# ST-261 & ST-262 Manual

**Notice:**

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# Model ST-261 & ST-262 User's Manual

# Atlantek Publication No.: 753027 Rev 4

## Printing History:

Rev 1: First release.

Rev 2: - Fixed errors in documentation of the data interface, Chapter 5.
-Added Esc 140 & Esc 141 Commands, Table 4

Rev 3: -Revised Chapter 5, Section 2, Plot Mode
-Removed Chapter 7, Sections 5 –9 and 11

Rev4: -Revised Chapter 5 Sections 1 & 2



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## Regulatory Notices

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept interference received, including interference that may cause undesired operation.

**Warning:** Changes or modification to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits of a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.


## Acknowledgements

"Versatec" is a trademark of Xerox inc.
"Wetordry" is a trademark of 3M Inc.


## References


IEEE Std 1284-1994, ***Standard Signaling Method for a Bidirectional Parallel Peripheral Interface for Personnel Computers***
Versatec™, ***Electrostatic Printer/Plotter Interface Specifications, Bulletin No. 312***, September 1977
Versatec™, ***V-80 Series Electrostatic Printer/Plotter Specifications, Bulletin No. 470***, December 1979


## Warranty

Atlantek, Inc warrants its products to be free of defects in material and workmanship under normal use conditions for a period of one (1) year commencing the date of shipment from its factory. Given notice and upon confirmation of such defects, Atlantek will, at its option, either repair or replace the defective product.

#### Exclusions

This warranty does not apply to defects resulting from: improper or inadequate maintenance by customer; misuse, abuse, alteration; unauthorized or improper service; operation outside the specified environmental range; improper shipping or installation; and use of unqualified media. This warranty does not apply to normal wear items such as friction pads, belts, and platen.

The thermal printhead is warranted for a period of one (1) year with prorated replacement based upon the actual percentage of normalized printhead life utilized. The printhead carries a normalized life of 50 kilometers (31 miles, approximately or approximately 394,000,000 dot lines) of media passed under the printhead. When reporting a printhead failure, the customer must provide the "Line Count" readings from the plotter diagnostic printout or from the Virtual Control Panel display, the model number, and unit serial number. Procedure for reading these counts and parameters is described in this manual (see Section 8.7) Prorated printhead replacement during the original warranty is based upon the following schedule

| Distance run – based upon displayed Line Count | Allowance for defective printhead: |
|---|---|
| 0 to 24.9 km | 100% |
| 25.0 to 49.9 km | 75% |
| 50.0 to 74.9 km | 30% |
| 75.0 km or more | no allowance |

The above warranty shall not apply to the thermal printhead used in the plotter when the thermal printhead has been judged to have been damaged by improper cleaning, or operated with improperly dried media.

**Warranty Limitations**
Atlantek makes no other warranty, either expressed or implied, with respect to this product. Atlantek specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Atlantek will not be liable for any special, indirect, incidental or consequential damages or loss, including loss of data from failure of the product. Some states or provinces do not allow limitations on the duration of an implied warranty, so the above limitations may not apply to you. However, any implied warranty of merchantability or fitness is limited to the one-year duration of this written warranty.

**Claims Procedure**
If an Atlantek plotter should fail, follow the instructions in the Troubleshooting section within this manual. Atlantek provides on-site service in some areas. Consult Atlantek regarding on-site service arrangements in your area. If the customer is located outside a defined on-site service region, the customer should contact Atlantek customer service to be assigned a return-to-factory authorization (**RA**) number. When calling customer service, be prepared with the full unit(s) model number(s), serial number(s) and nature of the problem(s). Under this RA#, the nature of the reported problem is documented, and Atlantek authorizes receipt of the incoming defective plotter. This RA# must be prominently noted on the outside of the shipping package of the product returned for service. The defective product is to be shipped freight-prepaid to Atlantek's address (given below). Atlantek will repair or replace the defect within 30 days and return it freight-prepaid to the customer.

If a defective part or subassembly is returned for repair or replacement, the same RA# procedure is followed. The defective part or assembly is returned freight-prepaid to Atlantek. Atlantek will repair or replace the item, normally within 2 business days and return it freight pre-paid to the customer. To minimize time out of service, the customer may elect to order the part or assembly with a purchase order. Atlantek will ship and invoice for the part or assembly, and will issue a credit to the customer upon receipt and confirmation of the defective part fault at its factory.

Telephone and freight address information for Atlantek, Inc. is as follows:

Atlantek, Inc.
10 High Street,
Wakefield, RI 02879
USA
Tel: (401) 783-5700, Fax: (401) 783-9881

Claims for shipping damage must be made by the customer to the carrier. The customer should thoroughly inspect the product immediately upon original delivery and, if damaged in any way, should file a claim with the carrier. Atlantek will, upon request, provide a quote to repair shipping damage.

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# 1. Introduction

## 1.1 Scope

This manual contains information necessary to install and operate the Gulton Model ST-261 Wellogger$^{R}$ Thermal Plotter.

This manual is intended for use by the operator and service personnel. However, only qualified service personnel should be allowed to install and service this equipment.

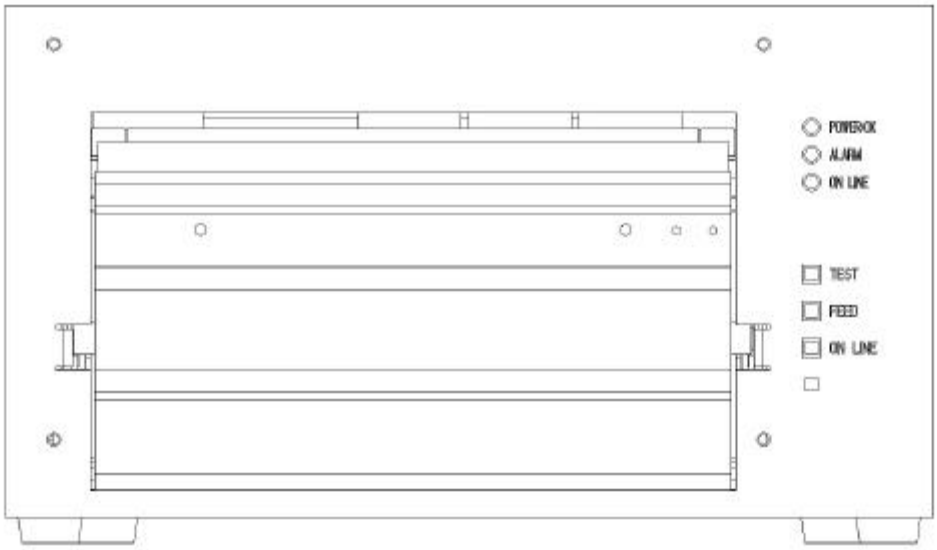


**Figure 1 - Gulton ST-261 Wellogger**

## 1.2 Product Overview

The Model ST-261 plotter is a direct-thermal type utilizing both continuous roll and fan-fold format thermally sensitive media of 8.75 inch width. The plotter uses a precision thermal printhead with elements spaced 1/8 millimeter (0.00492 inch) at 8 dots per millimeter (203 dots per inch). The plotter interface is compatible with IEEE 1284 parallel ports of PC compatible computers using the Atlantek supplied Windows drivers.

The plotter supports raster graphics data.

### 1.3 Media

Good quality media is essential for obtaining acceptable imaging performance. Atlantek maintains a stock of recommended media, which will assure top performance, as outlined in Section 9.1. However, if you do not buy your media from Atlantek, we caution you to specify media with low abrasivity and moisture content to attain maximum printhead life.

The Model ST-261 plotter requires roll media 8.75 inches wide, wound coated side out on 0.450 inch inside diameter core, or 8.75 inch wide fan-fold paper with 6.25-inch folds.

### 1.4 Maintenance

The plotter normally should not require any periodic maintenance except for periodic cleaning of the thermal printhead dot line and blowing out any accumulated dust. Information specific to this task is outlined in Section 4.3. This shall be necessary when the plotted output exhibits an insufficient blush characteristic in localized positions. Cleaning the printhead more often than every 10 rolls of media is a sign that substandard media is in use.

### 1.5 Safety

Personnel installing, operating, and maintaining the plotter should be thoroughly proficient in the installation, operation, maintenance, and service of the plotter. To their safety, and the safety of operator and maintenance personnel, basic precautions follow. These should be reviewed to promote safety awareness.

General

- Wear safety shoes, glasses, and gloves when uncrating the equipment.
- Wear safety glasses when maintaining or servicing the equipment.
- Beware of sharp edges, pinch points, and exposed staples when uncrating.
- Observe all warning and cautions, stated or implied, in the procedures.

Mechanical

- Unless specifically instructed otherwise, do not operate the equipment with the covers or access panels removed.
- Keep fingers, hands, and tools clear of moving parts.
- Route cables properly to eliminate tripping hazards.

Electrical

- When disconnecting the power cord, tag the prongs of the plug to prevent anyone from restoring the electrical power.
- Do not defeat or bypass built-in equipment safety features.
- Replace electrical components with units of equal rating and capacity.
- If any panel, cover, or guard must be removed for a given electrical adjustment or check, extreme caution shall be exercised to prevent personal injury. Wear insulated gloves when access to energized electrical components becomes necessary.

## 2. Specifications

| | |
|---|---|
| Package Configuration: | |
| | Desktop<br>19” EIA Rack Mount<br>Portable case with carrying handle |
| Dimensions: | |
| Desk top | 12.5”W x 7”H x 9.75”D |
| Rack Mount | 19”W x 7”H x 9.75”D |
| Weight: | 20 pounds, approx. |
| Environmental: | |
| Operating Temperature: | -5 $^0$C to +40 $^0$C |
| Operating Humidity: | 20% to 80% R.H., non-condensing |
| Storage Temperature: | -30 $^0$C TO +50 $^0$C |
| Storage Humidity: | 20% to 80% R.H., non-condensing |
| Vibration: | 2.5g RMS, 5 minutes, each axis |
| Shock: | 20g, 9 ms, 45 Hz crossover, 3 times each axis |
| AC Power: | |
| Operating Voltage: | 88 – 132 Vac, 47 - 63 Hz<br>170 – 264 Vac, 47 - 63 Hz, switch selected. |
| Power Consumption: | 200 W max. |
| Data Interface: | |
| Parallel: | IEEE 1284-II compliant high-speed parallel port,<br>Versatec Single ended or Differential, Optional |
| Serial: | RS-232 configuration port. |
| Data Transfer Rate: | |
| Parallel: | 2 Megabytes/second burst in ECP Mode.<br>125 kilobytes/second burst in Centronics Compatible Mode. |
| Serial: | 57,600 baud |
| Output Speed: | ST-261H, Up to 4 inches/second, mode and media dependent.<br>ST-261S, Up to 2 inches/second, mode and media dependent. |
| Chart Advance Accuracy: | ST-261H, +/- 0.5% with film media after calibration.<br>ST-261S, +/- 2.0% |
| Resolution: | 8 dots per millimeter (203 dots/inch) in printhead axis<br>200 steps per inch in chart paper axis |
| Active plot/print span: | 1728 dots over 216 mm (8.50 inches) |
| Front Panel Controls: | Test<br>Feed<br>Online |

| | |
|---|---|
| Front Panel Indicators: | Power On / Busy<br>Alarm<br>On Line |
| Firmware Upgrades: | In circuit flash programming. |
| Software: | ST Control, Windows 95/98/NT application allowing for easy Plotter Setup & Firmware Upgrades (Beta) via the serial port (Virtual Control Panel). |
| Drivers: | Windows NT 4.0 Driver, Windows 95/98 Driver |
| Regulatory Approvals: | FCC Class A |
| Recommended media: | Thermal Sensitive Paper or Synthetic Roll media, 8.75 inch (22.22 cm) wide by 3.00 inch (8.89 cm) max. diameter, wound coated side out on 0.45 inch (1.14 cm) I.D. core,.<br>Fan-fold media, 8.75 inch (22.22 cm) wide by 3.00 inch (8.89 cm) max. pack height, with 6.25 inch (15.88cm) folds |
| Accessories: | Versatec Interface, available. |

## 3. Installation

The general procedure for installing the equipment consists of unpacking, inspecting, moving, installing and checking. The instructions and safety recommendations set forth in Section 1 constitute a prerequisite to these instructions.

### 3.1 Receiving Inspection

The plotter was carefully inspected and tested prior to shipment. Upon its arrival, inspect the crate or carton for damage. Unpack the plotter as soon as possible to conduct a thorough examination of the unit and its components for hidden damage. Do this in the presence of the carrier if at all possible. If damage is noted, take photographs of the damaged portions and immediately file a claim with the carrier. If the carrier is not notified within 15 days of delivery, it cannot be held responsible.

Information on installation of any accessories or options, if ordered, is given in Section 9 – Accessories.

Consult the following Sections 3.2 through 3.4 for requirements to be considered before operating the plotter. Section 4 should be followed for basic operator information prior to placing the plotter in service.

### 3.2 Line Power Input Requirements

This equipment is provided with a power supply that requires switch selection of the input voltage for either a nominal 110 Vac or 220 Vac.

**WARNING**
***Applying 220 Vac with the selector in the 110 Vac position may damage the unit and void the warranty.***

The plotter is supplied with a 6-foot (183 cm) appliance line cord with a plug suitable for use in North America for 115 V ac operation. Similar cords are available for use in other countries.

### 3.3 Line Voltage Selection

Line voltage selection is by means of a slide switch on the bottom of the unit. The plotter is shipped with the voltage selector set for 110 Vac or 220 Vac as specified on the purchase order. Before first use, check the voltage label on the rear panel for suitability in your application. If this not correct, change the voltage setting then set the switch for the desired voltage and affix the correct power input label to the rear panel, next to the power-input connector, or write the selected voltage on the existing label with an indelible marker.

### 3.4 Data Interface Configuration

The standard plotter input conforms to the IEEE 1284-1984 standard utilizing an IEEE 1284-C miniature 36-pin ribbon type connector. A secondary RS-232 input utilizing an RJ11 telephone type connector is used for configuration of the plotter.

## 4. Basic Operation and Controls

This section describes the user-accessible controls and indicators used on the plotter and describes basic operating procedures. It is recommended that the operator read this section in its entirety before performing any procedure.

### 4.1 Printhead Lift Mechanism

In order to facilitate media loading, a printhead lift mechanism is implemented which is automatically actuated when the paper compartment door is opened. The printhead may be cleaned when the head is lifted. The printhead automatically lowers to contact the print media when the paper compartment door is closed and latched.

### 4.2 Printhead Cleaning

The printhead does not require frequent cleaning with normal usage. Occasionally deposits may build up on the printhead, which hinders effective heat transfer to the thermal media, and can result in poorly defined images. This is usually a sign of low-grade media in use.

Should it become necessary to clean the printhead, open the front door, which raises the printhead. The thermal elements are approximately 0.6 inch (15 mm) back from the edge of the printhead carrier block. Use cotton cloth gauze, cotton tipped swab, or clean rag (make sure there are no metal fragments on it!) soaked in isopropyl alcohol. Work the cloth sufficiently to bear upon the thermal elements, and then wipe the printhead laterally while applying upward pressure. Difficult cases may require persistent cleaning action.
For very stubborn deposits, 3M Wetordry™ Model 3M 281Q polishing paper (US Mesh: 6000) is a durable material which may be used with isopropyl alcohol to enhance cleaning action.

