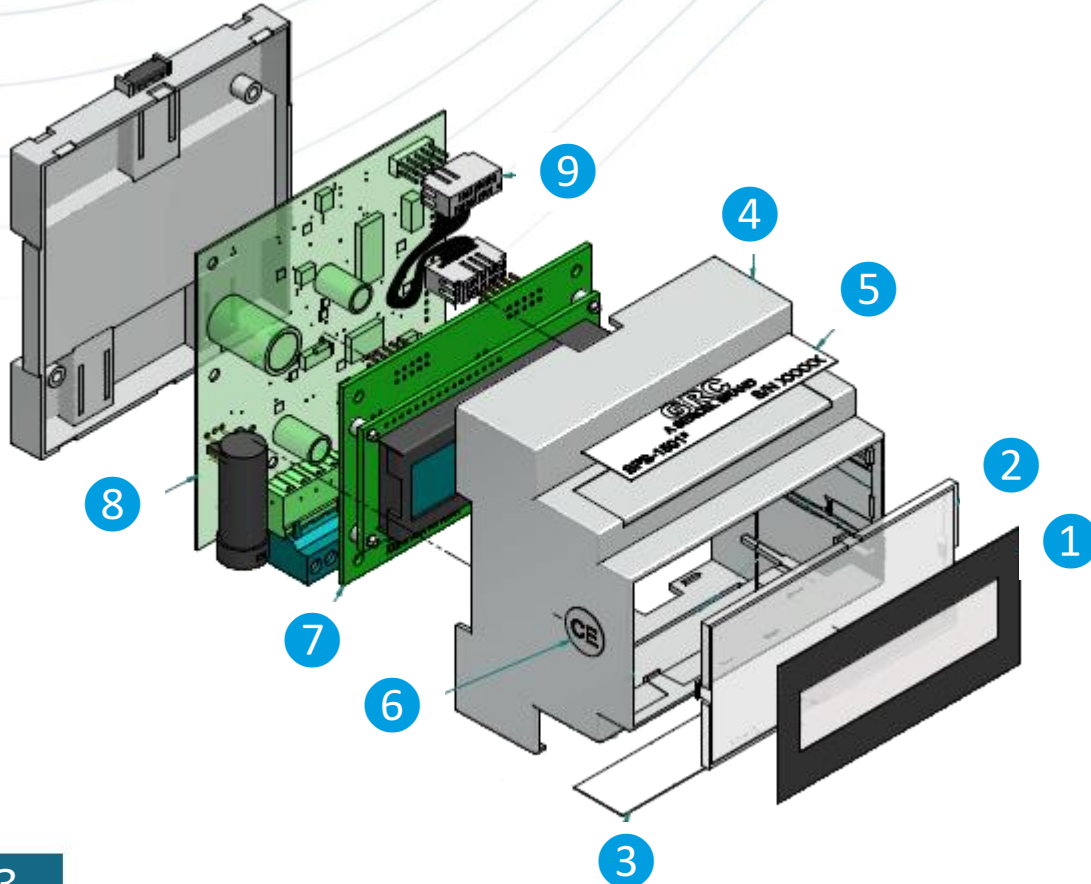


SPS-1500

- › The SPS-1500 may experience communication problems due to noisy environments, grounding problems, or installation issues. The LCD on the SPS-1500 will display error codes depending on the failure it is detecting. Below is a list of common error codes and possible solutions to assist with troubleshooting the SPS-1500.

