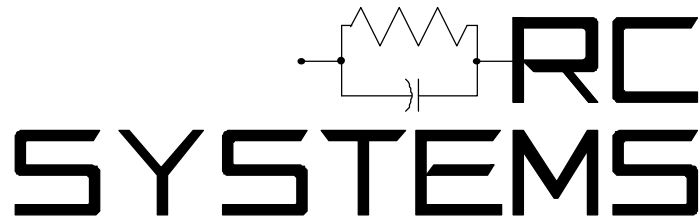


*ST-71 GUI Users Manual*  
*Revision 1.0*



**INSTRUCTION MANUAL**  
**R.C. SYSTEMS CO. INC.**  
**MODEL ST-71 GUI SOFTWARE**  
**(Revision 1.0)**

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## SECTION 1

### 1.0 GENERAL DESCRIPTION

**IMPORTANT!** This manual is written with the assumption readers are already familiar with ST-71 Controller operation and features.

The R. C. Systems Co. Inc. ST-71 GUI (*Graphic User Interface*) is Windows® based software designed to run on a personal computer (PC) and communicate to either one, or, two ST-71 16 Channel Controllers via the controller's RS-485 Modbus® serial interface. This allows as many as 32 points of monitoring by the GUI. PC's not equipped with an internal RS-485 interface will require an external RS-485 / RS-232 Isolating Converter such as the 10-0177 offered by R. C. Systems Co. Inc.

An optional telephone modem may also be connected at the ST-71 Controller allowing communications over phone lines. The controller's modem may be wired to autodial to the PC's modem upon an alarm event, and / or, the GUI may be configured for manual dialing out to the controller's modem as desired by an operator. An *events recorder* logs alarms and other system events that may be printed as they occur by connecting a dot matrix printer to the PC's printer port. MIN, MAX & AVERAGE and alarm event data are stored on the PC's hard drive in historical *day files*.

### 1.1 GUI DATA DISPLAY SCREENS

The GUI is capable of displaying up to 32 channels simultaneously as bar graphs (Figure 1.0) or 1 channel at a time as 24-hour trends (Figure 1.1.). Both screens indicate status of the controller's horn relay via a horn icon in the lower right area of the screen.

#### 1.1.1 MAIN BAR GRAPHS SCREEN

The most prominent GUI screen displays 16 bar graphs (single ST-71 controller) or 32 bar graphs (dual ST-71 controllers) along with each channel's engineering unit values. An *events* log and control buttons offering access to other GUI screens are also on the main bar graph screen. All active channel values and their alarm status may be viewed simultaneously. Alarms are indicated by color-coding of the bar graph fill levels. Gray indicates no alarm, yellow an alarm 1 and red an alarm 2.

