Model GPX
Operator’s Manual
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S.1 Introduction

When paired with a 10XAS-Series or 10XBR-Series sensor(s), the SCAN-A-LINE™ Model GPX is one of the most versatile, reliable, and cost effective guiding solutions in the world today.

S.1.a Functional Description

The SCAN-A-LINE™ Guide Processing Unit – Model GPX is a universal signal processor for all Scan-A-Line™ 10XAS-Series and 10XBR-Series Sensors. The Model GPX is equipped to supply regulated power and full signal processing for one or two Scan-A-Line™ Sensors. The Model GPX is configured for the operational mode via graphical user interface, thereby eliminating the need to search for jumper settings and/or pass codes.

The Model GPX may be used to drive a 24V electric actuator OR hydraulic control valve. The system may be controlled locally using the front panel buttons or remotely using RS-232. (see RS-232 commands). The front panel contains a bargraph display that indicates the actual strip position over the sensors. There is a green indicator on the display that will turn off to indicate sensor fault conditions.

S.1.b Physical Dimensions

The Model GPX is housed in a steel enclosure measuring 12 inches [305 mm] wide by 14 inches [356 mm] tall by 6 inches [152mm] deep and painted with corrosive resistant polane paint. The weight of the unit is approximately 15.5 pounds [7 kg]. Sensor connections are located on the bottom panel through 7-pin MS-style circular connectors. The Model GPX has seven connections on the bottom panel. System power is connected through an IEC connector located on the bottom of the enclosure.

S.1.c Unit Configuration

The Model GPX is configured for operation with 10XAS or 10XBR sensors using the GPX Setup Wizard software. The Model GPX supports two sensors of the same size and type within a single application.

S.2 Operational Considerations

The Model GPX is designed to operate in an industrial environment and can readily tolerate average factory conditions. Considerations for protection and maintenance of the Model GPX will ensure its operation for years to come.

NOTE:
If any welding is to be performed near the Model GPX, or anywhere on the process line where the Model GPX is installed, disconnect ALL cables from the Model GPX. This prevents system overload by the current generated from welding. If any welding is performed near the sensors, please cover the receivers such that no light produced by the welding may enter the receiver.
S.2.a Temperature Range

Operational temperatures should fall in the range from 32°F to 122°F [0°C to 50°C]. Temperatures above 140°F [60°C] for prolonged periods of operation or storage can lead to the degradation of the integrated circuits in the Model GPX. If temperatures outside the specified range are expected, special provisions should be made to protect the equipment.

S.2.b Vibration Considerations

SCAN-A-LINE™ processors can tolerate reasonable amounts of shock and vibration. The major problem with vibration is the increase in probability of loose hardware and/or connectors. Mount the Model GPX to a solid, fixed mounting where vibration is at a minimum. When high levels of vibration or shock are likely, shock-absorbing mounts will reduce maintenance problems.

S.3 Specifications for Model GPX

The electronics for the Model GPX are housed in a NEMA-type steel enclosure. All enclosures are painted with corrosive resistant polane paint.

S.3.a Power Requirements

The Model GPX has two switching power supplies. The main power supply provides +/-12V and 5V outputs for logic circuitry and hydraulic valve output. The second power supply provides 24V for electric actuator output. The standard power requirements are the same for both; 90VAC to 264VAC at 47Hz to 63Hz. The power supply has UL1950 and CSA C22.2 No. 234 safety approvals and meets FCC Class B conducted as well as VDE EN 60 950 Class B EMI conducted noise limits. The main power supply will automatically adjust for voltages between 90VAC and 264VAC with no jumpers or switch settings necessary.

Note: The 24V power supply is not auto range. There is an input voltage selection switch, located on the side of the power supply.

The power line is filtered to suppress power line transient noise and power line induced RF interference. Quick disconnect power line connections are made directly to the IEC power connector/EMI line filter on the bottom of the Model GPX enclosure. The main power supply for the Model GPX is located under a red warning panel in the top-right corner inside the enclosure.