SPS-1500

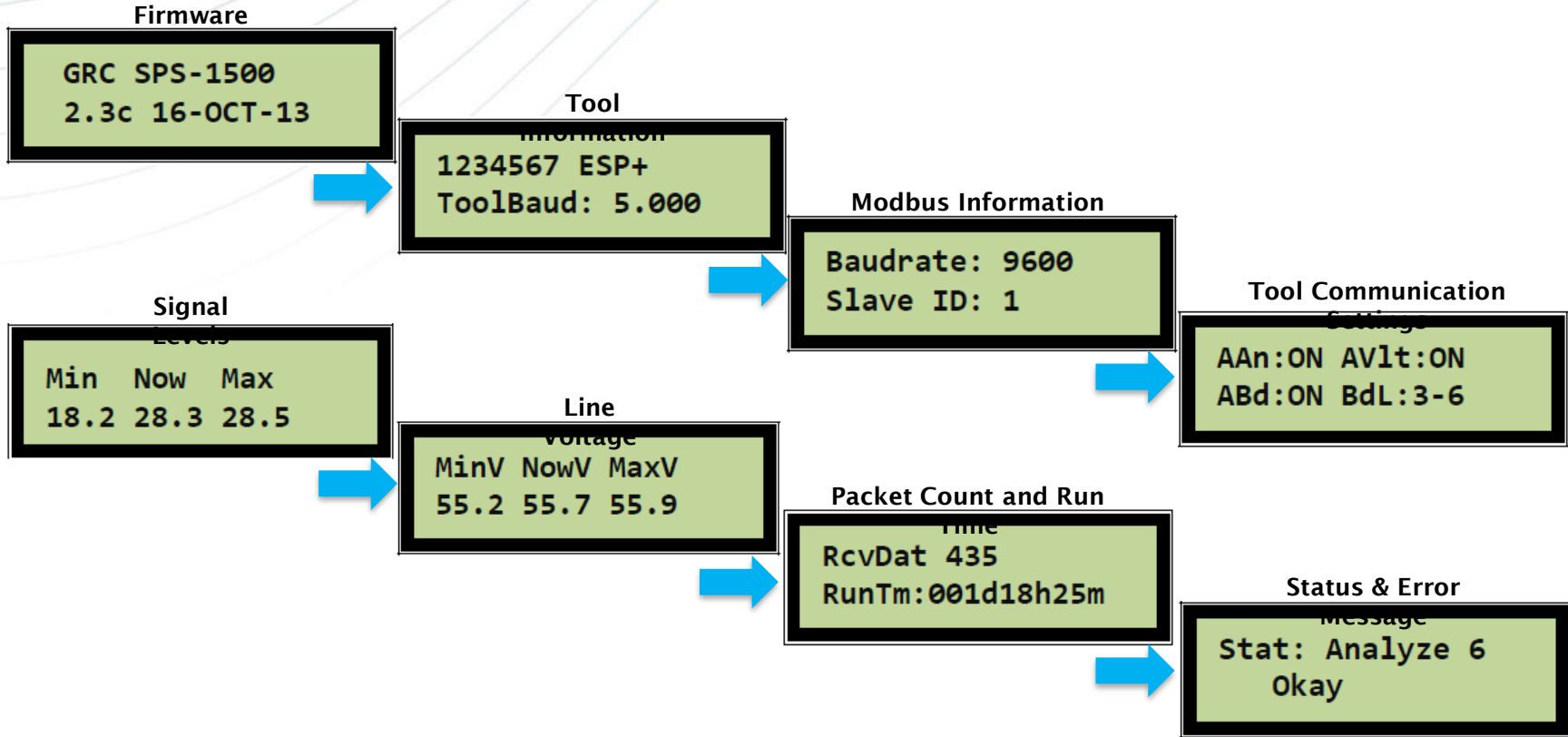


| Item | Description / Descripción |
|------|--------------------------------------|
| 1 | LCD BEZEL COVER LABEL |
| 2 | FRONT PANEL, FLAT TRANSPARENT |
| 3 | SPS1500 PRODUCT WIRING LABEL |
| 4 | ENCLOSURE |
| 5 | SPS1501 PRODUCT IDENTIFICATION LABEL |
| 6 | LABEL, CE IDENTIFICATION |
| 7 | PCB ASSY, SPS1500L LCD |
| 8 | PCB ASSY, SPS1500L ESP PWR SPLY |
| 9 | CABLES 10P 6 SKT |