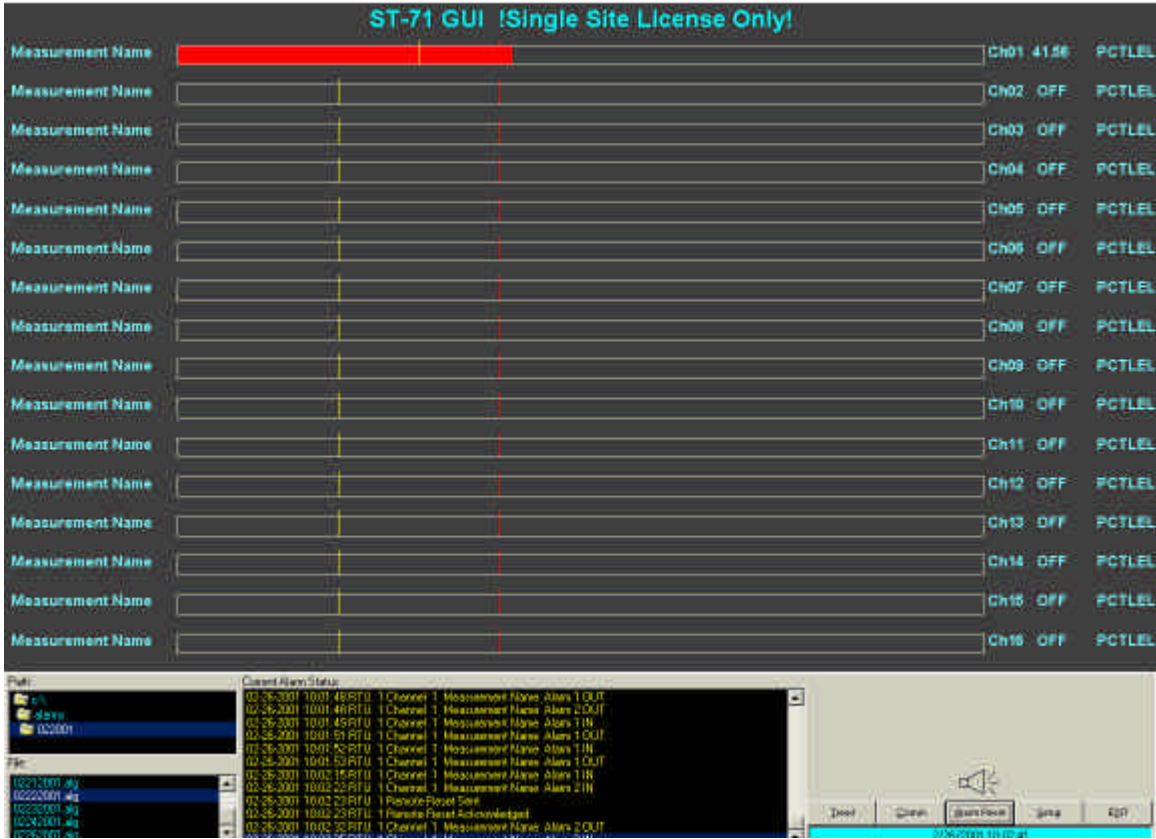


Figure 1.1

The events log window at bottom center may scroll if many entries have been logged during the current period. Yellow text indicates logs from the current day’s open log file. Blue text indicates the operator has opened a historical file from a preceding day by pointing to it in the directory on the left. Any new event automatically switches this window back to the yellow current day’s log file. New events may be printed as they occur to a local dot matrix printer (see section 2.02). Buttons on the bottom right allow switching to the trend screens and activating the setup menu and communications menus.

### 1.1.2 TREND SCREENS

The GUI is capable of displaying either *current* or *historical* 24-hour trends. Both offer MAX, MIN & AVERAGE data with 1/10-hour (6 minute) resolution. *Historical* trend data is presented from the archived *day files* stored on the PC’s hard drive (see section 1.2.1). Historical trends begin and end at midnight of each calendar day. *Current* trend data is stored in the ST-71 controller and may be retrieved at any time, upon demand, by the operator of the GUI. This data comes directly from RAM memory in the ST-71 controller and represents the most recent 24-hour period. *Historical* trends update automatically in real time when viewing the current date’s file. A *Reload/Refresh* button is available to display the latest data. When this button indicates *Reload*, this means the displayed trend is historical data from the hard drive and the current data from the RTU has been temporarily stored in memory. If the button indicates *Refresh*, the displayed

trend is current data from the ST-71 Controller RTU and it may be updated by clicking this button.