If it is found necessary, wrap the cleaning material around of a wooden cleaning stick, or equivalent implement. This may be of assistance in scrubbing the dot line.

Note: The recommended cleaning stick is an ordinary wooden tongue depressor, 1/16 inch (1.6 mm) minimum thickness, available through most pharmacies or medical equipment suppliers,

Caution: The thermal printhead is a fragile ceramic substrate containing active electronic circuits. Use extreme care to avoid damage when cleaning or servicing. Never use metal objects to clean the printhead dot line, as this can easily damage it. Do not insert any implement thinner than 1/16 inch (1.6 mm) between the printhead and platen since this may damage circuitry along the bottom surface of the printhead. The warranty does not cover printheads that are damaged by misuse.

After cleaning, allow 1 to 2 minutes for the alcohol to dry before reloading media.

**4.3 Loading Media** (refer to Figures 2, 3 and 4)

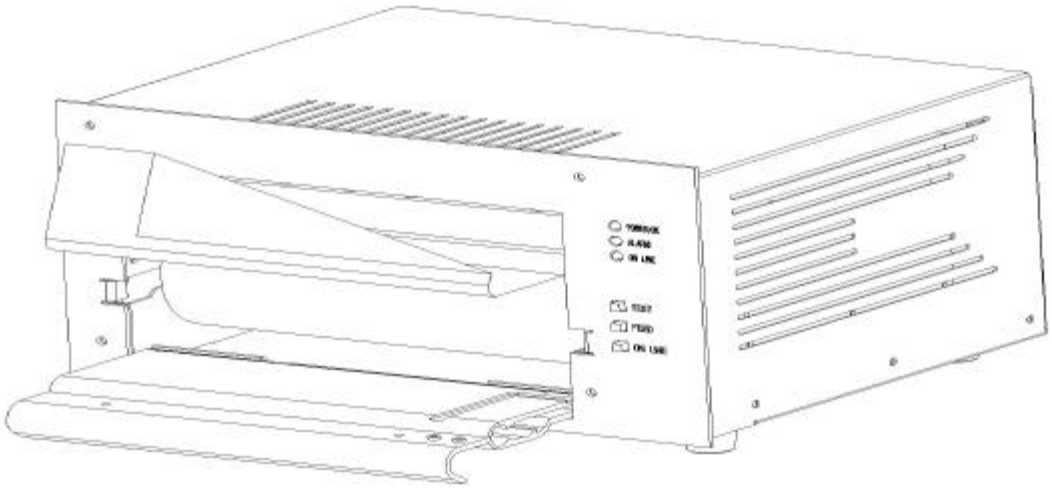

**Figure 2 – Internal Roll Media Threading Path (right-hand Side View)**

1. Open the plotter chart paper compartment door by pulling the top edge out and down.
2. Identify and install the correct thermal media.
3. Orient the roll so that the loose end comes off the top of the roll.
4. Insert the mandrel core into the roll. If the roll mandrel is not inside the paper compartment, remove it from its storage place provided in the door.
5. Insert the roll with mandrel straight into the paper compartment with the mandrel ends sliding into the appropriate slots until the mandrel clicks into place. Placement is correct if the roll is evenly parallel to the front of the plotter and the door can be closed without interference.
6. Grasp the media web free end at the sides with the coated (outside of roll) surface down and the end facing away from the operator. Insert the free end into the slot below the rubber drive platen and into the paper guide chute. (It may facilitate the loading of paper media to fold the end over sideways to create a pointed end). While inserting the web, watch for the end to emerge from the plotter on the top surface of the platen, in the slot between the plotter platen and printhead. It is sometimes helpful to laterally shift the web while inserting it or to insert it at a slight oblique angle. If the plotter is operational, it may facilitate threading to trigger platen rotation by momentarily pressing the **PAPER FEED** key, as described in Section 6.4.2.
7. When the free end has emerged above the platen, grasp it and pull it through approximately 1 to 2 feet (30 to 60 cm). Draw the web down to the supply roll and attempt to align the edges of the outfeed portion of the web laterally with the supply roll.
8. If the web is not square through the mechanism, it can be shifted to achieve this by momentarily relaxing manual tension on the web and then centering the web with a quick pull laterally near the platen.
9. Close the paper compartment door. This will lower the printhead providing pressure for frictional feed of the paper by the drive platen.
10. Move the media by momentarily pressing the **PAPER FEED** key. Check that the media rides tightly and with minimal wrinkles. This is important for print quality and because excessive wrinkles can cause inadvertent tripping of the Media-Out sensor, which is located on the inside face of the media compartment door. It may be necessary to repeat steps 8 and 9 until the media is square through the mechanism.

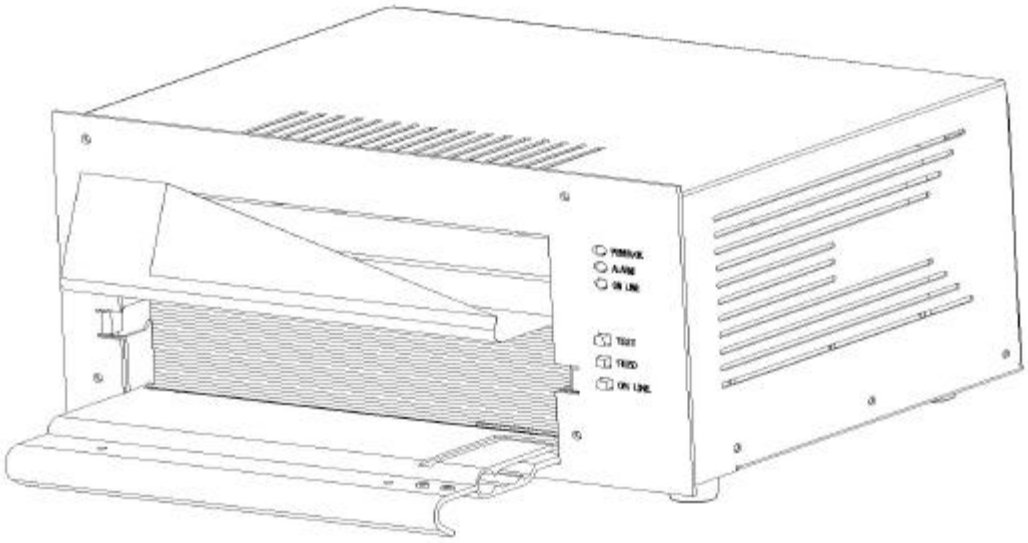

**Figure 3 – Internal Fan-fold Media Threading Path ( right-hand Side View)**

1. Open the plotter chart paper compartment door by pulling the top edge out and down.
2. Identify and install the correct thermal media.
3. If the roll mandrel is inside the paper compartment, remove it by pulling it straight out. Store it in place provided in the door.
4. Orient the fan-fold paper pack so that the loose end comes off the top of the pack away from the operator with the coated surface down. The bottom of the pack has a red stripe on the last several pages. If the red stripe is on top of the pack, the pack is upside down. Turn it over.
5. Insert the pack straight into the paper compartment.
6. Grasp the media web free end at the sides with the coated surface down and the end facing away from the operator. Insert the free end into the slot below the rubber drive platen and into the paper guide chute. (It may facilitate the loading of paper media to fold the end over sideways to create a pointed end). While inserting the web, watch for the end to emerge from the plotter on the top surface of the platen, in the slot between the plotter platen and printhead. It is sometimes helpful to laterally shift the web while inserting it or to insert at a slight oblique angle. If the plotter is operational, it may facilitate threading to trigger platen rotation by momentarily pressing the **PAPER FEED** key, as described in Section 6.4.2.
7. When the free end has emerged above the platen, grasp it and pull it through approximately 1 to 2 feet (30 to 60 cm). Draw the web down to the supply pack and attempt to align the edges of the outfeed portion of the web laterally with the supply pack.
8. If the web is not square through the mechanism, it can be shifted to achieve this by momentarily relaxing manual tension on the web and then centering the web with a quick pull laterally near the platen.
9. Close the paper compartment door. This will lower the printhead providing pressure for frictional feed of the paper by the drive platen.
10. Move the media by momentarily pressing the **PAPER FEED** key. Check that the media rides tightly and with minimal wrinkles. This is important for print quality and because excessive wrinkles can cause inadvertent tripping of the Media-Out sensor, which is located in the inside face of the paper compartment door. It may be necessary to repeat steps 8 and 9 until the media is square through the mechanism.

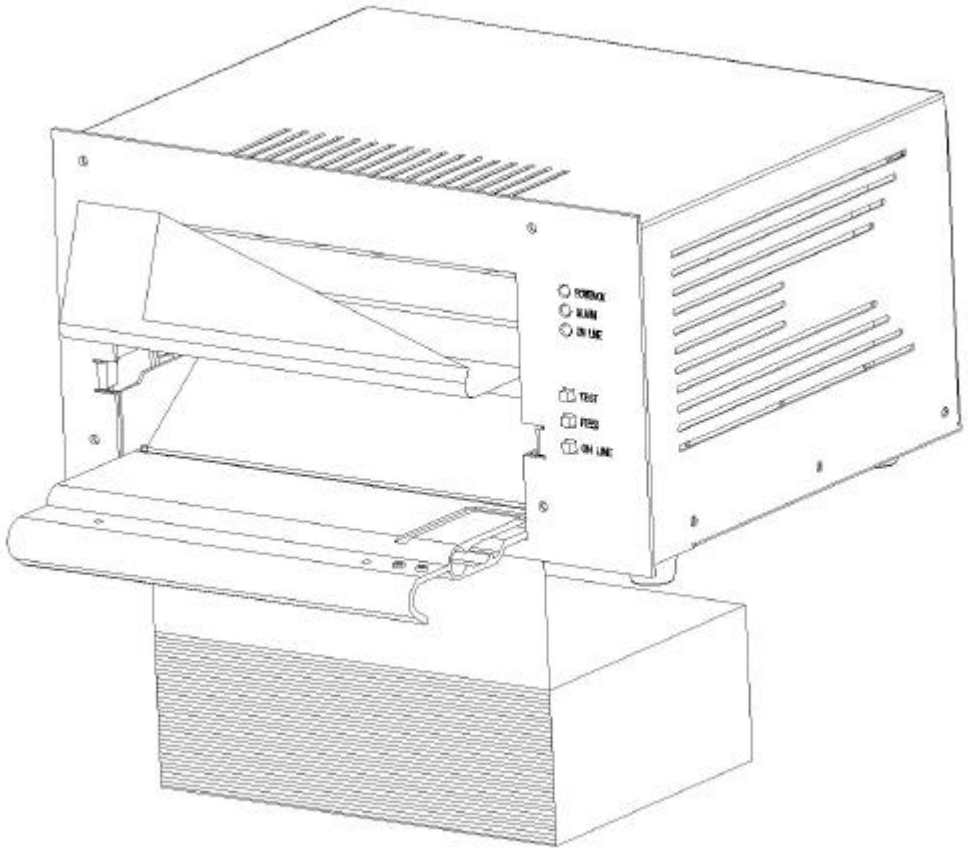

**Figure 4 – External Fan-fold Media Threading Path ( right-hand Side View)**

1. Open the plotter chart paper compartment door by pulling the top edge out and down.
2. Identify and install the correct thermal media.
3. If the roll mandrel is inside the paper compartment, remove it by pulling it straight out or remove it from its storage place in the door.
4. Orient the fan-fold paper pack so that the loose end comes off the top of the pack away from the operator with the coated surface down. The bottom of the pack has a red stripe on the last several pages. If the red stripe is on top of the pack, the pack is upside down. Turn it over.
5. Insert the pack straight into the external paper compartment or shelf below the printer.
6. Grasp the media web free end at the sides with the coated (outside of roll) surface down and the end facing away from the operator. Insert the free end up into the in the bottom of the printer between the paper door and the printer base plate, and then into the slot below the rubber drive platen and into the paper guide chute. (It may facilitate the loading of paper media to fold the end over sideways to create a pointed end). While inserting the web, watch for the end to emerge from the plotter on the top surface of the platen, in the slot between the plotter platen and printhead. It is sometimes helpful to laterally shift the web while inserting it or to insert at a slight oblique angle. If the plotter is operational, it may facilitate threading to trigger platen rotation by momentarily pressing the **PAPER FEED** key, as described in Section 6.4.2.
7. When the free end has emerged above the platen, grasp it and pull it through approximately 1 to 2 feet (30 to 60 cm). Draw the web down to the supply pack and attempt to align the edges of the outfeed portion of the web laterally with the walls of the paper compartment.
8. If the web is not square through the mechanism, it can be shifted to achieve this by momentarily relaxing manual tension on the web and then centering the web with a quick pull laterally near the platen.
9. Install the paper mandrel in its slot. This will push the paper back inside the paper compartment so that the paper wraps around behind the mandrel.

10. Close the paper compartment door. This will lower the printhead providing pressure for frictional feed of the paper by the drive platen.
11. Move the media by momentarily pressing the **PAPER FEED** key. Check that the media rides tightly and with minimal wrinkles. This is important for print quality and because excessive wrinkles can cause inadvertent tripping of the Media-Out sensor, which is located in the inside face of the paper compartment door. It may be necessary to repeat steps 8 through 10 until the media is square through the mechanism.

### 4.4 Front Panel Indicators and Controls

This section describes the function of front panel indicators and keys in the basic Online and Offline operational states. A detailed discussion of these features as they relate to all operational states is given in Section 6 – Operational States.

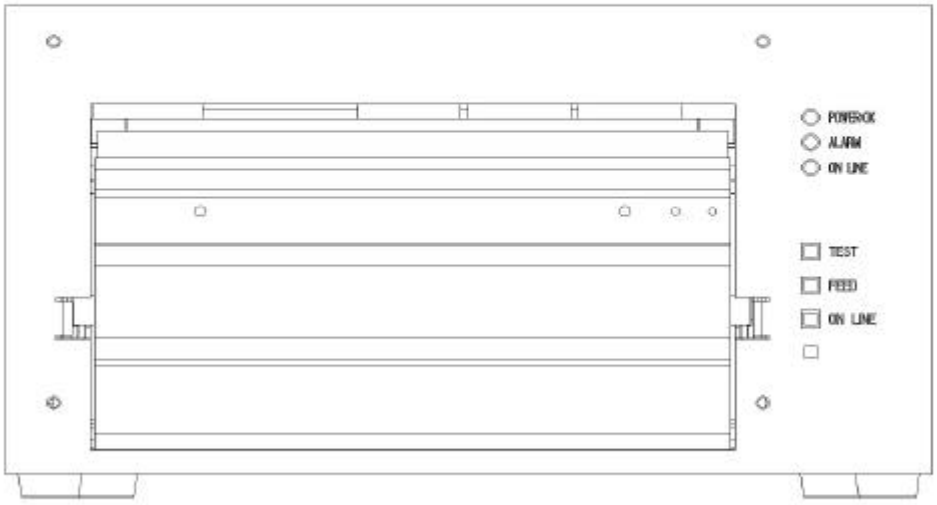


**Figure 5 – Front Control Panel Layout**

#### 4.4.1 Pushbutton Keys

- **ONLINE** – Pushbutton key that toggles the unit's status between Online and Offline. Online state activates the plotter data interface and disables PAPER FEED and SELF-TEST controls. Offline State disables the plotter data interface and enables these controls.