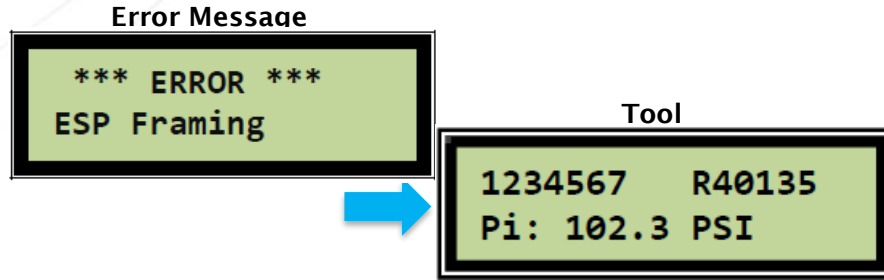
SPS-1500

Note: During normal start-up communications with the tool you will see error messages such as “High Amp”, “Low Amp”, “DC-DC Bad”, “DC-DC Chk”, “Analyze 1” through “Analyze 16” as well as other normal messages that are all part of acquiring the tool. After the SPS analyzes the line current from the tool you will see the message “SPS Power OFF” a couple of times. Then the SPS will show 2 or 3 phase Sync cycles and then begin to read gauge header data. This is all part of normal operations of the SPS-1500/SPS-1501. There is only a concern when an error message is repeated multiple times and communications is not established with the gauge after five minutes.