Short circuits to the regulated supplies will usually cause a thermal shutdown of the regulators without causing the fuse to blow. See Figure S.3-1 for the power supply fuse location. Contact Harris Instrument Corporation’s service department for recommended replacement.

NOTE:

A good system earth ground will be helpful in reducing the possibility of interference from other electrical equipment. Care should be taken to insure that the SCAN-A-LINE™ earth ground is separate from the grounds used by other systems. This is most important when high current (ex. welding, cutting, etc.) and high voltage (ex. Hi Pot Testing) are involved.
S.4 Installation

Mount the Model GPX vertically, with the cable and power connections pointed towards the floor. The Model GPX requires a good Earth ground, so be sure to use the three-prong power cord for connecting system power. If running the power through conduit, ensure that the system power has an adequate earth ground.

Inspect all cables that will connect with the Model GPX. Verify that the connectors are free of foreign materials and check the number of pins on each connector.

Typically, the Model GPX will connect seven-pin emitter cables for 10X-Series sensors. Processor interconnection cables, such as used to route the sensor signals from the Model GPX to another controller or measurement processor (such as a Model MPX), are typically connected through the four-pin (female) feature connector on the bottom panel. Connect the proper cable(s) to the appropriate MS-style circular connector(s) on the bottom panel of the Model GPX (See Figure K.4-1). Check the accompanying sensor manual(s) for more information on connecting sensor cables.

S.4.a Bottom Enclosure Connections

J1 = Sensor A
J2 = Sensor B
J3 = Correction PWM OUTPUT (To hydraulic valve)

This is the control signal to the valve, it connects via MS-style circular connector. The mating connector to J3 is a 3 pin (female) MS-style circular connector. Please contact Harris-Instrument Corporation to order. See below for solder view pin diagram.

<table>
<thead>
<tr>
<th>Pin Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>PWM OUT +/-</td>
</tr>
<tr>
<td>B</td>
<td>SHIELD</td>
</tr>
<tr>
<td>C</td>
<td>PWM OUT +/-</td>
</tr>
</tbody>
</table>

J4 = GPX/MPX Feature Connector.
The feature connector allows the use of a Model MPX parallel to the GPX to provide a concurrent measurement and guiding solution.

J5 = String Potentiometer INPUT (Position Feedback)
The input is usually 0-5V, but it could be 0-10V. (see section S.4.d)

J6 = Electric Actuator Input/Output (connector includes position feedback)
This is the connector for the electric actuator, it contains two pins for control output and three for position feedback.

Note: The potentiometer inside the actuator must be adjusted to output 2.5V when positioned at center stroke.

J7 = AC Power Input
This is where you connect power to the unit.
S.4.b Internal Connections

Relay Contacts (FAULT Relay)
The relay used in the Model GPX is rated at a maximum of 2 Amps at a maximum of 32VDC. Please do not connect AC power to the relay connections. The purpose of this relay is mainly to supply signals to PLC’s or other devices that will in turn control higher current operations.

The relay contacts for VIDEO FAULT are available to the customer inside the Model GPX processing unit, after removing the indicator driver board 3614015. See figure S.4-2.

NOTE:
All alarm devices must be installed outside the Model GPX box. AC Power brought into the box or run through the DC relays can cause electrical interference. Use external relays with proper noise suppression.

Figure S.4-2: Model GPX Fault Relay Output

Serial Ports
The Model GPX has two serial RS-232 ports, one for configuration and one for remote control of the front panel. The RS232 ports are located inside the Model GPX and can be accessed through the spare access hole located on the bottom panel, using the optional Serial I/O Harness. Contact Harris-Instrument Corporation to order.
S.4.c Front Panel Controls

The GPX may be controlled locally via the front panel buttons, as seen in the picture below.

The function of the buttons, left to right, are as follows:

**AUTO/MANUAL**

When the GPX is in AUTO mode, the system will produce a correction output signal with a duty cycle proportional to the magnitude of the position error. None of the other buttons will respond while in Auto, they will appear to not work. The operator may perform jog, auto zero, or auto center functions in Manual mode before switching to Auto. Press and release the button to switch between the two modes.

