.





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System Advantages

Integrating the numerical protection equipment into a substation control and protection system has the following advantages:

- Operational signals and alarms, including the results of fault locations, are entered chronologically in the substation event record. They are displayed on the monitor in the control center with a time resolution of 1 ms and can be output to a printer.

81

- Operational measured values from remote numerical protection equipment also can be displayed on the monitor, usually in a detailed system display.
- All information from the numerical protection equipment, including fault records, can be stored on disk and archived.
- The recorded information can either be transmitted to the station via a serial interface or through a modem to a PC in a central evaluation department.

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The software package LSAMASS is provided for the evaluation of archived data on a PC.

The Station Control System

A station control system is ready for operation when the plant parameters have been entered into the system. This includes the system configuration (graphics), feeder types, power and instrument transformers, real-time measured values, switching element position indications, etc. Along with flexibility and functionality, the amount of data to type in is growing. Mastering all this data and making it handy are the goals of the station control system.

Using one uniform system, all this information can be handled by just one user friendly system, LSATOOLS. This program helps the user define all substation specific data and then creates the necessary file for parameter capture as well as the documentation of the selected parameters and hardware.

The automatic data consistency and the uniform system for parameter capture and documentation reduces many error possibilities. The program is object oriented, runs on a compatible PC and gives the user a comfortable man-machine interface using multiple screens. It can be used for planning, implementation and testing of a station control system.

This system offers the following features:

- Automatic data consistency on all levels
- A uniform system for parameter capture and documentation
- No multiple data entries for the same task
- Use of the same system for all control and monitoring tasks
- User friendly man-machine interface
- Object oriented input
- IBM compatible

Glossary of Terms

POTT - Permissive Overreach Transfer Trip

PUTT - Permissive Underreach Transfer Trip

DSP - Digital Signal Processing

DIGSI - A PC software program that provides a direct interface to the relay for configuring, setting retrieval and evaluation of data.

LSA - Substation control and protection system with the I/O devices located at the substation level.

LSAMASS - A PC software package used for the evaluation of archived data.

SINAUT LSA - Substation control and protection system with the I/O devices located at the station control level

LZG - A master unit with associated station controls for operating and monitoring at the station control level.

LSATOOLS - A software package used to define all substation specific data, create the file for parameter capture and create the documentation of the used parameters and hardware.

For further information and technical assistance call 1(800) 347-6659.

Siemens Energy & Automation Utility Sales Offices

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