- **FEED** -- Pushbutton key that when pressed and held, produces continuous media feed until released. Alternatively, a momentary key press produces a Form Feed equivalent media advance. This function operates only when the plotter is Offline.

- **TEST** – Pushbutton key which when given a momentary press, triggers output of the configured Test pattern. This function operates only when the plotter is Offline. It allows an easy user check on plotter functions without requiring connection to a host system. When the key is pressed and held for greater than two seconds, a Chart Calibration Test is triggered. See Section 7.15 – Chart Calibration. Pressing this button while test plotting cancels the plot.

#### 4.4.2 Indicator Lamps

- **POWER / OK** – Green lamp which when lit indicates the presence of the +5 volt logic power and functioning of the internal logic, thus indicating that the plotter power is On and functioning OK. This lamp will also blink to indicate that the plotter is busy.

- **ONLINE** – Amber lamp, which when lit, indicates that the plotter is in the Online state, suitable for host interface driven operation.

- **ALARM** – Red lamp, which lights when any condition is sensed that prevents normal operation and could require corrective action by the operator. Usually this would result from a mechanical fault detected through one of the sensors. The alarm condition is reported through the Windows driver and through the serial configuration port. Generally speaking: paper out, door open or high or low print head temperature will stimulate this error.

### 4.5 Rear Panel Functions

- **Line Power Connector** – IEC-type line input connector. Attach the proper line cord for intended installation.

- **Data Input Connector** – IEEE 1284-C miniature 36-pin ribbon connector for parallel data interface. A standard IEEE 1284 cable may be used with appropriate termination connector for host computer.

- **Configuration Connector** – RJ11 6-pin telephone style connector for serial interface to virtual control panel.

- **POWER** – Switch which controls the AC power to the plotter.

### 4.6 Protective Sensors and Operator Interaction

The plotter is equipped with optical sensors that serve to protect the internal components and to provide useful prompts to the user when the plotter is not in an operable condition. The function of these may have an impact on everyday usage of the plotter.

#### 4.6.1 Printhead Lift and Door Open Sensor

As outlined above, the plotter is equipped with a printhead lift mechanism, which is activated automatically by opening the paper compartment door. The printhead must be engaged in the print position whenever the printhead is activated. This prevents damage to the printhead from improper heat sinking of the dot elements when energized in free air.

To ensure that the printhead is properly engaged, a flag on the printhead lift mechanism reflects a light beam of a reflective type optical sensor. As soon as the printhead moves out of the fully engaged position, the sensor activates circuitry that disables plotting and chart advance. The **ALARM** lamp shall light, and the host computer is notified.

In order to restore the plotter to an operational condition, simply close the chart compartment door. The alarm should then clear, and the plotter shall be in an Offline state. The plotter can then be placed Online if desired by using the **ONLINE** front panel key.

### 4.6.2 MediaOut / TOF Sensor

A media-out sensor is provided to protect the printhead and mechanism from unnecessary wear and to alert the operator in the event that media is consumed. The sensor is an infrared reflective LED device and is mounted on the rear surface of the media compartment door facing the lower lip of the extruded media chute. The sensor is directed inward such that it detects the presence of media as it wraps around the media chute. When this reflective surface is lost, as happens when media is consumed, plot and media advance are disabled. The **ALARM** lamp shall light, and the host computer is notified.

This condition shall be encountered should the plotter be powered up with no media installed. No harm can result from this. In order to restore the plotter to an operational condition, install media. When the media-out sensor detects an adequate reflective surface, the alarm should clear, and the plotter shall be in the Offline State. The plotter can be placed Online by using the **ONLINE** front panel key.

## 4.7 Initial Power-Up

After the proper media has been loaded, apply AC power by setting the power switch to the On position.

The Front Panel **POWER** indicator should illuminate to indicate that power has been applied. At this time, the **ALARM** indicator may come on and the **POWER** indicator blinks to indicate that the plotter is busy as the unit initializes. The initialization process can take several seconds and allows the machine to perform internal diagnostics.

Once initialized, the unit will normally enter the Online state (**ONLINE** indicator on) and **ALARM** indicator should be off. The **POWER** indicator should light steadily. Take the unit to the Offline State (**ONLINE** indicator off) by pressing the **ONLINE** pushbutton. Press the front panel **PAPER FEED** pushbutton to verify normal media feed.

After the media feed function has been verified, press and release the **TEST** pushbutton within one half second. Do not hold the button in or a calibration test plot will be printed instead. Check the self-test printout to be sure the self-test pattern prints properly. The self-test pattern will be one of the available patterns outlined in Section 7.2 – Test Pattern Selection. The default test pattern is a “Grid”, and this pattern should appear upon actuation of Self-Test until the plotter is configured differently by the user. This pattern verifies proper internal data manipulation and print consistency.

Connect the data interface to the plotter via the data connector on the rear panel of the unit. Connect the configuration serial interface cable to the RJ11 connector on the rear panel of the unit. Press and release the front panel ONLINE pushbutton to put the unit back to the Online State. The illuminated ONLINE indicator confirms the Online State.

Use a Windows program with the Gulton/Atlantek Windows driver to verify normal plotter operation.

## 5. Data Interface

The following information is intended for the system integrator, programmer, installers, and service personnel to assist in configuring the host system used with the plotter.

The plotter is an 8 dot/mm (203 dot/inch, approx.) unit capable of plotting in excess of 2 inches per second (50 mm per second) in the plot (raster data) mode. The plotter can operate either as a plotter or, using the internal character generator, as a printer. In the plot mode it has a width capacity of 216 bytes (1728 pixels).

The ST-261 plotter is an IEEE 1284-II compliant device designed to the IEEE Standard 1284-1994 document. The plotter supports the IEEE 1284 Compatibility mode, Nibble mode, and ECP mode.

### 5.1 Parallel Interface

IEEE Parallel Mode Negotiation

The parallel interface is designed to be compliant with IEEE Standard 1284-1994 and is capable of supporting Compatibility, Reverse Nibble, Reverse Byte, and ECP modes. With some hosts, it is preferable that the plotter refuse negotiation to modes other than Compatibility Mode. For maximum flexibility, the plotter supports two modes in this regard. The current state is denoted within the parameter printout performed by the plotter at power-up (if so enabled by Configuration) or upon either Serial or Parallel control command. The line of interest will indicate one of:

```
" Parallel Port: P1284 Negotiation Enabled "
" Parallel Port: Restricted to Compatible Mode Only "
```

As of plotter firmware revision 2.03, this mode is stored in non-volatile configuration storage. It may be changed at by pressing and holding the front panel FEED button as the plotter is powered up. Hold the FEED key until the front panel indicator lamps begin to flash, then release. Parameter printout should then indicate the new mode in effect. This mode should remain in effect through power cycling until changed by the above procedure.

For information on the behavior of firmware revisions prior to 2.03, please consult the factory.

#### 5.1.1 Parallel Interface Signals

The ST-261 plotter connects to the host system via an IEEE 1284-C miniature 36-pin ribbon connector.

**Table 1 Parallel Interface Pins**

| Pin # | Source | Compatible | Nibble | Byte | ECP | EPP |
|---|---|---|---|---|---|---|
| 1 | P | Busy | PtrBusy | PtrBusy | PeriphAck | nWait |
| 2 | P | Select | Xflag | Xflag | Xflag | User defined 3 |
| 3 | P | nAck | Ptrclk | Ptrclk | PeriphClk | Intr |
| 4 | P | nFault | nDataAvail | nDataAvail | nPeriphRequest | User defined 2 |
| 5 | P | PError | AckDataReq | AckDataReq | nAckReverse | User defined 1 |
| 6 | Bi-Di* | Data 1 | | | | AD1 |
| 7 | Bi-Di* | Data 2 | | | | AD2 |
| 8 | Bi-Di* | Data 3 | | | | AD3 |
| 9 | Bi-Di* | Data 4 | | | | AD4 |
| 10 | Bi-Di* | Data 5 | | | | AD5 |
| 11 | Bi-Di* | Data 6 | | | | AD6 |
| 12 | Bi-Di* | Data 7 | | | | AD7 |
| 13 | Bi-Di* | Data 8 | | | | AD8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | H | nInit | nInit | nInit | nReverseRequest | nInit |
| 15 | H | nStrobe | HostClk | HostClk | HostClk | nWrite |
| 16 | H | nSelectIn | IEEE 1284 active | IEEE 1284 active | IEEE 1284 active | nAstrb |
| 17 | H | nAutofd | HostBusy | HostBusy | HostAck | nDstrb |
| 18 | | Host Logic High | | | | |
| 19 | | Signal Ground (Busy) | | | | |
| 20 | | Signal Ground (Select) | | | | |
| 21 | | Signal Ground (nAck) | | | | |
| 22 | | Signal Ground (nFault) | | | | |
| 23 | | Signal Ground (PError) | | | | |
| 24 | | Signal Ground (Data 1) | | | | |
| 25 | | Signal Ground (Data 2) | | | | |
| 26 | | Signal Ground (Data 3) | | | | |
| 27 | | Signal Ground (Data 4) | | | | |
| 28 | | Signal Ground (Data 5) | | | | |
| 29 | | Signal Ground (Data 6) | | | | |
| 30 | | Signal Ground (Data 7) | | | | |
| 31 | | Signal Ground (Data 8) | | | | |
| 32 | | Signal Ground (nInit) | | | | |
| 33 | | Signal Ground (nStrobe) | | | | |
| 34 | | Signal Ground (nSelectIn) | | | | |
| 35 | | Signal Ground (nAutoFd) | | | | |
| 36 | P | Peripheral Logic High | | | | |

* Used in bi-directional Byte Mode.

### 5.2 Parallel Data Commands

#### 5.2.1 Summary

Commands processed by the plotter generally consist of 4-byte packets beginning the ‘Esc’ (0x1B) character, with, in some cases, command-specific variable length data field trailers. These consist of:

| | | |
|---|---|---|
| Raster data entry state control: | Esc B E G | Esc E N D |
| Raster data line definition: | Esc T .. .. {data} | |
| Chart feed control: | Esc V .. .. | Esc F F D |
| Character print line definition: | Esc P .. .. {data} | Esc Q .. .. {data} |
| Configuration control: | Esc J .. .. {command string} | |

The commands listed above are not all eligible simultaneously. For maximum performance in the essential raster plotting function, the plotter is designed so that raster data is received and plotted in a specialized “RASTER ON” state whereas the bulk of the other commands are to be interpreted in the “RASTER OFF” state.

In normal usage, configuration commands (Esc J ..), character print (Esc P, Esc Q), and chart feed (Esc V .., Esc F F D) commands are to be sent during the RASTER OFF state. Raster plot data (Esc T .. .. data) is to be sent during the RASTER ON state. Defined length chart feed (Esc V ..) commands may also be sent interspersed with raster plot data during the RASTER ON state.

### 5.2.2 Raster data entry Begin

**`Esc B E G`**

Receipt of this command while Data Entry state is RASTER OFF will change it to RASTER ON, preparing the plotter for upcoming Raster data. If the Data Entry state is RASTER ON, this command will be ignored.

### 5.2.3 Raster data entry End

**`Esc E N D`**

Receipt of this command while Data Entry state is RASTER ON will change it to RASTER OFF, restoring the plotter to its normal idle state and preparing it for potential configuration commands, character print lines, or chart commands . If the Data Entry state is RASTER OFF, this command will be ignored.

### 5.2.4 Raster Plot Data

**`Esc T xx yy {data}`**

Receipt of this command while Data Entry state is RASTER ON will cause the defined data line to be plotted, and the chart to advance one dot line.

Where:

**`xx yy`** specifies the byte count (16-bit binary value; MSB, LSB) of the **`{data}`** field. This count is normally the same as the inherent native width of the plot field, ie. 216 for ST-261 or 296 for ST-262.

This byte count must be evenly divisible by 4. If not equal to the inherent plot width the following rules apply:

Shorter scan lines are centered in the available plot field.

Longer scan lines are truncated so that the beginning data is plotted and the ending data is discarded. Do not send a byte count more than twice the inherent native plot field.

**`{data}`** specifies the data content to be plotted in bit per dot assignment.
0 = dot Off, 1= dot On.
For a data field of N bytes:
Bit 0 of Byte 0 is the right-hand-most dot in the defined plot field.
Bit 7 of Byte N-1 is the left-hand-most dot in the defined plot field.

Example:

| | | | | Right | | | | Left |
|---|---|---|---|---|---|---|---|---|
| Esc | T | 00 | 216 | Byte 0 | Byte 1 | Byte 2 | ... | Byte 215 |
| 0x1B | 0x54 | 0x00 | 0xD8 | 0x?? | 0x?? | 0x?? | 0x?? | 0x?? |

Receipt of this command while Data Entry state is RASTER OFF is illegal and will cause an error trap.

### 5.2.5 Defined Chart Feed

**`Esc V xx yy`**

Where:

**`xx yy`** specifies the line advance count (16-bit binary value; MSB, LSB) to be actuated. A value of zero is valid and constitutes a null command.

Example:

| | | | |
|---|---|---|---|
| Esc | V | 01 | 44 |
| 0x1B | 0x56 | 0x01 | 0x2C |

This commands an advance of 0x012C = 300 dot lines or 1.5 inch of chart.

This command may be sent either in the RASTER OFF or RASTER ON Data Entry States. Receipt of this command while Data Entry State is RASTER ON will insert the blank scan line(s) in the commanded sequence with respect to all leading and trailing Raster Data lines.

### 5.2.6 Advance to Top-of-Form

**`Esc F F D`**

Receipt of this command while Data Entry state is RASTER OFF will actuate a Form Feed chart advance, identical in function to a quick press of the FEED button (which is functional only when the plotter is Offline).

With fan fold type media configured, this will attempt to feed until a page registration mark is sensed, and then feed an extra amount according to the configured Top-of-Form registration distance. This value can be adjusted by the user using either Serial or Parallel configuration control to obtain desired registration of the fan fold perforation preparatory to future output.

With roll type media configured, this will perform a feed for the defined Form Feed distance. This value can be adjusted by the user using either Serial or Parallel configuration control.

Receipt of this command while Data Entry state is RASTER ON is illegal and will cause an error trap.

### 5.2.7 Character Print

**Esc P xx yy {data}** (log-orientation print line)
**Esc Q xx yy {data}** (text-orientation print line)

Receipt of either of these commands while Data Entry state is RASTER OFF will cause the defined data line to be printed, and the chart to advance one character line.
Where:

**xx yy** specifies the byte count (16-bit binary value; MSB, LSB) of the **{data}** field. This byte count must be evenly divisible by 4 and equal to or less than the inherent native plot width divided by 2. That is, 108 for ST-261 or 148 for ST-262. If not equal to this value, the entered character string is centered in the available width.

**{data}** specifies the character data in ASCII code. Codes 0x00 - 0x1F print as spaces.

Esc P ... generates log-orientation character lines. That is, the characters appear upright as the chart exits the plotter, and the defined data line fills left-to-right, in accordance with normal expectation. Successive print lines do not read as normal text however, because as normally viewed the bottom line is emitted first.