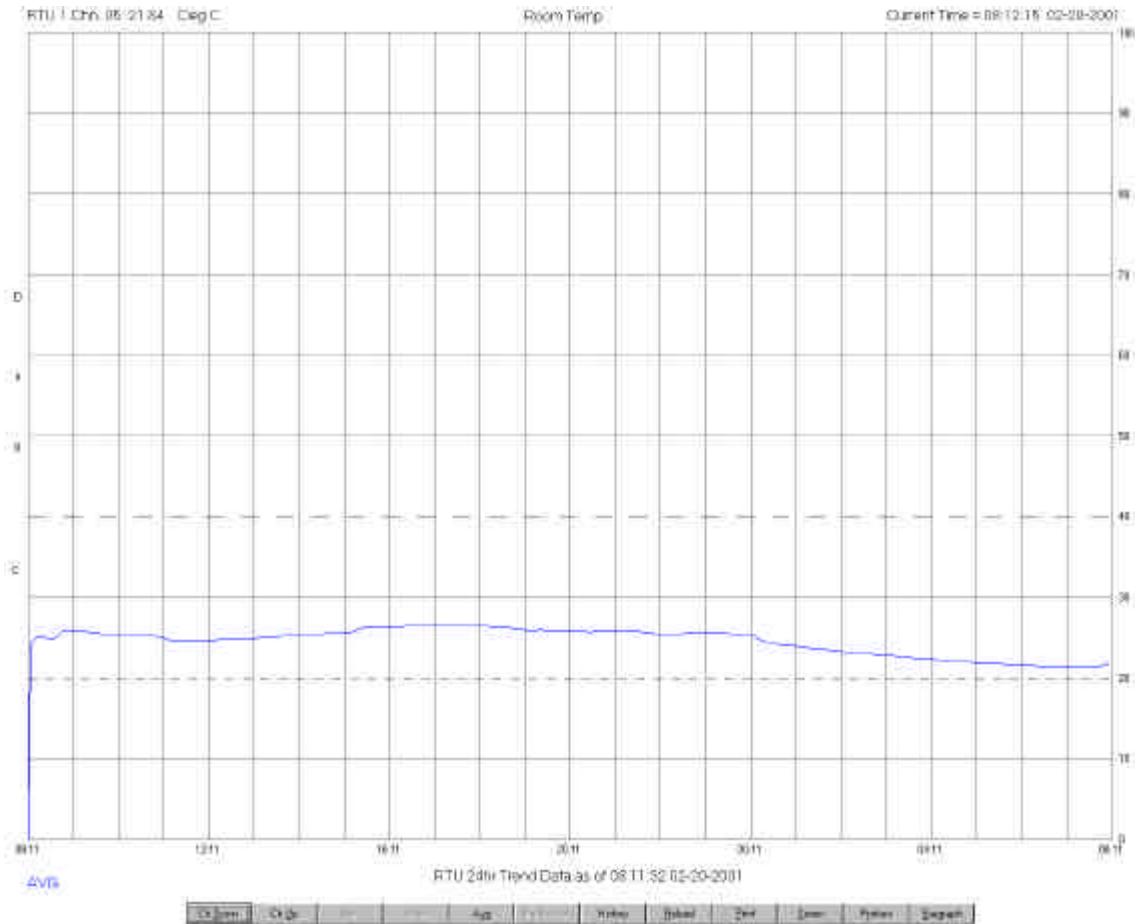


Figure 1.2

Since only one channel is shown per screen the *ChDown* and *ChUP* buttons allow scrolling of channels. *Min*, *Max* and *Avg* buttons indicate which of these variables are available to be presented to the trend screen. The *MinMaxAvg* button presents all 3 to the screen in varying colors (only if all 3 have been loaded). The *History* button brings up the window in Figure 1.3 allowing historical data to be retrieved from the hard drive.

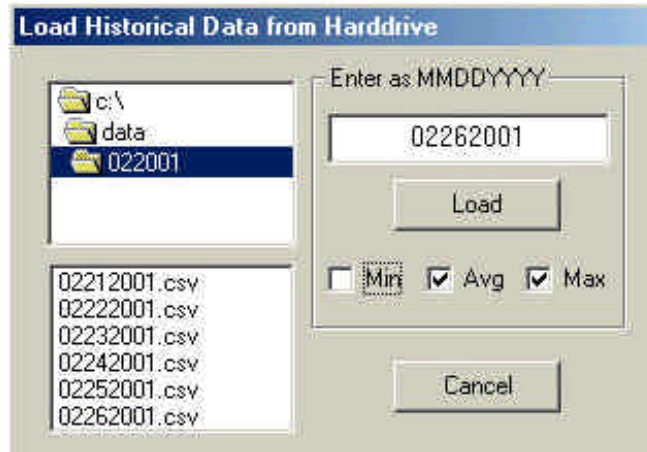


Figure 1.3

The *Print* button causes the graphic trend image to be printed to the printer selected under the *Printers* button. The *Comm* button brings up the window shown in Figure 2.3. The *Bargraph* button returns the GUI to the main Bargraphs screen.

## 1.2 DATA ARCHIVES

The GUI stores monitored data permanently on the PC's hard drive in *day files* in a .csv (comma separated variable) format. The event log file is also stored daily on the hard drive in an .alg text file. Therefore, at midnight of each day one .csv file and one .alg file is closed as new ones begin. If no alarms or other logged events occur during a calendar day that day's .alg file will be empty.

### 1.2.1 .CSV DAY FILES

The .CSV file format is portable into many spreadsheet and data base software packages. The name of each file includes the calendar date with the .CSV extension. Each day's .CSV file is stored in the DATA directory. The time stamp for the data is in seconds but a new data point is only stored each 360 seconds. MIN, MAX & AVERAGE data points are stored for 32 channels. A typical day file consists of 240 lines similar to the two shown below. The first column is the time stamp in seconds, so line 1 contains data collected between 12:00 AM and 12:06 AM. Line 2 is for data between 12:06 AM and 12:12 AM. In the sample below, channels 1 & 2 have data but channel 3 is turned off at the ST-71 controller. Inactive channels are indicated by the MIN, MAX & AVERAGE values all set at 00000. Serial communications problems, or the second controller not connected, will set MIN, MAX & AVERAGE fields at 65535, -32767 and 00000.