**JOG IN**

This button is used to manually move the mandrel or actuator in one direction. The system will jog until the user releases the button.

**JOG OUT**

This button is used to manually move the mandrel or actuator in the opposite direction of JOG IN. The system will jog until the user releases the button.

**AUTO ZERO**

After centering the mandrel or actuator, and positioning the strip, press and release Auto Zero to save the position of the strip. After switching to Auto, the GPX will automatically correct to maintain this position.

**AUTO CENTER**

Press and release this button to enter the Auto Center mode. In this mode, the GPX will use position feedback to move the mandrel or actuator to the center stroke position. Press and release the button again to exit this mode. To center the mandrel or actuator:

A) Switch to MANUAL. (press and release Auto/Manual until Manual is illuminated)

B) Turn on AUTO CENTER (press and release Auto Center, the box above the button will illuminate when ON)

C) Switch to AUTO (press and release Auto/Manual until Auto is illuminated)
After the mandrel or actuator is centered, switch to Manual BEFORE turning Auto Center OFF. You may then press and release Auto Zero to set the reference before switching back to Auto to guide the strip.

GUIDE A/B:
This press and release toggle button is similar to Auto/Manual except it toggles through three modes:

  Guide A: The GPX will guide to Sensor A. Any position change on Sensor B is ignored.
  Guide B: The GPX will guide to Sensor B. Any position change on Sensor A is ignored.
  Guide A-B: The GPX will guide to the centerline, calculated with data from both sensors

The box above the button will illuminate to indicate the mode.

Front Panel Button Disable

The indicator/input driver board has three jumpers for disabling the front panel buttons. (see picture) The jumpers, from left to right are as follows:

1. Auto Zero Button Disable
2. Guide A/B Button Disable
3. Disable all front panel buttons
**S.4.d Position Feedback Calibration**

The position feedback adapter board is used to scale the input from a string potentiometer, used for position feedback. When anchoring the string pot, allow enough room for the string to travel the entire range of the mandrel or actuator stroke. Before getting started, JOG the mandrel or actuator to center, or mid-stroke position.

1. Turn R1 (outlined in red) counter clockwise until you feel or hear clicks, the “clicks” are only slightly audible and may not be heard.

![Image of the position feedback adapter board with R1 highlighted]

2. Turn R10 (outlined in red) clockwise until it clicks.

![Image of the position feedback adapter board with R10 highlighted]

3. Turn R1 clockwise until the voltage at TP2 (arrow) is just below 2V. Refer to the picture in Step 1.

4. Turn R10 counter clockwise until the voltage at TP3 (arrow) is 2.5V. Refer to the picture in Step 2.
By default, the GPX expects the voltage on the position feedback to increase when the mandrel or actuator extends and decrease when the actuator or mandrel retracts. If you have the string pot mounted such that the opposite is true, you will need to set the jumper on the position feedback adapter board. The jumper is outlined in red below. **pin 1 is the left most pin** out of the three pins.

<table>
<thead>
<tr>
<th>Jumper Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Feedback voltage increases when mandrel/actuator extends</td>
</tr>
<tr>
<td>2-3</td>
<td>Feedback voltage decreases when mandrel/actuator extends</td>
</tr>
</tbody>
</table>

The polarity of the feedback voltage is unimportant when scaling the feedback. However, you must set the jumper for the correct polarity before attempting to guide.
S.4.e   GPX Setup Wizard

The Model GPX may be configured using the GPX Setup Wizard, which requires a host computer to run the user interface software. The user interface communicates with the GPX via RS-232 or USB. The two connections are outlined in red below. If an MPX is installed alongside the GPX, it may be used to configure the GPX.

1. Connect the USB or RS-232 cable to the GPX. If you are using USB, please disconnect power to the GPX micro board; see picture on right.