Esc Q ... generates text-orientation character lines. That is, the characters appear inverted as the chart exits the plotter, and the defined data line fills right-to-left. Successive print lines would read as normal text when the chart is inverted for viewing, in accordance with normal expectation.

Examples:

| | | | | Left | | | | Right |
|---|---|---|---|---|---|---|---|---|
| Esc | P | 00 | 108 | Char 0 | Char 1 | Char 2 | ... | Char 107 |
| 0x1B | 0x50 | 0x00 | 0xC6 | 0x?? | 0x?? | 0x?? | 0x?? | 0x?? |

| | | | | Righ | | | | Left |
|---|---|---|---|---|---|---|---|---|
| Esc | Q | 00 | 108 | Char 0 | Char 1 | Char 2 | ... | Char 107 |
| 0x1B | 0x51 | 0x00 | 0xC6 | 0x?? | 0x?? | 0x?? | 0x?? | 0x?? |

The character printing function as implemented in the plotter is a auxiliary feature which does not utilize same techniques as raster plotting modes. Consequently, the speed of printing is slower than potential plotting speed.

Receipt of these commands while Data Entry state is RASTER ON is illegal and will cause an error trap.

### 5.2.8 Raster Data Pipeline considerations

As the essential function of the ST-26x plotter is fast raster plotting, the data protocol is designed around this requirement. As such, auxiliary functions such as configuration, character printing, and top-of-form registration feed are separated from the raster plot function by use of the Data Entry state control commands (Esc B E G, Esc E N D). For optimal use, raster plot data transfer is best considered as being in blocks of data lines surrounded by Esc B E G ... Esc E N D commands. Note that “Esc V .. ..” commands may be interspersed with “Esc T .. ..” data lines to insert blanks as a alternative to transferring a whole line 00 bytes to represent one blank data line.

Plotter internal firmware is designed to take in raster data and buffer it internally while ramping the chart feed so to attain highest possible plot speeds without loss of step accuracy. It is expected that plot speed will fluctuate in accordance with the inherent fluctuations in host data transfer. Situations may arise where the data buffer in the plotter may exhaust itself, requiring the chart transport to stop while the plotter waits for more data from the host before proceeding, well before the end of the plot is encountered. Such a condition is termed “Data Starvation” and

is accommodated by the plotter. During the data starvation period, the red ALARM indicator lamp on the front panel will flash. This is only an indication for the operator, and does not normally necessitate corrective action, nor does it mean that plotter internal components in any jeopardy. The maximum duration of Data Starvation, however, is a matter of concern for the system integrator as it may call for alternative settings of the plotter configuration

In the case that Data Starvation persists for considerable time (9 seconds, typical configuration) the plotter is designed to recognize a timeout expiration and to automatically terminate the RASTER ON Data Entry state. This process may be recognized by the operator through the cessation of the ALARM indicator flashing. This means that the plotter has reverted to the RASTER OFF Data Entry state. This is done to accommodate the possibility that the host system may fail to terminate the raster file transfer due to unforseen errors and that it is desirable for the plotter to assume its normal idle condition.

In the case that host systems may exhibit long latent periods as an expected operating mode, it is desirable to reconfigure the plotter for a long data timeout period. This way, the Data Starvation condition can persist for up to an hour while the plotter remains eligible to receive and print raster data lines at whatever rate the host can supply them. This is accommodated by selecting the Long Timeout period. This can configured either through the serial or parallel port using the normal configuration control protocol.

> Over the serial port, send <Esc> ‘G’ ‘W’ ‘1’ ‘4’ ‘0’ ‘**0**’ <Ent>. Note that the second ‘0’ specifies the long timeout. Specifics for this are given in Section 5.4 and Table 4 of the plotter manual. With the “ST-Control” utility available for PC users, which uses the serial channel to implement a virtual control panel capability, apply a “0” to the “Parallel Port Timeout” dialog box in the “Control” window.
>
> Over the parallel port, send <Esc> ‘J’ 0x00 0x08 ‘W’ ‘1' ‘4' ‘0' ‘**0**’ 0x00 0x00 0x00. Note that the second “0” specifies the long timeout. Specifics for this are given in the separate section on Parallel Port configuration control. With the Windows 95/98 driver package available for PC users, which performs plotter configuration through the parallel port, this capability may be selected by applying a “0” to the “Parallel Port Timeout” dialog box in the “Control” window accessible thru the printer Properties function.

With the long timeout period selected, the automatic restoration of the RASTER OFF Data Entry state is disabled, for practical situations. When the actual end of raster plotting is encountered the host can send Esc E N D in the normal manner to close out raster plotting. It is also possible to terminate the RASTER ON Data Entry state during Data Starvation by asserting the parallel port “nINIT” line momentarily. This will cause the plotter to flush its data buffer and restore itself to the normal idle RASTER OFF state, thus effectively ending the Data Starvation wait function.

### 5.2.9 Parallel Configuration Commands

A set of parallel port configuration commands are supported as of firmware Rev 1.30. These allow user configuration to be applied over the parallel interface, similar in function to the virtual control panel function accessible through the serial interface (see Manual Section 5.4). Parallel port commands are intended to allow control of features such as media type, plot speeds, etc. to which an operator may require access. Service-oriented functions such as modification of the stored printhead resistance, or firmware upgrading, are NOT supported through the parallel port as of this writing.

The system programmer should exercise care in selecting which commands are sent and the database from which the commands are derived. The printer maintains non-volatile storage of all configuration settings, which are preset at the factory to appropriate values. Specific attention should be paid to the "Chart Calibration" setting (available in Model ST261H and ST262, but not ST261S). This is factory-set to provide a calibrated media advance of 1/200 inch or 1/8 mm per dot line, thus providing a potential improvement in advance accuracy. Faulty values entered for the Chart Calibration parameter can alter this setting. The factory chart calibration setting is documented in the shipment paperwork and can be displayed on the Parameter Listing provided by the printer at power-up. Naturally, this setting is subject to alteration by the user if the host system allows it.

In the case that the host system sends configuration commands, the database from which the parameters are derived should be initialized per the application requirements. Take care to enter the factory-set Chart Calibration value into this database, if it is chosen to send this command. A recommended practice upon installation of the printer would be to save the reported Chart Calibration value into the host system database prior to sending any configuration commands.

Windows/PC applications ('95 and '98, but not NT as yet) will likely find it beneficial to utilize Atlantek's driver to configure the printer through a convenient user interface. All configurable parameters are accessible through the Start/Settings/Printers/Properties menus, or through the "Printer Setup" or equivalent box of the application in use. Choose "Settings" and "Control" sheets to view and change all configuration parameters. The same caution as to preservation of the Chart Calibration value holds in this case as well. Unfortunately, there is no reverse parallel channel capability as of this writing (we're working on it), so that the PC host has no way of "asking" the printer what's in it; it can only configure it. Coherence of the PC with the printer is maintained through power-down by a printer device registry in the PC and non-volatile storage in the printer. For this reason, it's important that the parameters get saved, using the command provided, at the close of a configuration session. The Windows driver we supply will do this normally.

Internal printer configuration can be listed on the chart anytime the printer is idle by invoking a Parameter List function. This can be actuated by:

> Automatically upon printer power-up if the "Print Parameters at Power Up" switch is asserted. This switch may be controlled through either parallel command or serial command.
> Serial "Print Parameters" command. See Manual Section 5.4. This may be actuated by the "ST-Control" virtual control panel utility in Windows/PC applications.
> Parallel "Print Parameters" command. See below. This may be actuated within the "Properties" sheet when the ST-26x driver is installed in Windows/PC applications.

All configuration commands shall be sent outside the period bounded by "Esc B E G" and "Esc E N D" during which the printer is opened for raster data input. This forces the commands to be transacted when data is not being transferred and the printer is therefore idle. A configuration sequence should only be actuated when the printer idle and Online, the red Alarm lamp is not flashing, and no print jobs are expected for download.

There is considerable processing overhead resulting from the receipt of some commands. Whenever Media Type (Esc J xx yy W 1 5 7 ...), Intensity (Esc J xx yy W 1 5 6 ...), or Print Optimization (Esc J xx yy W 1 4 2 ..) are received, there follows by necessity a lengthy period (several seconds) of internal calculation to re-derive print strobe tables. Update and Save (Esc J xx yy W 1 5 9) is also time consuming. It is possible for this processing latency to create periods of extended Busy (the plotter holds up data transfer) such that the host system (if so equipped) can falsely conclude that the plotter is inoperable and declare an alarm. This is particularly prone to occur when large raster data files immediately follow a configuration session. For this reason, it is recommended that any host-determined plotter-busy timeout criteria get suspended or else relaxed to the maximum possible extent during configuration download. With the Atlantek-supplied Windows 95/98 driver, configuration commands are sent only when the Properties box is clicked and a parameter is changed within one of the dialog boxes. A screen prompt warns the user to wait 10 seconds before sending a print job, thus enforcing separation between configuration and raster data streams.

The general form of parallel configuration commands is as follows:

**Esc J [xx] [yy] W [parameter number] [parameter value] [pad]**

Where:

**[xx],[yy]** gives the byte count (16-bit binary value, MS Byte first) of the remainder of the command string, not including the 4 bytes: "Esc J xx yy". The quantity represented shall be between 4 and 52 inclusive, and must be divisible by 4.
**[parameter number]** shall be 3 ascii digits, specifying the command type as listed below
**[parameter value]** shall be an ascii numeric or literal string, as defined by the command, specifying the parameter assignment to be applied. This field may be absent in some commands.
**[pad]** is an optional field of white space as needed for filling out the balance of the command string, thus providing adherence with the [xx],[yy] count field. (Note: '00h', '20h' (space char.), '0Dh' (return), '0Ah' (new line), ie. Any white space character is valid for pad.

**Configuration Command -- Specific command syntax:**

1. **Media Type Select**

**<Esc> J xx yy W 1 5 7 {media type} {pad}**

The media type parameter value shall be a character string defined by the following. The menu option list should be presented through a scrollable selection line as follows:

| Parameter | Selection |
|---|---|
| "R01" | Draft grade roll paper, Part# 747086 |
| "R02" | Report grade roll paper, Part# 747088 |
| "Z01" | Draft grade fanfold paper, Part# 747087 |
| "Z02" | Report grade fanfold paper, Part# 747089 |
| "F01" | Roll film, Part# 747090" |

2. **Host Plot Speed Limit**
**<Esc> J xx yy W 1 0 8 {speed} {pad}**
3. **Test Plot Speed Limit**
**<Esc> J xx yy W 1 2 8 {speed} {pad}**

The speed parameter value shall be an ascii-representation floating point number indicating the speed in inches per second. The presented number gets limited internally subject to printer constraints and rounded off to the nearest discrete speed step available.

4. **Print Intensity**

**<Esc> J xx yy W 1 5 6 {intensity} {pad}**

The intensity parameter value shall be an ascii-representation integer number indicating the percent of nominal print energy applied. The presented number gets limited internally to the range of 70 to 130.

5. **Test Pattern Type**

**<Esc> J xx yy W 1 0 9 {pattern type} {pad}**

The pattern type parameter value shall be an ascii-representation integer number defining the test pattern as follows:

| Parameter | Selection Text |
|---|---|
| 1 | Grid |
| 4 | Narrow Band |
| 5 | Test Pattern 1 |
| 6 | Test Pattern 2 |
| 7 | Test Pattern 3 |
| 8 | Test Pattern 4 |
| 9 | Test Pattern 5 |

6. **Chart Calibration**

**<Esc> J xx yy W 1 0 5 {calibration reference distance} {pad}**

The chart calibration parameter value shall be an ascii-representation floating point number which specifies the scaling applied to a 20 inch nominal reference. Note that numbers smaller than 20.00 expand the printout, larger numbers contract the printout. The presented number gets limited internally to the range of 19.00 to 21.00.

7. **Form Feed Length**

**<Esc> J xx yy W 1 1 3 {feed distance} {pad}**

The feed distance parameter value shall be an ascii-representation floating point number which specifies the form feed actuation distance in inches (effective when roll type media is selected). The presented number gets limited internally to the range of 0.5 to 20.0.

8. **Cue Mark Registration**

**<Esc> J xx yy W 1 0 2 {registration distance} {pad}**

The registration distance parameter value shall be an ascii-representation floating point number which specifies the media displaced between sensing of the top-of-form cue mark and the desired stopping position following a front panel or interface-actuated form feed command (effective when fan-fold type media is selected). The presented number gets limited internally to the range of 0.25 to 12.5 .

9. **Interface Time-Out**

**<Esc> J xx yy W 1 4 0 {time-out duration} {pad}**

The duration parameter value shall be an ascii-representation integer ranging which specifies the interface time out duration in seconds. An assignment of 0 results in a very long (100 minutes as of firmware Rev 1.30) timeout period. The presented number gets limited internally to the range of 0 to 9.

10. **Auto Form-Feed Switch**

**<Esc> J xx yy W 1 4 1 {switch parameter} {pad}**

The switch parameter value shall be a character “0” (disable) or “1” (enable) which controls automatic generation of a form feed upon receipt of the end-of-print “<Esc> E N D” command.

11. **Parameter Print on Power-Up Switch**

**<Esc> J xx yy W 1 2 0 {switch parameter} {pad}**

The switch parameter value shall be a character “0” (disable) or “1” (enable) which controls automatic printout of plotter parameters as part of power-up reset procedures.

12. **Update and Save Non-volatile Storage Trigger**

**<Esc> J xx yy W 1 5 9 {pad}**

Note there is no parameter value field.
This command shall trigger immediate storage of all plotter control parameters to non-volatile memory, thus providing for restoration of all current settings through the next power-up cycle. This command must be sent after all other commands which are to be preserved in non-volatile storage. Therefore, this command would normally be the last of a command configuration sequence.

13. **Parameter Printout**

**<Esc> J xx yy W 1 1 7 {pad}**

Note there is no parameter value field.
This command would not necessarily be sent in the course of a normal configuration sequence. Its utility would to provide the user the opportunity to view the effect of changes made after a configuration download is actuated.