TIME	CHANNEL 1			CHANNEL 2			CHANNEL 3			cont'd through CHANNEL 32
	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	
000360	07168	07186	07180	06925	06944	06939	00000	00000	00000	.....cont'd through column 97
000720	07102	07121	07110	06851	06879	06867	00000	00000	00000	..... cont'd through column 97

The data values are 15 bit 2s complement integers with +- 5% over/under range applied. The following equation should be used convert each floating-point value back into its appropriate engineering units.

$$\text{Engrg. Unit Value} = \frac{\text{CSV FP Value} \cdot (\text{Span Value} - \text{Zero Value}) \cdot 1.1}{32767} + \{\text{Zero Value} - [(\text{Span Value} - \text{Zero Value}) \cdot 0.05]\}$$

For example, the 07180 value in the 4<sup>th</sup> column of the top line of the sample above is the AVERAGE for channel 1 between 12:00 and 12:06 AM. If the engineering units for this channel were 0-100 degC (0=Zero Value & 100=Span Value), then plugging 7180 and 0 & 100 into the equation should produce an AVERAGE engineering unit value of 19.10 degC. Give it a try! If the Zero Value is always 0, then the (Span Value – Zero Value) parts of the equation may be simplified to equal the Span Value.

### 1.2.2 .ALG DAY FILES

The .alg daily files are simple text files compatible with most text editors or word processors. Each day's .alg file is stored in the ALARMS directory. A small sample of a log file shown below indicates 2 channels going in and out of alarm 1.

```
02-20-2001 07:48:38 RTU 1 Channel 1 Measurement Name Alarm 1 IN
02-20-2001 07:48:38 RTU 1 Channel 2 Measurement Name Alarm 1 IN
02-20-2001 07:55:38 RTU 1 Channel 1 Measurement Name Alarm 1 OUT
02-20-2001 07:55:38 RTU 1 Channel 2 Measurement Name Alarm 1 OUT
```

If no alarms or other logged events occur during a calendar day, that day's .alg file will be empty.

## SECTION 2

### 2.0 SYSTEM SETUP

Clicking the SETUP button from the bargraphs screen brings up the window shown in Figure 2.0. **IMPORTANT: A SYSTEMS ADMINISTRATOR WITH A DETAILED UNDERSTANDING OF EACH ITEM SHOULD COMPLETE SETUP MENUS.**

#### 2.0.1 CONNECTION SETUP TAB

The **CONNECTION** tab shown in Figure 2.0 allows configuration of variables controlling the serial interface to the ST-71 Controllers. **Port No.** sets which port the PC will utilize for communications to either the modem or the RS-485 interface. **Baud Rate** must match the setting at the ST-71 Controller and is typically 9600 baud. **Connection** may be *Direct*, *Dial Out* or *Dial in*. *Direct* is for RS-485 applications. *Dial Out* allows the operator to enter a phone number and connect to the ST-71 Controllers through modems. *Dial In* means the GUI is waiting for a call from the ST-71 Controller's modem when an alarm occurs at the controller. **Handshaking** is a modem configuration item that controls the handling of data between the GUI and the modem. **Poll Rate** sets how quickly the GUI will ask for another parcel of data. **Timeout** sets how long the GUI will wait for a RTU response before indicating a communications error. RTS and DTS may be required by some RS-232 / RS-485 converters used in Direct Connect

applications. The **Additional Modem String** field allows commands to be sent to the PC's modem that may be required for reliable communications. Commands disabling modem features such as auto baud detect and data compression may be required.