SPS-1500 Screen Sequence



SPS-1500 Screen Sequence



SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|--|---|--|
| DC-DC Bad or DC-DC Chk - (Voltage measured by SPS is not matching what is sourced by SPS) | <ul style="list-style-type: none">• Bad Ground Connection• Low Resistance from Gauge Signal to Ground• Excessive Gauge signal line current• Faulty SPS | <ul style="list-style-type: none">• Check Downhole readings (Phase-Phase & Phase-Ground (Reverse Polarity Megger))• Try alternate SPS power supply• Use voltmeter to confirm voltage MAX Voltage is over 45VDC. |
| DC-DC Bad or DC-DC Chk - (El voltaje medido por SPS no coincide con el de SPS) | <ul style="list-style-type: none">• Mala conexión a tierra• Baja resistencia de la señal del sensor a tierra• Corriente de línea de señal de sensor excesiva• SPS defectuoso | <ul style="list-style-type: none">• Verifique las lecturas eléctricas del equipo de fondo (fase-fase y fase-tierra (megóhmetro con polaridad inversa))• Pruebe una fuente de alimentación SPS alternativa• Use un multímetro para confirmar que el voltaje MÁX. sea superior a 45 VCC. |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|---|---|---|
| Baud Fast – (Gauge Data is changing at a Rate higher than expected) | <ul style="list-style-type: none">• Set voltage is too high• Motor noise affecting gauge current modulation | <ul style="list-style-type: none">• Disable Auto Baud and raise Max Tool Baud to 8-10• Reboot or cycle power to restart analyzing stage• Disable Auto Volt/ Auto Analyze with DataWorks. Set voltage to ~60VDC. |
| Baud Fast – (Los datos del sensor están cambiando a una velocidad superior a la esperada) | <ul style="list-style-type: none">• El voltaje configurado es demasiado alto• Ruido del motor afecta a la modulación actual del sensor | <ul style="list-style-type: none">• Desactive Auto Baud y aumente Max Tool Baud a 8-10• Reiniciar o apagar y encender para reiniciar la etapa de análisis• Desactive Auto Volt / Auto Analyze con DataWorks. Establezca el voltaje en ~ 60 VCC. |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|---|--|--|
| Low Amps – (Gauge current is lower than expected) | <ul style="list-style-type: none"> • Disconnected from tool • High resistance connection at motor WYE point to gauge • Blown Signal fuse • Low amp setting set to high | <ul style="list-style-type: none"> • Check Downhole readings (Phase-Phase & Phase-Ground (Reverse Polarity Megger)) • Check all connection(s) • Check Signal fuse • Check Setting of Low amp with DataWorks (15VDC Nominal) • Check Setting of High amp with DataWorks (25VDC Nominal) |
| Low Amps – (La corriente del sensor es mas baja de la esperada) | <ul style="list-style-type: none"> • Sensor no esta conectado • Conexión de alta resistencia en el motor WYE punto a sensor • Fusible de señal abierto • Ajuste de amperaje bajo establecido en alto | <ul style="list-style-type: none"> • Verifique las lecturas del fondo del pozo (fase-fase y fase-tierra (megóhmetro con polaridad inversa)) • Verifique todas las conexiones • Compruebe el fusible de señal • Verifique el ajuste de amperaje bajo con DataWorks (15 VDC nominal) • Verifique la configuración de alto amperaje con DataWorks (25 VDC nominal) |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|--|---|---|
| <p>High Amps – (Gauge current is higher than expected)</p> | <ul style="list-style-type: none"> • Poor Wellhead grounding • Excessive Gauge Signal Line Current or injection of noise from motor at wye point. | <ul style="list-style-type: none"> • Connect to the SPS with “DataWorks” software to manually set the following current settings for the gauge: <ul style="list-style-type: none"> - Check Setting of Low amp (15mA normally for SPS-1500 and 2-8mA normally for SPS-1501) - Check Setting of High amp (25mA normally for SPS-1500) • Verify Downhole readings (Phase to Phase, Phase-Ground (Reverse Polarity Megger)) • Replace the SPS-1500 |
| <p>High Amps – (La corriente del sensor es mas alta de la esperada)</p> | <ul style="list-style-type: none"> • Conexión a tierra del cabezal de pozo deficiente • Corriente de línea de señal del sensor excesivo o ruido del motor en el punto estrella. | <ul style="list-style-type: none"> • Conéctese al SPS con el software "DataWorks" para establecer manualmente las siguientes: <ul style="list-style-type: none"> - Compruebe la configuración de Low Amp (15 mA normalmente para SPS-1500) - Compruebe la configuración de High Amp (25 mA normalmente para SPS-1500 y 22-26 mA normalmente para SPS-1501) • Verifique las lecturas del equipo de fondo (fase a fase, fase-tierra (megóhmetro con polaridad inversa)) • Reemplace el SPS-1500 |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|--|---|--|
| Analyzing – (SPS is adjusting output voltage to analyze gauge signal) | <ul style="list-style-type: none">• Normal Operation message unless message is continuous or repeating over 5 minutes. | If message is continuous or repeats over 5 minutes: <ul style="list-style-type: none">- Check all wire connections- Check Phase to Phase and Phase-Ground connection (Reverse Polarity Megger) (Applies to SPS-1500 only)- Check Signal fuse- Adjust Set voltage (Approx. 60+/- for 1500 and Approx. 40+/- for the SPS-1501). This can be done using “DataWorks” software. |
