SEL-2030 Communications Processor Guideform Specification

The communications processor shall operate a star communications network and provide a combination of functions including Boolean logic processing, automatic transmission of outgoing messages and parsing of responses, data scaling, data aggregation, simultaneous collection of data from up to 16 slave devices (both SEL and non-SEL), and simultaneous data access for multiple master devices. The communications processor shall provide Modbus RTU Slave and DNP3 Level 2 Slave protocols and provide two card slots for the installation of additional protocol cards. Specific operational and functional requirements are as follows:

Power Supply. The communications processor shall be capable of operating on a wide range of power supply voltages and shall be available with one of three power supply types: 85–350 Vdc or 85–264 Vac, 38–200 Vdc or 85–140 Vac, or 20–60 Vdc.

Temperature. The communications processor shall be capable of continuous operation over a temperature range of –40° to +85° C in order to allow mounting in an outdoor control cubicle or in case of the failure of enclosure heating or cooling. The communications processor shall be type tested to IEC 60068-2-1: 1990 (Test Ad 16 hr @ –40°C), IEC 60068-2-2: 1974 (Test Bd 16 hr @ +85°), and IEC 60068-2-30: 1980 (Test Db 12 + 12-hour cycle @ 55°C, 6 cycles).

Environmental Testing. The communications processor shall be tested to the same standards as protective relays including IEC 60255-21-1, IEC 60255-21-2, IEC 60255-21-3, IEC 60255-22-1, IEC 60255-22-2, EN 61000-4-2, IEC 60255-22-3, IEC 60255-22-4, EN 61000-4-4, and IEEE C37.90.1.

Input/Output. There shall be an optional input/output module with 16 optoisolated inputs and 4 outputs. There shall be three types of inputs available rated for operation at a nominal 48 Vdc, 125 Vdc, or 250 Vdc. The inputs shall draw no more than 4 mA when nominal control voltage is applied. The outputs shall be contact type with a 30 A make and 6 A carry with MOV protection.

Alarm Output. There shall be an Alarm contact output programmed to signal internal errors and malfunctions. The alarm contact shall be programmable so that the alarm conditions that activate the output can include additional conditions with the communications processor, collected data, and the results of logical and mathematical calculations. The Alarm contact shall be configurable to operate as a Form A or Form B contact.

EIA-232 Ports. The communications processor shall have one front panel and 16 rear panel ports using standard DB-9 connectors and MOV protection. Two pins on each port shall be available as a demodulated IRIG-B time synchronization signal. One rear port shall be capable of receiving a demodulated IRIG-B signal. Six rear ports shall have a selectable +5 Vdc output on Pin 1. Each rear port shall be capable of operation at 300–9200 bps.

Password Security. The communications processor shall have a multilevel password system requiring that you pass through lower levels to reach higher levels. The passwords shall be user configurable and allow up to 12 characters including case-sensitive letters, digits, and special characters including !@#$%^&*()-_=+;:,<.>/?'"\|. There shall be a jumper to allow emergency password disable. This password scheme meets or exceeds all of the DOE Password Guide (DOE G 205.3-1).

Protocol Card Slots. There shall be two slots that allow installation of field-installable protocol cards. The communications processor shall automatically recognize and communicate with the protocol cards.

Database. Each port shall have a separate database that allows data collection and labeling. Manipulation of data within the databases shall be available via label reference or memory address reference. There shall be a programmable User region that allows the data transfer, data scaling and offset, arithmetic operations, Boolean combinations, and data concentration.

Configuration. Configuration of messages and data processing functions shall be through simple message commands and data movement equations that do not require specific knowledge or tools for programming in C or other programming languages. Configuration of messages for data collection with SEL devices shall include automatic parsing and labeling of data.

Outgoing Messages. The communications processor shall be capable of sending outgoing messages triggered based on collected data, calculated data, time of day, and periodic time functions. Outgoing messages can contain any binary or ASCII character, internal database registers, and automatic CRC checksum calculation.

Incoming Messages. In response to an outgoing message, the communications processor shall be capable of ignoring the response or parsing as ASCII integer, ASCII floating point, character string, integer string, integer string with XON/XOFF, and flexible parsing. Flexible parsing shall be capable of handling messages that contain numbers that may be replaced with non-numeric text temporarily through a system of decode equations.

Auto-configuration. The communications processor shall be capable of automatically communicating with SEL devices to determine communication parameters and features of the connected device.

Interleaved Conversations. The communications processor shall be capable of simultaneous ASCII, binary, and IRIG-B communications with connected SEL relays over a single communications cable or with the addition of transceivers over a single fiber-optic pair. The collection of status and measurement data and control operations from master devices connected to the SEL-2030 shall not be interrupted by ASCII engineering conversations with the relay over the same cable.

Synchrophasors. The communications processor shall be capable of receiving synchronized phasor measurement data via the SEL Fast Messages for synchrophasors with supported message rates of 1 per minute to 1 per second. Received synchrophasor data shall be available for use in logic processing and redistribution through outgoing protocols such as DNP3 or Modbus.

DNP3. The communications processor shall be capable of operating as a DNP3 Level 2 Slave. The communications processor shall allow configuration of any incoming data or data calculated within the communications processor to be available through the DNP interface. All control points within the communications processor shall be available as DNP control points using latch on/latch off, pulse on/pulse off, or trip/close control functions.

Modbus. The communications processor shall be capable of operating as a Modbus slave simultaneously on as many as three ports. The Modbus slave implementation shall allow direct access to any register within the communications processor. The Modbus implementation shall allow control of any control point within the communications processor.

Boolean Equation Processing. The communications processor shall process Boolean equation statements for the purposes of triggering outgoing messages and control actions and combining collected data for retrieval by master devices.

Configuration Storage. The communications processor shall store all settings and configuration in nonvolatile memory allowing recovery after prolonged loss of power including failure of the internal battery.

Nonvolatile Storage. There shall be an option for 2MB of flash memory used as nonvolatile storage of incoming and calculated data within the communications processor. Data stored in the nonvolatile memory shall be available for retrieval after sustained power outage including failure of the internal battery.