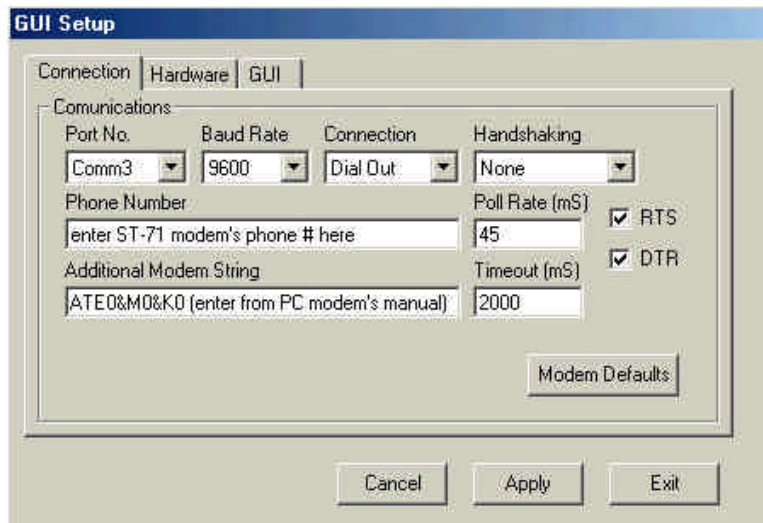


Figure 2.0

### 2.0.1 HARDWARE SETUP TAB

Clicking the **HARDWARE** tab allows setting the GUI to match the ST-71 controller's firmware, if remote alarm resets are allowed from the GUI, and if there is going to be a second ST-71 RTU connected. A check in the **Allow Remote Alarm Reset** box activates the GUI's **ALARM RESET** button on the bar graph screen. This allows acknowledging and resetting of the ST-71 Controller's alarm relays. This action is the same as going to the ST-71 controller and pressing its local **ALARM RESET** button. A check in the **Second RTU** box causes the GUI to look for a second ST-71 Controller. The first ST-71 must have an RTU address of 1 and the second ST-71 must have an RTU address of 2. Checking this box also reformats the bar graph screen for 32 bar graphs instead of 16.

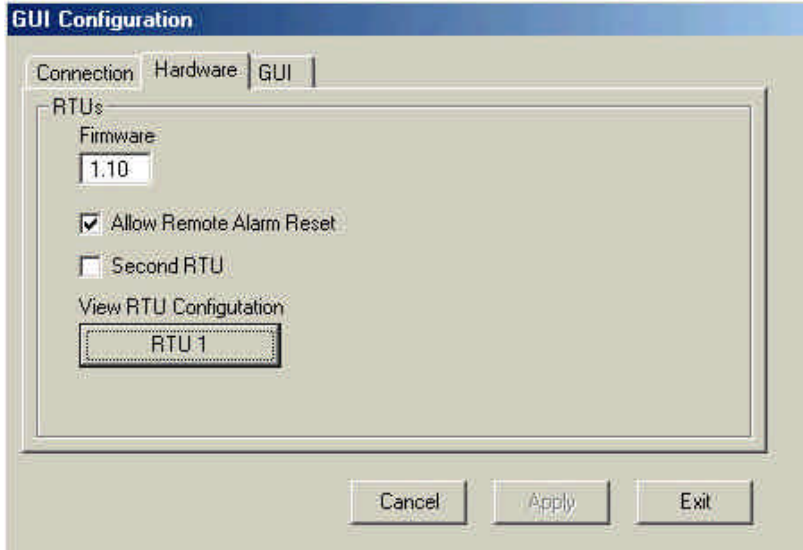


Figure 2.1

The **View RTU Configuration** button causes the GUI to read each controller's ASCII and alarm set-point values and display them on the screen shown in Figure 2.2. This feature is useful for confirming correct settings at the ST-71 RTU's.

The screenshot shows a window titled 'Current Configuration for RTU 1'. It contains a table with 16 rows, each representing a channel (Ch01 to Ch16). Each row lists the channel number, the measurement name, the range (0 - 100 PCTLEL), and the Alarm1 and Alarm2 set-points.

Channel	Measurement Name	Range	Alarm1	Alarm2
Ch01	Measurement Name	0 - 100 PCTLEL	Alarm1 = 30	Alarm2 = 40
Ch02	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch03	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch04	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch05	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch06	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch07	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch08	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch09	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch10	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch11	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch12	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch13	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch14	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch15	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40
Ch16	Measurement Name	0 - 100 PCTLEL	Alarm1 = 20	Alarm2 = 40

Figure 2.2

## 2.0.2 GUI SETUP TAB

Clicking the **GUI** tab allows setting type of trend data retrieved from the ST-71 Controller when the *current* trend data is updated. Some user applications may require **Min, Max & Average** trends while others only the **Average**, taking 1/3 the time to retrieve from the ST-71 serial port. The **Print Alarms** box allows the GUI to print to a local dot matrix printer each time a new event is added to the log file. A dot matrix printer is required for this printout since other types are incapable of printing only a single line of text followed by a carriage return. This printer's driver should be installed and indicated in the **Alarm Printer** box. The customer the GUI is licensed to, the GUI's revision level, and its serial number are also indicated within this window.