| Analyzing – (SPS se está ajustando el voltaje de salida para analizar la señal del sensor) | <ul style="list-style-type: none">• Mensaje de funcionamiento normal a menos que el mensaje sea continuo o se repita durante 5 minutos. | Si el mensaje es continuo o se repite durante 5 minutos: <ul style="list-style-type: none">• Verifique todas las conexiones de los cables• Compruebe la conexión de fase a fase y de fase a tierra (megóhmetro con polaridad inversa) (solo se aplica al SPS-1500)• Comprobar fusible de señal• Ajuste el voltaje establecido (Aprox. 60 +/- para 1500 y Aprox. 40 +/- para el SPS-1501). Esto se puede hacer usando el software "DataWorks". |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|---|--|--|
| No Tool – (No Tool indicates there is no gauge current) | <ul style="list-style-type: none"> • Blown SPS Fuse • Blown Surge Protector Fuse/MOV • Bad SPS to Gauge Signal wire connection • No-Tool Current setting incorrect in SPS | <ul style="list-style-type: none"> • Read the DC current drawn by the gauge with an ammeter in series and DC mode. DC current is normally 15-30mA. • Check all fuses and surface connections. • If connections and equipment okay error may indicate possible downhole connection is open. • Using “DataWorks”, verify “No Tool Amp” value is set to 5.3mA (default value). |
| No Tool – Indica que no hay sensor conectado | <ul style="list-style-type: none"> • Fusible SPS abierto • Fusible / MOV del protector de sobretensión abierto • Mala conexión del cable de SPS a la señal del sensor • Configuración de corriente No-Tool Current incorrecta en SPS | <ul style="list-style-type: none"> • Lea la corriente DC consumida por el sensor con un amperímetro en serie y modo DC. La corriente DC debe ser normalmente de 15 a 30 mA. • Compruebe todos los fusibles y las conexiones de superficie. • Si las conexiones y el equipo están bien, el error puede indicar que una posible desconexión en el fondo. • Usando “DataWorks”, verifique que el valor de “No Tool Amp” esté establecido en 5.3mA (valor predeterminado). |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|--|---|---|
| Line Noisy- (SPS is unable to measure current modulation from gauge) | <ul style="list-style-type: none">• Motor WYE phase imbalance voltage is high | <ul style="list-style-type: none">• Check all fuses and surface connections.• If connections and equipment okay error may indicate possible downhole problem.• Check line voltage at wye point on surge protector for motor noise injection. |
| Line Noisy- (SPS no puede medir la modulación actual del sensor) | <ul style="list-style-type: none">• El voltaje de desequilibrio de fase en el WYE point del motor es alto | <ul style="list-style-type: none">• Compruebe todos los fusibles y las conexiones de superficie.• Si las conexiones y el equipo están bien, el error puede indicar un posible problema en el fondo del pozo.• Verifique el voltaje de línea en el punto estrella del protector contra sobretensiones (surge protector) para detectar la inyección de ruido del motor. |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|--|---|---|
| No Signal- (SPS measures gauge current but no modulation current) | <ul style="list-style-type: none">• Possible SPS/gauge firmware corruption• Possible SPS/gauge component failure• No-Tool Current setting incorrect in SPS | <ul style="list-style-type: none">• Use DC Ammeter to measure DC current from SPS to gauge. Gauge current is normally modulated from approximately 15mA to 25mA. If not modulated, check SPS and connections. |
| No Signal- (SPS mide la corriente del sensor pero no la corriente de modulación) | <ul style="list-style-type: none">• Posible corrupción del firmware del sensor / SPS• Posible falla en algún componente del sensor / SPS• Configuración de No-Tool Current incorrecta en SPS | <ul style="list-style-type: none">• Utilice un amperímetro de DC para medir la corriente DC de SPS al sensor. La corriente del sensor normalmente se modula desde aproximadamente 15 mA a 25 mA. Si no está modulado, verifique SPS y conexiones. |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|-----------|--|---|
| LINE BAD- | <ul style="list-style-type: none">Phase imbalance, short circuit or damaged equipment | <ul style="list-style-type: none">Check drive, grounding to wellhead, surface cable to wellhead and system grounds. Check Surge Suppressor MOV, fuses, surface choke and wiring. Check gauge fuse on SPS-1500. Test resistance/insulation of the downhole cable at wellhead |
| LINE BAD- | <ul style="list-style-type: none">Desequilibrio de fase, cortocircuito o equipo dañado | <ul style="list-style-type: none">Verifique el VSD, la conexión a tierra al cabezal del pozo, el cable de superficie al cabezal del pozo y las tierras del sistema.Compruebe el MOV del supresor de sobretensión, los fusibles, el choke de superficie y el cableado. Verifique el fusible del sensor en el SPS-1500. Pruebe la resistencia / aislamiento del cable de fondo de pozo desde la boca del pozoReemplace SPS-1500 |