2. Open the GPX Setup Wizard by double clicking GPXSetupWizard.exe
3. Select the COM port to which you connected the GPX. If the COM port does not appear in the list, check to see if the GPX is connected to the host computer and restart the program.

4. Select the System Configuration, Scan Direction, and Emitter Size. See example below for a 10XAS system with 40 inch emitters scanning in.
5. If this is a 10XBR (Passline Independent) system, double click the Separation box to open the keypad.

6. Enter the Emitter-to-Receiver separation distance in inches and click Enter.
7. Click Program.

8. A message box will appear when programming is complete, usually a couple seconds after clicking Program.

9. The GPX is now configured. You may disconnect the serial cable and exit the Setup Wizard. Don’t forget to plug power back to the GPX micro board if you unplugged it to configure via USB.
S.5 Basic Operation

The Model GPX is very easy to operate. The basic operation goes as follows:

1. Center the mandrel or actuator by following these steps:
   - A. Press Auto/Manual on the front panel to place the GPX in Manual mode.
   - B. Press Auto Center button on the front panel to turn on Auto Center mode.
   - C. Press Auto/Manual button on the front panel to place the GPX in AUTO mode.
   - D. After the mandrel or actuator is centered, place the GPX back in MANUAL mode.
   - E. Press the Auto Center button on the front panel to turn off Auto Center mode.

2. Position the strip over the sensors and press Auto Zero to save the reference position.

3. Press Auto/Manual to place the GPX in AUTO mode.

To stop guiding, place the GPX in MANUAL mode. You may increase or decrease the minimum duty cycle of the correction output signal by adjusting the GAIN potentiometer, pictured below. If the system is slow to correct the strip position, turn the gain knob clockwise; make small adjustments. Apply only enough gain to maintain the strip position, too much gain may have a negative effect.
S.6 General Maintenance

All SCAN-A-LINE™ processing computers are highly reliable and tolerant to most industrial environments. Maintenance of the Model GPX after installation is extremely limited. Since there are no moving parts in the Model GPX, there is nothing to lubricate. If any form of maintenance is performed on the line near the Model GPX, be sure to disconnect all cables from the unit.

NOTE:
If welding is to be performed anywhere on the process line where the Model GPX is installed, disconnect ALL cables from the Model GPX. This prevents a system overload (and associated damage) from the current generated by the welding.

The only typical maintenance for the Model GPX processing computer is:

1) Check all cable connections. All connections should be snug.
2) Make sure all cables are free of cuts, nicks, or crimps. Replace cables if they are damaged.
3) Check power connections and insure that power is available to the unit.
4) Check all mounting fixtures. Tighten if necessary. In high vibration environments, mounting plates can vibrate loose. If vibration is still causing problems, simple vibration dampening can solve most vibration interference.

NOTE:
Damaged cables can cause serious damage to the entire Guiding System. Repair or replace damaged cables as soon as the damage is discovered to prevent voiding the system warranty.

S.7 Troubleshooting

The following procedures are designed to isolate faulty components in systems that are installed and have been operating properly. This section only covers component or major assembly level trouble shooting. Subassembly or board level trouble shooting is NOT RECOMMENDED with SCAN-A-LINE™ equipment and may VOID THE WARRANTY. For installation problems, see the installation portion of this manual, or contact your SCAN-A-LINE™ representative or Harris Instrument Corporation Service Department for more information.

CAUTION:
To avoid personal injury and damage to the equipment, remove 117VAC (or 220VAC if applicable) power line from the processing computer BEFORE performing any maintenance or tests on the system.

S.7.a Preliminary Inspection

1) Begin with a thorough visual inspection of the system under test. Before testing for circuit malfunctions, ensure the power switch is ON and that power is supplied to the system.
2) Verify that the emitter and receiver lenses are unbroken, reasonably clean, and free of foreign material. Cracked lenses, excessive dirt, and foreign material on the lens can cause the system to perform invalid corrections.
3) Examine all cables for cuts, nicks, or crimps that could cause open or short circuits. Ensure that all connectors are secure and free of foreign material.