**Sample configuration / print session:**
Note that the number of trailing nulls in the pad field is indefinite and is needed only attain compliance with the byte count given after "J".

| | |
|---|---|
| 1Bh 'J' 00h 08h 'W' '1' '5' '7' 'Z' '0' '2' 00h | Media Type: Report Fan fold paper |
| 1Bh 'J' 00h 08h 'W' '1' '5' '6' '1' '1' '0' 20h | Intensity: 110% |
| 1Bh 'J' 00h 08h 'W' '1' '0' '9' '4' 00h 00h 00h | Test Pattern: "Narrow Band" |
| 1Bh 'J' 00h 08h 'W' '1' '0' '8' '3' '.' '0' '0' | Host Plot Spd: 3.0 inch /sec |
| 1Bh 'J' 00h 08h 'W' '1' '2 ''8' '1' '.' '5' 00h | Test Plot Spd: 1.5 inch /sec |
| 1Bh 'J' 00h 0Ch 'W' '1' '0' '5' '2' '0' '.' '1' '2' 00h 00h 00h | Chart Cal: 20.12 inch |
| 1Bh 'J' 00h 08h 'W' '1' '1' '3' '4' '.' '5' 00h | Form Feed: 4.5 inch |
| 1Bh 'J' 00h 0Ch 'W' '1' '0' '2' '2' '.' '5' '5' 00h 00h 0Dh 0Ah | Cue Reg'n: 2.55 inch |
| 1Bh 'J' 00h 08h 'W' '1' '4' '0' '7' 20h 0Dh 0Ah | Timeout: 7 sec |
| 1Bh 'J' 00h 08h 'W' '1' '2' '0' '0' 00h 0Dh 0Ah | Print Parameters on Pwr Up: Disabled |
| 1Bh 'J' 00h 08h 'W' '1' '4' '1' '1' 00h 00h 00h | Auto Form Feed: Enabled |
| 1Bh 'J' 00h 04h 'W' '1' '5' '9' | Save to NVRAM |
| 1Bh 'J' 00h 04h 'W' '1' '1' '7' | Print out configuration |
| 1Bh 'F' 'F' 'D' | Register Page |
| 1Bh 'P' 00h 6Ch {108 bytes of ascii data} | Alphanumeric header line |
| 1Bh 'B' 'E' 'G' | Open for raster data transfer |
| 1Bh 'T' 00h D8h {216 bytes of raster data} | Send raster data (repeat for multiple lines) |
| 1Bh 'E' 'N' 'D' | Close raster data |
| 1Bh 'V' 01h 90h | Feed chart - 4 inch |

### 5.3 Serial Interface

The serial interface is used for the Virtual Control Panel and the command communications channel of the Windows driver. Control and configuration commands may be sent to the plotter while status and error messages may be received by the host from the plotter.

A full duplex three-wire signal connection is used without hardware handshake. It is wired to an RJ11 connector accessible on the rear of the unit. Typical wiring connections to the standard DB-9 and DB-25 serial connectors for personal computers are shown in Table 3 below. Standard purchased cables and adapters may be used. Note that it may be necessary to reverse the transmit and receive connections to pins 2 and 3 to accommodate the computer port DTE or DCE configuration. This may be done with a purchased adapter or by reversing the wires in the cable or adapter.

If a serial communications or terminal program other than the Windows driver is used, the program options should be set for no hardware flow control. The protocol is 1 start bit, 8 data bits, no parity, 1 stop bit and 57600 baud.

**Table 2 RJ11 Serial Interface Signal Connections**

| **RJ11 Pin #** | **Signal** | **DB-25 Pin #** | **DB-9 Pin #** |
|---|---|---|---|
| 1 | N.C. | | |
| 2 | Receive Data In | 2 | 3 |
| 3 | Transmit Data Out | 3 | 2 |
| 4 | N.C. | | |
| 5 | Common | 7 | 5 |
| 6 | N.C. | | |

### 5.4 Configuration Commands

Configuration commands are sent as escape sequences of the form

Esc G [R or W] [Parameter Number, three ASCII digits] [Parameter Value][Terminator, ASCII CR]

All command data are in ASCII characters.

Spaces and brackets are not to be included but are shown for clarity of presentation only.

An **R** or **W** is used to signify a Read or Write operation.

The Parameter number is three ASCII digits.

The Parameter Value field may be ASCII characters, digits, or none at all for certain parameters. See Table 5 for allowable values and examples.

A Read Data command generally contains no parameter value and returns the three digit parameter number followed by the data and an ASCII CR terminator.

A Read or Write Data command returns one of five possible responses.

1. If the command was successful, the return message is the three-digit parameter number followed by the data and an ASCII CR.
2. If the syntax is correct but the command is not supported, the reply is the three-digit parameter number followed by "*" (ASCII asterisk, $2A_{hex}$) terminated with an ASCII CR.
3. If the command string terminated by an ASCII CR is received but not recognized as any legal command, the reply is "XXX*?" terminated with an ASCII CR. This could result if the syntax is not correct. For example, the string does not begin with Escape, does not have either an R or W for the second character, or does not have a recognizable three-digit parameter value.
4. If the command syntax is correct and the parameter number is legal and recognized but the data is out of range or not understood, the reply is the parameter number followed by an ASCII "?" terminated with an ASCII CR.
5. If the command syntax is correct and the parameter number is legal and the parameter data is legal. The plotter can not execute the command because it is plotting. The plotter indicates that it is busy by the return string, a three-digit parameter number followed by the data, a "B" and an ASCII CR. See Table 5 for commands that are legal in the Dynamic Mode.

Some commands may take several seconds to execute before the plotter responds. The user should always wait for a response after each command and check for errors before sending another command to ensure synchronicity.

**Table 3 Sample Commands and Responses**

| **Command** | **Send Message** | **Reply Message** | **Comment** |
|---|---|---|---|
| Set Units to US (English) | EscGW101U<CR> | 101U<CR> | Legal command. |
| Set cue mark distance to 2.15 inches | EscGW1022.15<CR> | 1022.15<CR> | Legal command. |
| Set cue mark distance to 2.15 inches (Incorrectly) | EscGW1022.15<CR> | XXX*?<CR> | Missing W<br>Unrecognizable string. |
| Start uncompensated chart calibration | EscGW103<CR> | 103<CR> | Legal command. |
| Set chart calibration to 23.067 inches | EscGW10523.067<CR> | 105?<CR> | Parameter value out of range. |
| Erroneous string | Tvk$s9cw&zW<CR> | XXX*?<CR> | Unrecognizable string. |
| Read plot speed limit | EscGR108<CR> | 1082.10<CR> | 2.10 in/sec |
| Read Online status | EscGR118<CR> | 1180<CR> | 0 = Offline. |
| Unsupported parameter number | EscGR273<CR> | 273*<CR> | Parameter 273 is not supported. |
| Change print intensity to 120% while plotting | EscGW106120<CR> | 106B<CR> | Busy. Can not change while printing. |

Esc is $1B_{hex}$

<CR> is $0D_{hex}$

**Table 4 Configuration Commands**

| Parameter | Read/ Write | Parameter # | Command Syntax | Comment | Dynamic Config. | Default Value |
|---|---|---|---|---|---|---|
| Units | R/W | 101 | EscGW101U<CR> | Metric or US (Default)<br>M = Metric *, U = US | No | U |
| Cue Mark distance | R/W | 102 | EscGW1021.685<CR> | X.xxx inches or XX.x millimeters * | No | 2.00 inch |
| Chart Cal Test (uncompensated) | W | 103 | EscGW103<CR> | Execute test without compensation | No | |
| Chart Cal Test (compensated) | W | 104 | EscGW104<CR> | Execute test with compensation | No | |
| Chart Cal value | R/W | 105 | EscGW10520.685<CR> | If Metric, XXX.x millimeters, 500.0 nominal *<br>If US, XX.xxx inches, 20.000 nominal. | No | 20.00 inch |
| Print Intensity | R/W | 106 | EscGW1063<CR> | Percent of normal, from 70 to 130 percent. | No | 100 |
| Media Type | R/W | 107 | EscGW107F02<CR> | R01, R02, etc. Roll Paper.<br>F01, F02, etc. Roll Film.<br>Z01, Z02, etc. Fanfold Paper. | No | Z02 |
| Plot Speed Limit | R/W | 108 | EscGW1081.65<CR> | X.xx inches/sec or XXX.x mm/sec *<br>Reply value is be the next lower discrete step speed. | No | 2.0 S<br>4.0 H |
| Test Pattern Type | R/W | 109 | EscGW1095<CR> | Grid (1) & Narrow Band (4) | No | 1 |
| Execute Test Print | W | 110 | EscGW110<CR> | | No | |
| Plot Width,<br>Bytes per Scan Line | R/W | 111 | EscGW111216<CR> | XXX bytes, even numbers only | No | 216 |
| Print Width,<br>Characters per Line | R/W | 112 | EscGW112108<CR> | XXX characters per line. ** | No | 108 |
| Formfeed Length | R/W | 113 | EscGW11312<CR> | Active in Roll only, XX.xx inches or XXX.x mm * | No | 11.00 inch |
| Media Left | R/W | 114 | EscGW114400<CR> | Decrementing, XXX.xx Feet or XXX.x Meters *.<br>Reset by any value write. | No | 00.0 |
| Media Used | R/W | 115 | EscGW115400<CR> | Incrementing, XXX.xx Feet or XXX.x Meters *.<br>Reset by any value write. | No | 00.0 |
| POST Error Codes | W | 116 | EscGW116<CR> | Read: Read last stored POST error codes. **<br>Write causes a Print configuration and status parameters on chart including POST Error Codes. | No | |
| Print Parameters | R/W | 117 | EscGW117<CR> | Causes parameters to print on ST-261 chart. | No | |
| OnLine/OffLine | R/W | 118 | EscGW1181<CR> | 1 = ON Line<br>0 = Off Line | Yes | 0 |
| Status | R | 119 | EscGW119<CR> | OnLine/OffLine, Printhead Lifted, Out of Media ** | Yes | |
| Flag, Print Parameters after Reset | R/W | 120 | EscGW1201<CR> | 1 = Enable, 0 = Disable. | No | 0 Disabled |

| Parameter | Read/ Write | Parameter # | Command Syntax | Comment | Dynamic Config. | Default Value |
|---|---|---|---|---|---|---|
| EOT Advance Distance | R/W | 121 | EscGW12111.00<CR> | XX.xxx inches or XXX.xx millimeters * | No | 00.0 |
| Reset | W | 122 | EscGW122<CR> | Command Software Reset. Initializes all parameters from NVRAM and clears buffers. | No | |
| Reset to Defaults | W | 123 | EscGW123<CR> | Causes all parameters to return to default values. | No | |
| Default Power-Up Control | R/W | 124 | EscGW1241<CR> | 0 = Offline<br>1 = Online | No | 0 |
| Retrieve All Parameters | W | 125 | EscGW125<CR> | Returns all parameters in one string. ** | No | |
| Plot Location | R/W | 126 | EscGW126108<CR> | XXX bytes, even numbers only ** | No | 0 |
| Print Location | R/W | 127 | EscGW127108<CR> | XXX characters ** | No | 0 |
| Self-Test Speed Control | R/W | 128 | EscGW1281.65<CR> | X.xx inches/sec or XXX.x mm/sec *<br>Reply value is be the next lower discrete step speed. | No | 2.0 S<br>4.0 H |
| Update and Save | W | 129 | EscGW129<CR> | Restarts with new values after save. | No | |
| Execute Form Feed | W | 130 | EscGW130<CR> | Form feed length same as executed from front panel switch | No | |
| Raster Data Format | R/W | 131 | EscGW1310<CR> | Bits per pixel in each raster byte<br>0 = Bimodal | No | 0 |
| Cancel Plotting | W | 132 | EscGW132<CR> | This command puts the plotter Offline, stops plotting, and clears the buffers. | Yes | |
| Set P1284 Plot Time Out | R/W | 140 | EscGW140<CR> | This command sets the Parallel Port Data Time Out. Values allowed 0 to 9 integers only. | No | 4 Sec |
| Set Auto Form Feed | R/W | 141 | EscGW141<CR> | This command allows for the automatic execution of a Form Feed after each plot.<br>0=OFF, 1=ON | No | 0 |
| | **Reserved 200 to 299**<br>**Reserved 300 to 399**<br>**Reserved 400 to 499** | | | | | |

* Metric not support as of this release, ** Command not support as of this release

| Parameter | Read/ Write | Parameter # | Command Syntax | Comment | Dynamic Config. | Default Value |
|---|---|---|---|---|---|---|
| | **Service Commands 500 to 599** | | | | | |
| Printhead Resistance | R/(W) | 501 | EscGR501<CR> | XXXX ohms. Write protected, service only. | No | Factory set |
| Total Printed Lines Counter | R/(W) | 502 | EscGR502<CR> | Reset by any value write. | No | |
| Film Printed Line Counter | R/(W) | 503 | EscGR503<CR> | Reset by any value write. | No | |
| Paper Printed Line Counter | R/(W) | 504 | EscGR504<CR> | Reset by any value write. | No | |
| Media Distance Counter (Total dot lines moved) | R/(W) | 505 | EscGR505<CR> | Incrementing, XXX.xx Feet or XXX.x Meters. Reset by any value write. | No | |
| Printhead Temperature | R | 506 | EscGR506<CR> | XX.x Degrees Celsius | No | |
| Software Version | R | 507 | EscGR507<CR> | Version XX.xxx, Checksum XXXX hex. | No | |
| Printhead Serial Number | R/(W) | 508 | EscGR508<CR> | | No | Factory set |
| Unit Serial Number | R/(W) | 509 | EscGR509<CR> | YYMMNNN | No | Factory set |
| Unit Model | R | 510 | EscGR510<CR> | Returns unit model number plus installed options | No | Factory set |
| Read Paper Sensor Value | R | 511 | EscGR511<CR> | Returns paper sensor voltage value. | No | |
| Open Flash ROM Reprogram Channel | W | 512 | EscGW512<CR> | Responds with 512R<CR> when ready, then waits for download of Motorola S record format file. When record is complete, re-flashing of ROM takes place, followed by a reply of 512D for done. The plotter then performs a reset. | No | |

R = Read only W = Write only R/W = Read and Write

R/(W) = Read allowed, Write protected for authorized service access only. This feature allows setting of these values only at the factory or by qualified service personnel. This insures quality operation and eliminates the misuse of the Atlantek head life warranty.

The only reason theses values need to change is in the case of head replacement. Thus, if the head is deemed worn an access code will be issued with the purchase of the replacement head (including any pro-rating) allowing the odometers and head resistance to be modified. The access code is unique for each printer.

## 6. Operational States

This section describes the range of operational states that the Model ST-261 may assume. These are as follows:

- **Initialization** -- entered upon power up.
- **Online** – normal host driven state.
- **Offline** – for media feed and test plotting.
- **Alarm** – sensor based fault condition detected.
- **Configuration** – operator customization of plotter parameters.
- **Flash in System Reprogramming** – firmware updates.

In the section that follows, each of these operational states is explained in terms of function and user interactions with the data and command inputs.

### 6.1 Initialization

In the period immediately following power-up, the plotter internal electronics performs essential initialization functions, minimal self test, determines the disposition of the previous plotter configuration as stored in nonvolatile RAM (NVRAM), and then determines the appropriate operational state. During this period, error messages may be sent to the host for display to the user.

One of the first functions of the plotter upon power-up is to read the front panel keys. Pressing and holding a key prior to switching power on can influence actions in the Initialization State. In all cases, the key may be released when the alarm light turns off.

**Table 5 Summary for Initialization State**

| Indicators | Status | Notes |
|---|---|---|
| **POWER** | On/Blink | Unit Power is On |
| **ONLINE** | Off | Interface is inactive |
| **ALARM** | On | Lamp test. |
| | | |

#### 6.1.1 Initialization Keypad Functions

Normal action following Initialization is for the plotter to go to the Online State, assuming that internal electronics and sensors indicate that all is in order. It may be preferable in a particular environment for the plotter to power-up into the Offline State. This may be useful if the host is in an unknown state for some time following the system initialization and it is undesirable for the plotter to respond to possible invalid conditions on the interface. One consequence of this might be for the plotter to feed media continually due to uninitialized outputs from the host. A good way to prevent this is to configure the plotter such that it does not go Online, and therefore it does not respond to the host. The plotter may be placed Online manually by pressing the **ONLINE** key when the host has been initialized.