SPS-1500 Troubleshooting

| Error | Possible Cause | Troubleshooting Step |
|--------------|---|---|
| Packet Size- | <ul style="list-style-type: none">• Communication problem as the SPS-1500 looks for the optimal voltage to run the gauge | <ul style="list-style-type: none">• If AutoAnalysys and AutoVolt are disabled (Manual Mode), increase the voltage; If AutoAnalysys and AutoVolt are enabled the SPS-1500, try running in a Manual Mode and increase de Set Voltage until the gauge is communicating. |
| Packet Size- | <ul style="list-style-type: none">• Problema de comunicación ya que el SPS-1500 busca el voltaje óptimo para detectar el sensor | <ul style="list-style-type: none">• Si AutoAnalysys y AutoVolt están desactivados (modo manual), aumente el voltaje; Si AutoAnalysys y AutoVolt están habilitados el SPS-1500, intente ejecutar en modo manual y aumente el voltaje de ajuste hasta que el sensor se comunique. |

SPS-1500 Troubleshooting

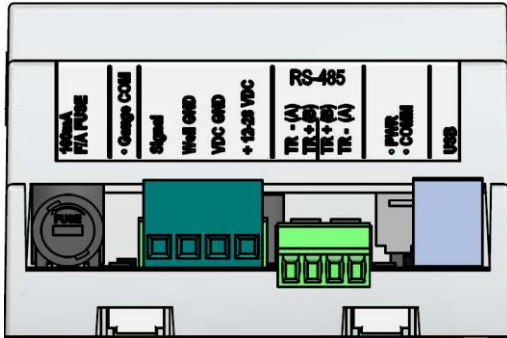
| Error | Possible Cause | Troubleshooting Step |
|-------|---|--|
| OKAY- | <ul style="list-style-type: none">• Normal Operation, no errors | <ul style="list-style-type: none">• SPS is communicating with the gauge |
| | <ul style="list-style-type: none">• Operación normal, sin errores | <ul style="list-style-type: none">• El SPS se esta comunicando con el sensor |

Note: Many problems with the SPS-1500 can be solved with proper grounding techniques. A good ground must be established from the production tubing at wellhead back to the ground point at the surface package for proper operation. This does not apply to the SPS-1501 as it grounds to the TEC line.

No Modbus communication

› Possible Reason(s)

- Send / Receive connections reversed
- Improper address and Baud Rate
- Not receiving Modbus request (Magenta LED by Modbus connector flashes when SPS receives Modbus request)



› Correction

Check for proper Modbus address and Baud rate on SPS-1500 LCD

RS-485 connections

- Make sure jumpers, J6 & J7, are on SPS-1500.
- Make sure same polarity connection is going from SPS-1500 to RS-485 adaptor board [e.g. 'TR-' from SPS-1500 connects to TD(A) of RS-485 adaptor].

RS-422 connections

- Make sure jumpers, J6 & J7, are **not** on SPS-1500.
- Make sure all 4 wires are connected with correct polarity. For example
- 'TR-' from SPS-1500 connects to TD(A) of RS-422 adaptor and -TR+' from SPS-1500 connects to TD (B) of RS-422 adaptor.

SPS Default Configurations

| SPS Control | Description | Default |
|--------------------------|--|---------|
| Power On Voltage Setting | Sets initial Line Voltage at startup | 40.00 |
| MBWD:Modbus Watchdog | Enables 5 Min Modbus packet timer timeout and restart | ON |
| SAFEV: Safe Voltage | Measures Signal Levels before gauge power on and can disable the tool if voltages are too high | ON |
| Auto Volt | Sets optimum line voltage | ON |
| Auto Analyze | Analyzes for optimum line communication | ON |
| Auto Baud | Toggle Auto Baud | ON |
| Minimum Baud Rate | Edit Minimum tool baud rate | 3 |
| Baud Rate | Edit Maximum tool baud rate | 8 |
| Line Voltage Tolerance | Edit Line Voltage Tolerance | 4 |
| No Tool Amp | Edit current threshold while no tool connected | 5 |
| Low Current | Edit low current threshold | 16-18 |
| High Current | Edit high current threshold | 30-32 |

SPS Default Configurations (Cont..)

| SPS Control | Description | Default |
|------------------------|--|---------|
| LCD Backlight | Toggle LCD backlight | ON |
| LCD Time | Adjust time between data screens | 3 |
| LCD F W Info. | Toggle Display: Firmware Version | OFF |
| LCD Tool Information | Toggle Display: Tool Information | ON |
| LCD Modbus Information | Toggle Display: Modbus Information | ON |
| LCD Wye Imbalance | Toggle Display: Wye Voltage Imbalance | ON |
| LCD Comm Settings | Toggle Display: SPS Communication Settings | ON |
| LCD Signal Levels | Toggle Display: SPS-Tool Signal Levels | ON |
| LCD Line Voltage | Toggle Display: Current Line Voltage | ON |
| LCD Run Time | Toggle Display: SPS-1500 Power On Time | ON |