NOTE:
Caution should be taken when replacing possibly defective components with known good spares. Serious damage may occur to the known spares, as well as other components of the system. If there are any doubts about the condition of a spare, or the malfunctioning system, please contact Harris Instrument Corporation Service Department for assistance.

S.7.b Diagnostic Indicators
This section details the diagnostic LED indicators located inside the Model GPX enclosure.

1) When the diagnostic indicators are functioning properly:
   a) The +12VDC, -12VDC, and +5VDC indicators should be fully lit when power is turned on to the unit.

2) No diagnostic indicators are lit.
   This condition may signal a short circuit somewhere external from the processing computer or may indicate a major malfunction in the processing computer itself.

   a) Disconnect the emitter cable(s) and remove power from the processing computer. Check the AC input fuse located inside the Model GPX case on the power supply (Figure S.3-1 pg. 5). If the fuse is blown, replace it with a new fuse of the same type and rating. Restore power and reconnect the system in the following steps:
      1) Connect just the emitter cable to the Model GPX. The +12V, -12V, and +5V indicators should be fully lit. If not, the cable is defective.
      2) Now connect the emitter to the emitter cable. The +12V, -12V, and +5V indicators should be fully lit. If some or none are not fully lit, then the emitter is malfunctioning.
      3) Finally, connect the receiver cable to the emitter. The +12V, -12V, +5V should be lit.

   If the fuse is not blown, either the system power supply, sensors, or one of the boards in the GPX is malfunctioning. Contact Harris Instrument Corporation Service Department for more assistance.
3) Video Fault Indicators:

The LED indicators should be off during normal operation.

One or more of the LEDs may turn on to indicate the following conditions:

- **A1** = there are too few edges detected on Sensor A. This is usually the result of misalignment. If the strip is present and the system is not misaligned, the sensors may need balanced. Contact Harris-Instrument Corporation Service Department for assistance.

- **A2** = there are too many “edges” on Sensor A. The sensor is seeing more than the expected number of edges. This is usually the result of dirt or debris on the emitter glass. Broken or damaged emitter glass also causes this type of fault.

- **B1** = there are too few edges detected on Sensor B. This is usually the result of misalignment. If the strip is present and the system is not misaligned, the sensors may need balanced. Contact Harris-Instrument Corporation Service Department for assistance.

- **B2** = there are too many “edges” on Sensor B. The sensor is seeing more than the expected number of edges. This is usually the result of dirt or debris on the emitter glass. Broken or damaged emitter glass also causes this type of fault.
S.7.c  Issues Known To Degrade System Performance

The following list describes possible reasons for a malfunctioning system.

- Misalignment may cause false edge detection. Be sure to mount the System according to the layout drawing provided with your system.
- The system optics should be free of debris. If there is excessive dirt or dust in the sensor area, appropriate air knives should be installed.
- Sensor(s) and lenses should be cleaned and checked at least once per shift.
- Primary to the translucent materials gauge, the edges of the material should be smooth. Ragged edges, folds, and wrinkles in the strip can cause false edge detection.
- The distance from the emitters to the strip must be even. If one side of the strip is different by 0.5 inch, the system may have trouble establishing the correct edge position.
- All alarm devices must be installed outside the Model GPX box. AC power brought into the box or run through the DC relays can cause electrical interference. Use external relays with proper noise suppression.
- Flashing lights or strobe lights in the immediate area may cause false edge detects. Some solutions are available. Please contact Harris Instrument Corporation Service Department for further assistance.

S.8  Related Drawings

The following pages contain Various drawings for the Model GPX. For drawings of other configurations, please contact Harris Instrument Corporation.

<table>
<thead>
<tr>
<th>Drawing #</th>
<th>Description</th>
<th>Drawing Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model GPX Dimensions</td>
<td></td>
<td>AutoCAD LT Rel. 3</td>
</tr>
<tr>
<td>Model GPX Interior View</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table S.8-1: Drawing Information*