If it is desired to stay Offline upon power-up, the user can reconfigure the plotter "Default Power-Up State" (see Section 7.12) for "Offline". This shall take effect upon the following power-up. Alternatively, the user may press and hold the **ONLINE** key at power-up. This results in the plotter going to the Offline state following Initialization, contrary to that configured in the Default Power-Up State.

Normal action during Initialization is for the plotter to restore the configuration previously in effect.

- The ONLINE key has been held during power-up.
- An error condition has been detected during Initialization.

### 6.1.2 Initialization Data Report

During Initialization, several reports may be issued through the serial configuration port.

For example:

Model ST-261
Firmware Revision 2.03
Diagnostics Pass

### 6.2 Online State

In the Online state, and only in this state, the plotter is sensitive to host input over the parallel port. Specific functions of the parallel port are discussed in Section 5 – Data Interface. Obviously this state is intended for the vast majority of functional usage of the plotter.

**Table 6 Summary for Online State**

| **Indicators** | **Status** | **Notes** |
|---|---|---|
| **POWER** | On | Unit power is On |
| **ONLINE** | On | Interface is active. |
| **ALARM** | Off | |
| | | |
| **Keys** | **Function** | |
| **ONLINE** | Press to go to Offline state. | |
| **PAPER FEED** | No function. | |
| **TEST** | No function. | |

### 6.2.1 Online State Key Functions

When in the Online State, the only key function supported is the Online toggle.

### 6.2.2 Sensor Faults

Sensor-fault based alarm conditions (i.e. Out of Media, Printhead Lifted) which occur while in the Online State cause immediate stoppage of any plot/print, which may be underway and change to the Alarm State.

### 6.2.3 Online State Output Speed

The effective output speed achieved in the host-driven Online operation is a product of many factors. Internal logic within the plotter is designed to accept data input from the host and to regulate the output speed to a prescribed maximum in accordance with the average data transfer rate. Maximum speed is determined by the following:

- Configured energy level (see Section 7.1)
- Configured Chart Speed Limit (see Section 7.4)
- Possible slowdown may be enforced by a sensed high or low temperature condition at the printhead (see Section 4.4.3) or a very low temperature at the printhead. At printhead temperatures below 25 degrees C, the plotter may print slower because of extended print cycles to provide sufficient energy for proper printing.

Depending upon host environment and plotter configuration, a fluctuating data transfer rate may allow the plot speed to vary. Section 7.4 discusses usage of the explicit Chart Speed Limit control if the application requires chart output to proceed at a constant speed.

### 6.3 Offline State

In the Offline State, the front panel based functions Feed and Self-Test can be performed, thus serving to verify basic plotter function without connection to a host. All returns out of the Alarm State are to the Offline State.

**Table 7 Summary for Offline State**

| **Indicators** | **Status** | **Notes** |
|---|---|---|
| **POWER** | On | Unit Power is On |
| **ONLINE** | Off | Interface is inactive |
| **ALARM** | Off | |
| | | |
| **Keys** | **Function** | |
| **ONLINE** | Press to go to Online state. | |
| **PAPER FEED** | Short press to trigger Form Feed.<br>Long press to perform continuous media feed. | |
| **TEST** | Short press to trigger Self-Test printout, press again to stop.<br>Long press to trigger Self-Test printout followed by a chart calibration printout. | |

#### 6.3.1 Offline State Key Functions

As the internal logic initializes the Offline State, various functions are performed, including the formation of the Self-Test pattern in memory.

- **ONLINE** key press serves as a request to go to the Online State. This is honored only if the plotter is idle, i.e. Feed or Test is not currently underway.

- **PAPER FEED** key press while the plotter is idle causes media feed to begin immediately. If the key is released within approximately 0.5 second, then a Form Feed is triggered. The media is advanced a distance as would be done by a host triggered Form Feed (see Section 7.10 – Form Feed Length).

  If instead, the key is held for longer than this period, continuous feed occurs as long as the key is held pressed, thus allowing the user to feed any amount.

- **TEST** key press while the plotter is idle causes the previously configured self-test plot or print to be output. If the key is released within approximately 0.5 second a test plot is triggered. If the key is held longer than 0.5 second, a Calibration Plot is triggered. The type of test plot or print is selected through a configuration command. Test plot or print may be ended at any time by a second momentary **TEST** key press. Some patterns inherently stop after a preset output distance. See section 7.3 – User Configuration Commands, Test Pattern Selection, for a detailed description of each pattern. When the key is pressed and held for greater than two seconds, a Chart Calibration Test is triggered. See Section 7.15 – Chart Calibration.

#### 6.3.2 Sensor Faults

Sensor-fault based alarm conditions (i.e. Out of Media, Printhead Lifted) which occur while in the Online state cause immediate stoppage of any plot/print which may be underway and change to the Alarm state.

### 6.3.3 Offline State Output Speed

The effective output speed for **PAPER FEED** and **SELF-TEST** functions is a product of many factors:

The configured Test Pattern implies a specific maximum speed.
Configured Energy Level (see Section 7.2).
Configured Chart Speed Limit (see Section 7.4). This is applicable only if the Self-Test Speed Control (see Section 7.16) is configured for "Online Config." If "Maximum" is selected, this limit shall not apply.
Possible slowdown may be enforced by a sensed high temperature condition at the printhead (see Section 4.4.3)
Another factor in speed performance is based on the model number. The ST261S has a top plot speed of about 2"/sec; The ST261H has a top plot speed of about 4.1"/sec.

### 6.4 Alarm State

The plotter is equipped with sensors for the detection of conditions, which could cause damage to internal components. When a problem condition is detected, the current state of operation is ended and a special sensor fault handling state is entered. Alarm messages indicating the specific faults that were detected, are sent out the serial port and the IEEE 1284 parallel port if the host supports the bi-directional mode. In addition, the blinking rate or continuous On condition of the ALARM indicator has significance.

**Table 8 Summary for Alarm State**

| **Indicators** | **Status** | **Notes** |
|---|---|---|
| **POWER** | On | Unit Power is On |
| **ONLINE** | Off | Interface is inactive |
| **ALARM** | On | Indicates that an alarm condition exists |
| | | |
| **Keys** | **Function** | |
| **ONLINE** | No function. | |
| **PAPER FEED** | Momentary press triggers an approximately 4-inch platen advance. | |
| **TEST** | No function. | |

### 6.4.1 "Printhead Lifted and Door Open"

The ALARM indicator is on continuously when the printhead is lifted. The cause is self-explanatory. The sensor has detected that the printhead lift lever has been moved to a position close to unlocking the head. Its function is to insure that the printhead is not pulsed without media in contact with the thermal dot elements.

Corrective action is simply to close the media compartment door. If no fault is then seen, the Offline State is entered. Otherwise, the plotter remains in the Alarm State and the problem is reported through the serial port and the parallel port. Entering the Online State by pressing the ONLINE button will continue plotting. There may be some small artifact in the chart at the point of interruption.

### 6.4.2 "Out of Media"

The ALARM indicator lights to indicate an out-of-media condition. A reflective optical sensor is installed in the rear face of the media compartment door just below the platen roller. Its function is to insure that the bare platen does not rub against the printhead when media has been used up. If the media is consumed, or if for any other reason the web is not detected, then a fault is declared. This may result from excessive

wrinkling or bulging in the web in front of the sensor. The sensor is designed to function with the media tight (or nearly so) against the guide bar.

Corrective action should be first to lift the printhead by opening the media compartment door. Then reload media with attention to smooth travel over the guide bar. With the media loaded correctly, the plotter should report "Printhead Lifted". At this point, close the media compartment door. The plotter should respond as outlined above for "Printhead Lifted".

If translucent or transparent media is used which is out of the calibrated sensing range of the sensor, the "Out of Media" fault condition may occur. The plotter may need to be recalibrated for this material or it may not be used.

### 6.4.3 "High Temperature Shutdown"

If the printing density and speed causes the printhead temperature to rise too high, the plot speed will be limited to prevent damage to the printhead. Under these conditions, the plotter will slow down and the ALARM indicator lights to alert the user as to the cause of the slowdown. When the printhead cools sufficiently, the speed limit will no longer be in effect and the ALARM indicator will be off.

### 6.4.4 Alarm State Media Feed

To facilitate media loading, capability is provided to trigger a momentary media feed which will assist the operator in threading media into and through the mechanism. Anytime while the media compartment door is open and the printhead is lifted, a momentary press of the **PAPER FEED** key shall initiate platen roller advance of approximately 4 inches (10 cm) at a 3 inch/second (7.5 cm/sec) rate. This is intended to give the operator opportunity for threading and guiding of media with both hands available and assisted by the platen roller motion. It is possible to execute this whether or not media is in position at the media sensor, as long as the media compartment door is open.

## 6.5 Configuration State

The plotter does not have a separate Configuration state. It is a sub-function of the Offline State. However, the plotter can be configured in one of three ways:

- By the use of the Virtual Control Panel feature through the serial configuration port which is active in both the Offline and Online states.
- Through the use of the parallel port in the Online state.
- Through the Windows driver setup screens.

## 6.6 Flash in System Reprogramming State

The Reprogramming State is entered from the Configuration State with a specific command and is used for firmware updates. The plotter responds with 510R<CR> when ready, then waits for download of a Motorola S record format file. When record is complete, re-flashing of ROM takes place, followed by 510D for done. The plotter then shut off and then turned on. If the download was unsuccessful, the plotter will not restart. An unsuccessful download may require that the plotter to be returned to the factory for service.

The Plotter sets the OK and ALARM lights to off and the LINE light to on upon entering the reprogram state. The Motorola Hex Record is then uploaded, this mode is recognized by the OK and LINE lights flashing alternately in response to the file being downloaded. The final phase is recognized by a much slower rate of the above discussed Light Display. Once the lights stop flashing wait 30 seconds and then do a power Off/On cycle. Your are done !!!! The whole process will take 2-3 minutes.

# 7. Configuration

The ST-261 communicates to the host through two ports, one serial port and one parallel port. The bi-directional IEEE 1284 port accepts commands and data, and returns data and status values. Normal user configuration of the plotter may be done by accessing the printer setup menu in the Windows driver. Alternatively, from a DOS based program, configuration commands may be sent as escape sequences.

The Virtual Control Panel feature through the RS-232 port accepts only configuration commands and performs a two-way dialogue for configuration using a terminal program. This port does not accept raster graphics data.

### 7.1. Configuration through the Serial Port

The plotter may be configured through the serial port using either the Virtual Control Panel interactive menu mode or with a string of commands as escape sequences. The baud rate is fixed at 57600 baud. The protocol uses one start bit, no parity, 8 data bits, and one stop bit.

#### 7.1.1 Dynamic Configuration

Dynamic Configuration refers to configuration while the plotter is in the Online State. A subset of the configuration commands may be executed while in the Online State. Commands which would change the plotting characteristics in process or which require recomputing of tables in memory are not available in the Online State. These commands would return a reply of busy. See Table 5 for the commands which may be executed in the Online State.

### 7.2 Energy Level and Media Selection

In order to accommodate a wide array of thermal imaging media types and simplify plotter setup, the plotter supports selection of several media types as well as user configuration of the thermal printing energy level. Generally, the higher the energy level, the darker the image, and because of the internal controls of the plotter, the slower the maximum chart output rate. This speed restriction is imposed in order to limit overall printhead dissipation to safe levels. Recommended base energy level setting depends upon the currently installed thermal media although personal preferences may be accommodated by the Print Intensity command. The selected energy level is effective in all printing conditions, including Online host-driven plotting and printing, and Offline Paper Feed and Self-Test print/plot patterns. The following table summarizes media types and the resultant speed limits.

**Table 9 Media Characteristics**

| **Type Designation** | | **Energy Level** | **Maximum Speed * inch/.sec, (mm/sec)** | **Application** |
|---|---|---|---|---|
| **Roll** | **Fanfold** | | | |
| R01 | Z01 | Draft | 2.0, (63) 4.1(126) | Lightweight, Non-top-coated papers. |
| R02 | Z02 | Report | 2.0, (50) 4.1(126) | Heavier, Non-top-coated papers<br>Light, Top-coated papers. |
| R03<br>F01 | Z03 | Premium paper,<br>Translucent Film | 2.0, (50) 4.1(126) | Heavy top-coated papers.<br>Opaque Synthetic and High Speed Films |
| F02 | | Transparent Film | 1.0, (38) 2.0(50) | Most Film media |

* The left column values are for the ST261S and the right column values are for the ST261H.

There are two commands that affect energy level, **Media Type** and **Print Intensity**. The Print Intensity command modifies the base energy level from 70% to 150% of its nominal value

### 7.3 Test Pattern Selection

Choices Available:

Grid
Lines
Waveform
Narrow Band
Zigzag

The user may select the test pattern, which is to be output upon actuation of the **SELF-TEST** key in the Offline State. A momentary press of this key starts the plot. A second momentary press of the key also stops the plot. Some patterns also will terminate after a certain length of output. Available patterns are:

- **Zigzag** pattern consists of a filled pattern, which presents a variable dot load on the printhead in order to perform a worst case imaging density test. Once started, this pattern runs until stopped by the keypad.
- **Grid** pattern plots an 8.5 inch wide by 20 inch long rectangular grid if "inch" units have been selected, or 500 mm long if metric units have been selected. This pattern is useful for checking chart calibration accuracy. The pattern runs by itself just over 20 inches (50.8 cm) or 500 mm, for metric measure, but it may be terminated early by the SELF-TEST key.
- **Lines** pattern plots one of every 8 dots across the entire active span (1728 dots or 216 mm) of the printhead. The pattern is repeated vertically for approximately 0.15 inch (3.8 mm), then shifted by one dot. The sequence is repeated indefinitely, thus testing every dot in the active span of the head. Non-printing dots are obvious because of the resultant interruption of the pattern. It is normal to see miniscule skips and dropouts in these lines because of the fineness of the dots and graininess in the media. Operating at the highest Energy Level setting can mitigate this. Once started, this pattern runs until stopped by the SELF-TEST key.
- **Narrow Band** pattern plots a cycling band of squares, each with its own internal pattern of on/off dots, in both horizontal and vertical axes. Atlantek Inc. uses this pattern for testing purposes.
- **Waveform** pattern plots a sequence of horizontal waveforms with shade filled peaks. This pattern runs for approximately 32 inches (81 cm), then stops by itself, but it may be terminated early by the SELF-TEST key.

### 7.4 Chart Speed Limiting

The user has the ability to place a maximum limit upon chart output rate through the use of a configuration parameter. The plotter is capable of adapting to variable data rates from the host system without loss of data or the introduction of gaps in the plotted output. However, when large speed fluctuations result from discontinuous host data flow, some density variations may be noticed. For the most demanding applications, the user may choose to limit the maximum chart output rate in order to eliminate these variations. Note that since the chart speed is controlled in discrete step values, the actual speed limit will be the next lowest discrete speed from the one requested. The command reply value will be the actual speed limit value and not necessarily the requested value.

The speed limit imposed by this configuration is effective in all Online print/plot output, excluding blank media feed. Offline state Paper Feed and Self-Test may also be limited by this parameter depending upon the state of another control, the Self-Test Speed Control. (see Section 7.XX).