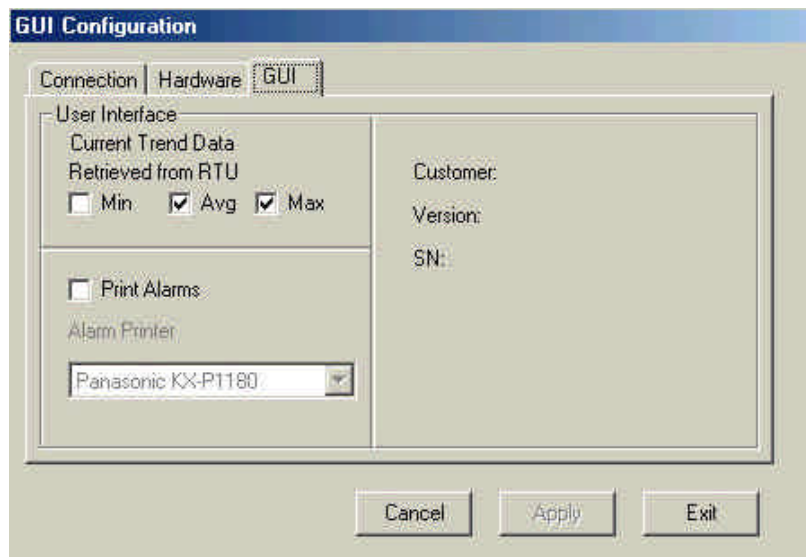


Figure 2.3

## 2.1 COMMUNICATIONS PORT STATUS WINDOW

Clicking the **Comm** button from either the Bar Graphs or Trend screens brings up the window shown in Figure 2.4. The **Transmit Data** field indicates the actual Modbus® message sent from the GUI to the ST-71 Controllers. The **Receive Data** field indicates the Modbus® reply from the ST-71's. Data strings received by the GUI are potentially much longer than those transmitted since large amounts of data may be requested by a short transmitted string. The **Remote Status** fields indicate if communications between the GUI and the ST-71 RTU's are working properly. **ERROR STATUS** is 2 columns of error indicators for each ST-71 RTU. A green indicator beside any variable indicates this is the ST-71 RTU value currently being requested by the GUI. A red indicator indicates the value was not successfully retrieved due to a problem encountered during transmission. The **Re-Initialize** button causes the GUI to retrieve all ASCII and alarm set-point data from the ST-71 RTU's. This data rarely changes in the ST-71 RTU and therefore is only retrieved automatically by the GUI upon start-up and at the bottom of each hour. The Exit button closes this window.

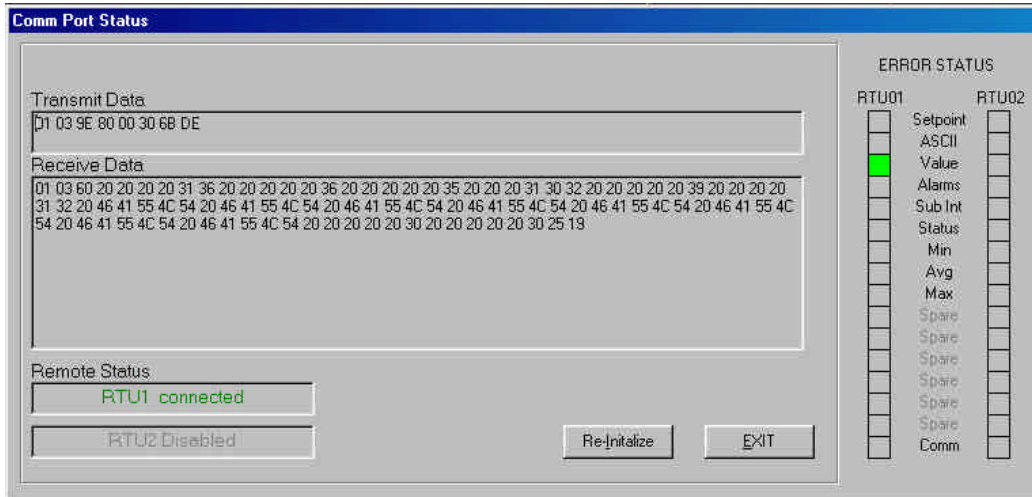


Figure 2.4