### 7.5 Form Feed Length

Form feed advance distance can be configured using this parameter. Form feed is actuated through the host interface by command Esc F F D. A quick press of the FEED key may also actuate form feed while in the Offline State. The value of this command affects only roll media and does not change the feed length of fanfold media, which uses the top of form cue mark.

### 7.6 Default Power-Up State Control

This selection allows the user control of the state into which the plotter shall normally proceed following Initialization. As described in Section 6.1 – Initialization, the plotter can be configured to proceed into either Online of Offline State, in accordance with the selection invoked by this configuration item.

### 7.7 Cue Mark Distance

This selection allows the user to set the distance from the leading edge of the cue mark to the fold for fan fold media. The units are in inches or millimeters as determined by the Display Units command. The actual value entered may need to be slightly greater or less than the measured distance as determined by test results and personal preferences.

### 7.8 Media Used Counter and Media Left Counter

The Media Used Counter is the value of media used since last being reset. The Media Left Counter is the value of media remaining since last being reset. The units are consistent with that set by the Display Units command in either feet of meters. For the correct value to be displayed, these counters must be reset to correct values whenever the media is replaced. The Media Used Counter is reset to zero. The Media Left Counter must be set to the length of the media being installed If the Media Left Counter displays a negative number or an unusually large value, it indicates that the value was not set properly and the counter has wrapped around past zero.

### 7.9 Chart Distance Calibration

The plotter can be calibrated for a chart distance accuracy of +/- 0.5% when using film media. Due to the dimensional variability of paper with humidity and temperature, this feature does not apply to plots on paper media. Four commands are involved with chart distance calibration:

**Units**

**Chart Cal Test Uncompensated**

**Chart Cal Test Compensated**

**Chart Cal Value**

The Units configuration parameter selects either inch or millimeter measurements and affects the length of the test plot and the interpretation of the chart calibration value.

Pressing and holding the front panel TEST button for longer than 2 seconds may trigger a chart calibration test plot including compensation.

#### 7.9.1 Chart Calibration Procedure

1. Install the film media for which the plotter is to be calibrated. It is important to calibrate with the media that will be used for the final plot since variations in thickness and surface finish from one type of media to another cause step size variations.
2. Set the Units if not already configured as desired. Select inch or millimeters depending on the desired result using the **Units** command.
3. Trigger a chart calibration printout without compensation by sending the **Chart Cal Test Uncompensated** command.
4. Measure the length of the test plot. It should be close to 20 inches or 500 millimeters depending on the units selected. For inches, measure to the nearest 1/64 of an inch and write the decimal equivalent to three decimal places. For metric units, measure to the nearest tenth of a millimeter and write the decimal equivalent to one decimal place.
5. Send the measured distance value to the plotter using the **Chart Cal Value** command.

6. Send the **Chart Cal Test Compensated** configuration command to trigger a chart calibration test plot.
7. Measure the length of the test plot. It should be either to 20 inches +/- 1/32 inch or 500 millimeters +/- 0.5 mm depending on the units selected. If this tolerance is not met, repeat the procedure beginning at step 3 and measure more carefully.
8. The plotter normally holds calibration within 0.1 inch on the 20 inch test or 2.5 mm on the 500 mm test over a period of time and temperature. If the plotter can not maintain this, consider cleaning the drive platen and printhead or a problem with the media.

### 7.10 Print Parameters after Reset

This flag can be set to cause the parameters and configuration to print on the chart after each reset, as at power on and after the Reset command. It is useful in debugging plotter settings. Normally set off.

### 7.11 Reset to Defaults

This command causes all settable parameters to be reset to factory defaults. It is useful in debugging b y setting the parameters to known valid states.

## 8. Configuration – Service

The parameters listed below are of interest to those who may be called upon to analyze plotter internal functions as would be required for servicing. For the most part, parameters are read-only and should be considered as status reports and not, as the nomenclature might suggest, “Configuration” as such. Sending the corresponding escape sequence command through the serial port connection and displaying the returned value on a terminal accesses each parameter.

### 8.1 Printhead Resistance

This is the average dot resistance of the printhead, which is stored in the plotter memory at the time of manufacture or when the printhead is replaced at the factory or authorized service center. This value is used by the plotter to set the nominal dot energy for the particular printhead that is installed.

### 8.2 Total Printed Lines Counter

This is the total number of dot lines printed by the plotter since its manufacture.

### 8.3 Film Printed Line Counter

This is the total number of dot lines printed when the plotter is configured for film media.

### 8.4 Paper Printed Line Counter

This is the total number of dot lines printed when the plotter is configured for paper media.

### 8.5 Media Distance Counter

This is the total number of dot lines of media moved by the printer since its manufacture.

### 8.6 Printhead Temperature

This is the temperature of the printhead in degrees Celsius.

### 8.7 Software Version

This returns the firmware version. This is useful in determining which features are supported and the need for firmware updating.

### 8.8 Printhead Serial Number

This number is assigned when the plotter is manufactured and is used for warranty tracking purposes.

### 8.9 Unit Serial Number

This number is assigned when the plotter is manufactured and is used for service assistance and warranty tracking purposes. It takes the form YYMMNNN.

### 8.10 Unit Model

This value indicates the base model plus any variations and factory installed options.

### 8.11 Firmware Update

The firmware for the ST-261 is contained in a flash ROM that may be reprogrammed in the field. The new firmware files are available on the Atlantek Inc internet web site www.atlantekinc.com, on floppy disk, or by email. Installation of the update file requires either the Atlantek Windows driver or a utility program from Atlantek. Follow the instructions with your software package. Note that if the update is improperly done, the plotter may be nonfunctional and require reprogramming at the factory.

# 9. Accessories

## 9.1 Media

Atlantek stocks a variety of media types for different requirements. All the Atlantek supplied media has been selected and tested for superior performance of printing and printhead life in Gulton and Atlantek plotters. The following table summarizes these types.

## 9.2 Printer Drivers

Printer drivers for Microsoft Windows are available from Atlantek. These drivers send data to the computer parallel port and allow access to most configuration commands through the serial communications channel.

**Table 10 Thermal Media Reference**

| **Media Type** | **Atlantek Part No. See Note below** | **Description** |
|---|---|---|
| Draft | Roll 747086-x<br>Fan-fold 747087-x | Facsimile Grade Paper<br>Non-top-coated |
| Report | Roll 747088-x<br>Fan-fold 747089-x | Heavier Grade Paper<br>Non-top-coated |
| Premium | Roll 747xxx-x<br>Fan-fold 747xxx-x | Heavier Grade Paper<br>Top-coated |
| Translucent | Roll 747xxx-x | Synthetic plastic media with velum-like appearance |
| Film | Roll 747090-x | Synthetic clear media |

The "-x" generally signifies the media length in feet. Some media is available in more than one length.

- **Draft** grade media is a general purpose, lightweight media for use in high speed, continuous plotting applications and for high volume check plotting. Draft grade paper produces a high contrast black image on a smooth, bright white background which may be marked with black or colored pencil. This media allows the fastest print speeds.

- **Report** Grade media is the ideal paper for applications where are retained and more heavily handled. Report grade paper utilizes a thicker base stock, approximately 20% heavier weight than Draft grade, that is less susceptible to wrinkling and folding. Report grade paper may also be marked with a pencil.

- **Premium** grade media, the best paper-based material, will produce exceptionally bright, crisp, high-contrast images on easy-to-handle heavyweight stock. In addition, Premium grade is fabricated with a protective top-coating, which makes the plot impervious to scratching and staining. The top-coat reduces the sensitivity somewhat, thus requiring plotter operation at a higher Energy Level and slower maximum print speed.

- **Translucent** synthetic media is a plastic-based, medium weight material that produces superior plot quality at reasonable plotting speeds. Like Premium grade paper, Translucent media will not scratch or finger mark and will conduct light, making this ideal for plot data comparisons on a light table, and for making diazo copies.

- **Film** synthetic media, is similar to Translucent except for being optically clear. It has superior handling and marking qualities and is ideal for making diazo copies. Film media requires operation at the highest Energy Level to attain good blush characteristics which necessitates slower print speeds..

# 10. Service

## 10.1 Major Functional Components

1. **Thermal Printhead:** This is the major component of the plotter. Its function is to generate localized heat patterns along a contiguous linear array of dots such that the desired image is formed on the media. The image is formed one horizontal line at a time. The printhead receives logic signals from the Controller Board and print power from the Power Distribution Board.

2. **Mechanism:** This provides the necessary critical alignment between the Printhead dot line and the Platen roller, such that best image quality results. In addition, the mechanism provides support for the media supply roll or fan-fold pack, and a means for the user to thread media.

3. **Controller PC Board:** This printed circuit board provides the electronic logic for interfacing with the host system, front panel indicators and buttons, driving the printhead, and controlling the chart motion through the Stepper Motor. This board is on the right-hand side and is visible with the cover removed.

4. **Power Distribution PC Board:** This printed circuit board provides a low impedance coupling path between the Print Power Supply and the Printhead. Electronic solid state relay components are incorporated here for the purpose of controlling power to the printhead and enhance correct power up/down sequencing to safeguard the Printhead. This board is located just behind the printhead and is recognizable as having large cylindrical electrolytic capacitors mounted on it.

5. **Print Power Supply:** This provides approximately 24 V dc for driving the Printhead, Stepper Motor, and the 5 Volt down-converter for the system logic. The output voltage is adjustable and must be set to 24.0 Volts dc, +/- 0.25Vdc.

6. **Stepper Motor:** This provides the mechanical drive for the Platen roller, as coupled through a cog belt. It is located on the left-hand side of the mechanism behind the printhead. The Controller Board electrically drives the Stepper Motor.

7. **Sensors:** Optical sensors as outlined below serve to protect internal components against stress operating conditions. The Controller Board manages all of these sensors.

    A. **Printhead Lift Sensor:** This is an infrared reflective type sensor, located on the right-hand side with the printhead lift mechanism. This ensures that the printhead is engaged in the print position for printing to take place.

    B. **Out-of-Media Sensor:** This is an infrared reflective type sensor that is mounted on the back side of the media compartment door facing the paper chute. It is intended to halt print/plot in the event that media is consumed. This sensor also detects the top-of-form cue mark.

## 10.2 Removal / Replacement Instructions – Desktop and Rack Mount Units

These instructions provide information for removal / replacement of components, especially those whose removal may not be obvious to the service person. Generally, installation can proceed in the reverse order of removal.

**1. Top Cover:**
Remove six screws, three on the left side and three on the right side, then lift the cover off.

**2. Front Panel:**
Remove the top cover first. The front panel is held to the chassis with four screws.

**3. Printhead:**
See section 10.4 Printhead Service./

**4. Controller Board:**
The Controller Board is mounted to the right side plate with nine screws. Unplug all cables from the Controller Board and remove the mounting screws.

**5. Power Supply:**
The power supply is held to the rear panel with five screws. Loosen the power connections on the power supply terminal block before removing the supply.

**6. Stepper Motor:**
The stepper motor is held to the left side plate by four screws. Unplug the stepper motor cable from the controller board. Loosen the motor mounting screws. Remove the drive belt. Fully remove the motor mounting screws and remove the motor.

**7. Platen Roller:**

**8. Power Distribution Board:**
The Power Distribution Board is mounted to its support with 4 screws. Unplug the cables before removing the screws.

### 10.3 Power Supply Adjustment / Configuration

The plotter cover must be removed for this adjustment.

*Input Voltage Configuration*: The input voltage selection is made by means of a slide switch on the top side of the Power Supply. Select 110 or 220 as required.

*Adjustment:* The output adjustment potentiometer for this supply is located near the output terminals and is accessible with a screwdriver from the left side. With the plotter powered-up and not printing, the output voltage should be set for 24.0 Volts dc +/- 0.25 Vdc.

***CAUTION:*** Power Line Voltage is present on the same terminal block as the 24 volts.

### 10.4 Printhead Service

#### 10.4.1 Printhead Replacement

If the printhead on the Model ST-261 should require replacement, first make note of the Odometer Length Count as outlined in section 8. These numbers should be recorded in the table following this section so that valid usage figures on the replacement head can be determined at a later time. Before removing the printhead, make a configuration parameter printout on the chart and send this with the defective printhead to the factory. Note that the Control Board non-volatile RAM stores all pertinent configuration data for the plotter in which it is installed, including unit serial number, printhead serial number, and odometer readings. If the controller board is moved to another plotter, the data will not correspond to the new printer and it may be difficult to determine the warranty status for future repairs. All units returned to the factory for service will have the data properly updated and maintain the correct warranty status.

1. Before removing the printhead, power-down the plotter and disconnect it from the power line.
2. Remove six screws, three on each side of the cover, then slide the cover off.
3. Remove the front panel.
4. Remove the two front screws of the printhead pressure strut.

5. Loosen the two rear screws of the printhead pressure strut. The plate will pivot on these screws and be pushed upwards by the four printhead pressure springs. Lift the plate and remove the springs.
6. Unplug the printhead power and data cables from the printhead.
7. Remove two screws, one on each end of the printhead pivot shaft. Lift the printhead and support bracket assembly out the front of the plotter.
8. Remove the two screws holding the printhead pressure strut to the printhead and remove the printhead.
9. Reassemble the parts in the reverse order.

### 10.4.2 Printhead Alignment

The printhead alignment may need to be adjusted after printhead removal and replacement, or any time that an unevenness in printing is seen and cleaning the printhead does not correct it.

Correct printing requires that the printhead dot line be in full contact with and parallel to the platen drive roll. Two screws, one on each end of the printhead pivot shaft control this alignment. This adjustment requires the cover to be removed and the unit powered to print a test pattern.

## 10.5 Controller Board Sensor Adjustment

The Controller Board is equipped with a potentiometer to adjust the sensitivity of the paper sensor for optimum reliability over a broad range of different media, which may be used in Gulton and Atlantek plotters. This potentiometer R3, is located in the upper left quadrant of the Controller Board. This must be adjusted whenever a media sensor or Controller Board is changed in the field.

### 10.5.1 Principle

The media monitoring function is performed by a reflective optical sensor mounted on the rear face of the media compartment door. During normal operation, the media web is drawn taut in front of this sensor, thus providing sufficient optical reflection to generate a signal that can be sensed by the logic circuitry. This sensor component includes both emitter and detector elements. Since it operates in the infrared band, it comes equipped with a visible light filter to minimize the effects of ambient lighting. The sensor detector element is designed to pass a current level proportional to the light amplitude sensed. A simple resistive element changes this current to a voltage signal for use.

It is the nature of these sensors to exhibit a wide unit-to-unit variation in current output for a given reflectivity. For this reason, along with the wide variety of media that may be employed in Gulton Plotters, the board is equipped with a potentiometer that may be adjusted to normalize the sensor voltage response and thus obtain reliable media sensing. Recommended signal levels at potentiometer R3 are:

- “Light” condition (media present), 0.8 V max.
- “Dark” condition (media out), 4.0 V min.

### 10.5.2 Procedure

NOTE: Only qualified service personnel should make this adjustment. Misadjustment of this setting may cause the plotter to stop printing due to a false out-of-media condition or not sense a true out-of-media condition thus causing damage to the printhead, drive platen, and other components. Such abuse due to misadjustment is not covered by the warranty.

### 10.6 Troubleshooting

**Table 11 Troubleshooting**

| Symptom | Possible Causes | Recommendations |
|---|---|---|
| No lamps at power-up | No AC Power source.<br>Defective Line cord.<br>Voltage configuration incorrect.<br><br>Fuse blown.<br><br><br>Defective power switch.<br>Defective power supply.<br><br>One or more cables disconnected.<br>Controller board defective. | Check power.<br>Replace line cord.<br>Check selector switch on power supply.<br>Fuse inside power supply is not field replaceable. Fix cause before replacing.<br><br>Check power supply output +24V.<br>Check all cables.<br>Return plotter for service. |
| Media-Out Alarm even though media is installed | Media Sensor not plugged into Controller Board.<br>Defective Media sensor or cable.<br>Improper sensor adjustment.<br>Defective Controller Board.<br>Clear media in use. | Check connections.<br><br><br>Adjust sensor per procedure.<br><br>Adjust sensor per procedure. |
| Host indicates that Plotter is Busy, Offline, or Out-of-Media | Plotter not in Online state.<br>Media door open.<br>Host data cable poor connection.<br>Incorrect interface configuration.<br>Defective host data cable.<br>Defective Controller Board. | Put Online.<br>Close door.<br>Repair cable.<br><br>Repair cable.<br>Repair Controller Board. |
| Host plot data garbled but Self-Test plot okay. | Incorrect plot/print byte count configuration.<br>Defective host data cable.<br>Defective Controller Board. | Correct byte count.<br><br>Repair cable.<br>Repair Controller Board. |
| No plot/print in both Self-Test and Host Plot/Print. | Wrong media in use.<br>Media installed incorrectly.<br>Power feed wires not installed between Power Distribution Board and Printhead.<br>Defective Power Distribution Board.<br>Power Distribution Board not connected to Controller Board. | Install correct media.<br><br>Check wires.<br><br><br>Replace Power Distribution Board.<br>Check connections. |
| Light plot/print in both Self-Test and Host Plot/Print. | Wrong media in use.<br>Energy Level too low for media.<br>Printhead misaligned.<br>Defective Printhead.<br>Defective Controller Board.<br>Power Supply voltage adjusted too low. | Use proper media.<br>Increase print intensity.<br>Align printhead.<br>Return plotter for service.<br><br>Check 24 volt supply. |
| Vertical bands (gaps) in plotted output for both Self-Test and Host Plot. | Dirt on Printhead.<br>Poor quality media.<br>Printhead misaligned.<br>Defective Printhead.<br>Defective Controller Board. | Clean printhead.<br>Use recommended media.<br>Align printhead.<br>Return plotter for service.<br>Return plotter for service. |
| Entire plot width drops out in horizontal band when plotting full width zigzag pattern. | Defective Power Supply.<br>Defective Power Distribution Board. | Replace Power Supply.<br>Replace Power Distribution Board. |

| | | |
|---|---|---|
| Incorrect chart length calibration. | Calibration setting incorrect.<br>Media slipping.<br><br>Platen defective.<br>Incorrect drive belt pulleys installed. | Recalibrate chart.<br>Check printhead pressure; Clean drive platen.<br>Replace drive platen.<br>Check pulleys. |
| Horizontal density “banding” noticed during start/stop plotting conditions. | Belt loose. | Try reducing speed limit to reduce variation. |
| Media tracking problems. | Poor quality media.<br>Printhead pressure too high.<br><br><br>Media incorrectly installed. | Use recommended media.<br>Check for even printhead pressure; check printhead springs; check for mechanical binding and cable routing near printhead.<br>Install media correctly. |
| Plotter output speed is lower than expected. | Energy Level set too high.<br>Wrong Media Type configuration.<br>Speed Limit invoked needlessly.<br>Host data transfer rate is limiting speed.<br>High Temperature shutdown is in effect. | Reduce Print Intensity.<br>Select correct Media Type.<br><br>Increase speed limit.<br>Check host and application program.<br>Read printhead temperature with command. |
| Failure to retain Configuration through power-down period. | Defective Controller Board. | Return plotter for service. |
| | | |

# 11. Options

Several options are available for the ST-261 plotter. Some of these are factory installed only.

## 11.1 Versatec™ Interface

An optional factory installed interface is available to emulate the Versatec™ plotters. An additional 37 pin D connector is on the rear panel. The interface can be setup for single ended or differential input. The IEEE 1284 interface is inactive when the Versatec™ interface is active, therefore any configuration commands must be sent through the serial port.

### 11.1.1 Parallel Interface Signals

The plotter connects to a host system via a male 37-pin D connector. The connector mounted on the plotter has pin contacts (DB-37P). The electrical interface is factory set for differential (ling lines) configuration, but may be configured for TTL (single ended).

**Table 12 Versatec™ Interface Connector Pin Assignment**

| D Connector Pin Number | SIGNAL MNEMONIC | |
|---|---|---|
| | TTL | DIFFERENTIAL |
| 1 | IN1 | IN1+ |
| 20 | DGND | IN1- |
| 2 | IN2 | IN2+ |
| 21 | DGND | IN2- |
| 3 | IN3 | IN3+ |
| 22 | DGND | IN3- |
| 4 | IN4 | IN4+ |
| 23 | DGND | IN4- |
| 5 | IN5 | IN5+ |
| 24 | DGND | IN5- |
| 6 | IN6 | IN6+ |
| 25 | DGND | IN6- |
| 7 | IN7 | IN7+ |
| 26 | DGND | IN7- |
| 8 | IN8 | IN8+ |
| 27 | DGND | IN8- |
| 9 | CLEAR.L | CLEAR- |
| 28 | DGND | CLEAR+ |
| 10 | PICLK.H | PICLK+ |
| 29 | DGND | PICLK- |
| 11 | READY.L | READY- |
| 30 | DGND | READY+ |
| 12 | PRINT.H | PRINT+ |
| 31 | DGND | PRINT- |
| 13 | RESERVED | DGND ** NOTE 1 ** |
| 32 | ** NOTE 2 ** INOP.H | INOP- |
| 14 | RE+SERVED | RESERVED |
| 33 | DGND | RESERVED |
| 15 | RESET.L | RESET- |
| 34 | DGND | RESET+ |
| 16 | RFFED.L | RFFED- |
| 35 | DGND | RFFED+ |
| 17 | REOTR.L | REOTR- |
| 36 | DGND | REOTR+ |
| 18 | RLTER.L | RLTER- |
| 37 | DGND | RLTER+ |
| 19 | INOP.H ** NOTE 2 ** | INOP+ |

Notes:

"**DGND**" is logic common "ground". It is internally connected to the plotter frame and from there to the AC power earth terminal on the power input connection.

1. (**Differential interface only**) Pin13 is available for joining Digital Ground between plotter and host. If this is knot desired, removing Jumper Shunt JPxx on the option PC board assembly can break the connection.

2. (**TTL interface only**) These pins carry identical INOP.H (Low = Online, High = Offline) status outputs. According to the published Versatec™ TTL interface specifications, Pin 32 is expected to be "ONLINE.L" output, and Pin 19 is expected to be a "NOPAPER.H" output. For installations that follow this, a direct connection should yield acceptable results.

The differential format is always preferred for a reliable host to plotter interface. We advise against employing the TTL interface for cable runs over 25 feet (7.6 m). If the TTL interface must be used, make sure that the interconnecting cable is constructed with each signal wire paired with its adjacent **DGND** contact in twisted pair configuration. (pin 1 with pin 20, pin 2 1ith pin 21, etc., up to pin 18 with pin 37; pin 19 need not be paired). This cable construction is also recommended for the differential interface. A continuous cable shield, terminated to the connector metal shells at each end is also recommended both to reduce EMI emissions and susceptibility to outside interference.

**Table 13 Versatec™ Interface Signals and Functions**

<table>
<tr><th>Signal</th><th colspan="2">Function</th><th>TTL Active Level</th><th>Source</th></tr>
<tr><td>IN1</td><td>Parallel Input Data (LS Bit)</td><td rowspan="8">Plot Polarity<br><br>True = Black<br><br>False = White</td><td rowspan="8">High = True<br><br>Low = False</td><td rowspan="15">Host</td></tr>
<tr><td>IN2</td><td>Parallel Input Data</td></tr>
<tr><td>IN3</td><td>Parallel Input Data</td></tr>
<tr><td>IN4</td><td>Parallel Input Data</td></tr>
<tr><td>IN5</td><td>Parallel Input Data</td></tr>
<tr><td>IN6</td><td>Parallel Input Data</td></tr>
<tr><td>IN7</td><td>Parallel Input Data</td></tr>
<tr><td>IN8</td><td>Parallel Input Data (MS Bit)</td></tr>
<tr><td>PICLK</td><td colspan="2">Parallel Input Clock False-to-True)</td><td>High = True</td></tr>
<tr><td>PRINT</td><td colspan="2">True = Print; False = Plot</td><td>High = True</td></tr>
<tr><td>RLTER</td><td colspan="2">Line terminate command</td><td rowspan="5">Low = True</td></tr>
<tr><td>RFFED</td><td colspan="2">Line term w/ Form Feed command</td></tr>
<tr><td>REOTR</td><td colspan="2">Line term w/ EOT command</td></tr>
<tr><td>CLEAR</td><td colspan="2">Line term w/ Buffer Clear</td></tr>
<tr><td>RESET</td><td colspan="2">Interface Reset</td></tr>
<tr><td>READY</td><td colspan="2">True = Ready to receive byte</td><td>Low = True</td><td rowspan="2">Plotter</td></tr>
<tr><td>INOP</td><td colspan="2">True = Offline; False = Online</td><td>High = True</td></tr>
</table>

The interface signal functions are as follows:

- **IN1** through **IN8** contain the data to be printed or plotted. These lines are monitored by the plotter with every PICLK. The data line should be changed only when PICLK is false.
- **PICLK**, when true, indicates that a byte of data is ready for transmission to the plotter. This line should go true only when READY is true and INOP is false; otherwise, it will be ignored. When the PICLK signal has been accepted by the plotter, the READY will go false to signal the host to remove PICLK and the data.
- **PRINT**, when true, indicates that the print mode of operation is selected; when false, it indicates that plot mode is selected. The plotter monitors the PRINT signal with every command signal. PRINT should be changed only when PICLK and remote commands are false.
- **RLTER**, when true, indicates that any data in the print or plot buffer is complete and is to be printed/plotted, with accompanying normal chart advance (i.e. no extra feed) for that plot or print line. This line should go true only when READY is true and INOP is false; otherwise, it will be ignored. When RLTER has been accepted by the plotter, READY will go false (i.e. busy) indicating that the host should remove RLTER.
- **RFFED**, when true, indicates that any data in the print or plot buffer is complete and is to be printed/plotted, after which the media is to be advanced in accordance with the Form Feed function, as configured. Response to Form Feed is outlined in Section 7.13 – Form Feed Length. Default action is to feed 2.5 inches (63.5 mm) of chart. This line should go true only when READY is true and INOP is false; otherwise, it will be ignored. When RFFED has been accepted by the plotter, READY will go false (i.e. busy) indicating that the host should remove RFFED
- **REOTR**, when true, indicates that any data in the print or plot buffer is complete and is to be printed/plotted, after which the media is to be advanced in accordance with the End of Transmission function, as configured. Response is outlined in Section 7.14 – End of Transmission Advance Length. This line should go true only when READY is true and INOP is false; otherwise, it will be ignored. When REOTR has been accepted by the plotter, READY will go false (i.e. busy) indicating that the host should remove REOTR.
- **CLEAR**, when true, indicates that any data in the print or plot buffer is to be cleared. Any partial data lines that have been received but yet to be plotted/printed are lost. This line should go true only when READY is true and INOP is false; otherwise, it will be ignored. When CLEAR has been accepted by the plotter, READY will go false (i.e. busy) indicating that the host should remove CLEAR.
- **RESET**, when true for 100 nsec or more, forces the plotter to reset the interface hardware. Any partial data lines that have been received but yet to be plotted/printed are lost. the function is similar to CLEAR except that it is not dependent on the READY signal being asserted in order to be effective. This line is honored by the plotter when in Online state only.
- **READY**, when true, indicates that the plotter is ready to accept a new data byte or command from the host system. READY is set false, to indicate that the plotter is busy, approximately 120nsec after the receipt of an asserted signal from any one of PICLK, RLTER, RFFED, or REOTR from the host system. As soon as READY goes false, the host system should remove the data or command. READY will be brought true after the data or command has been processed and the command from the host has been removed, thus confirming that a new data byte or command may be received. Ready is also set false at start-up and stays false until all of the internal power-on reset processing is completed and the plotter is in Online state.
- **INOP**, indicates that the plotter is inoperable through the host interface for some reason. This could mean that either the plotter is in Offline state or an Alarm conditions exists. If an Alarm exists, a message indicating the cause will be sent to the Virtual Control Panel. INOP will be brought false after the **ONLINE** key has been toggled to put the plotter to Online state, assuming that any problem conditions have been corrected. INOP is also set true at start-up and stays true until all of the power-on reset processing is completed.

### 11.1.2 Handshake Protocol

The plotter uses simple software handshake protocol. Whenever READY is true, the host system is allowed to assert a command signal (one of PICLK, RLTER, RFFED, CLEAR, or REOTR). After a settling delay of approximately 120nsec, the command is accepted and READY is negated. When the host system has detected READY going false, it responds by negating the command. After the internal processing is complete, the interface logic re-examines the command signals and asserts READY, if and when they are all negated. If the host system either fails to negate the command or negates it and re-asserts another command before the READY has been re-asserted, the interface will stay busy forever. The timing diagram in Figure XX illustrates the interaction of the various command and status lines.

Only one command signal should be activated at a time, otherwise the interface may arbitrarily process one and ignore the other. RESET will override any other command signal and will be accepted whenever the plotter is in Online state.

Remote command lines RLTER, REOTR, and CLEAR are polled upon the completion of their assigned functions. If the command signal has not been negated as of this time, (10 microseconds minimum after the negation of READY in response to the command), then an internal trap shall be actuated, the plotter enters the Alarm state, and an alarm message sent to the Virtual Control Panel. The plotter must be power cycled to resume normal function. The most probable cause of this is a faulty host interface system or interconnecting cable. Possibly, this may result from failure of the host driver hardware to initialize promptly with all command signals to the plotter in a negated state.

### 11.1.3 Plot Mode

When used in plot mode, the plotter accepts 8-bit data and plots it as is, (i.e. a dot will be plotted for any bit that is true). The plot line fills from right to left as media exits the plotter. The most significant bit, IN8, is the rightmost bit per byte. The PICLK signal clocks successive data bytes into the plot buffer when the PRINT mode line is false. After the buffer is full, (depending upon the configured Plot Width configuration), the data is automatically plotted and subsequent PICLK's will place data onto the next plot line. Partially full plot buffers can be forced to be plotted by using one of the remote commands (RLTER, RFFED, or REOTR) or via a mode change (refer to "Mode Changes" for more information). A remote line terminate, RLTER, immediately following an automatic Full Buffer line termination is ignored.

- Plot line termination occurs upon:
- Full Buffer (number of bytes depends upon the configured Plot Width)
- RLTER line assertion
- RFFED line assertion
- REOTR line assertion
- Mode change from plot mode to print mode (recognized upon PICLK assertion)