General Description of the Remote Gauging System, (RGS)

This real time rain fall data collection system has 78 Field Monitoring Stations that consist of a Remote Terminal Unit (RTU) and rain gauge. The RTU requests rainfall data from the rain gauge every 6 minutes, then stores and forwards that data by radio when polled every 6 minutes by one of 6 Data Concentrator Units (DCUs). The DCUs poll their assigned RTUs in sequence. If an RTU fails to respond to the DCU poll, the DCU will poll that RTU 3 times before going to the next RTU in sequence. After polling each assigned RTU, the DCU forwards the data by microwave link every 6 minutes to the main microwave tower near the San Antonio airport. The data is then sent via internet to the Master Terminal Unit (MTU) server at the EAA main office.

The MTU server operating system is Windows Server 2003. A Supervisory Control and Data Acquisition, SCADA, application from the ClearSCADA / Schneider Electric, Telemetry, and Remote SCADA Solutions runs the MTU and its database 24 hours a day for continuous data collection. MODBUS is the I/O, or messaging, interface for the application.

For the purposes of the CodeFest, the last 2 years of RGS data from ClearSCADA has been exported to MS SQL data tables which replicate the 6 data tables set up in ClearSCADA which contain all the rain gauge readings. The 6 data tables represent the 6 DCU's in use by the EAA, which link to several RTU's.

In each data table, the first column is the "TimeStamp", which the data and time of the RTU reading, which is in Greenwich Mean Time, GMT, and 6 minutes earlier than the current time. The remaining columns represent the 13 poll messages returned from each RTU. The 13 poll messages are described in the chart below. Therefore, if a DCU has 15 RTU's linked to it, then the data table will have 196 columns. Which is 15 RTU's multiplied by 13 poll message plus the TimeStamp column. The data table definitions are described in the additional worksheets for each DCU which are named Bandera, DHanis, GreenMountain, Kyle, SouthFork, and Uvalde.

Note: the "AccDaily" reading is from 12am to 11:54pm. During a rain event, the "AccDaily" reading will accumulate rainfall, in inches, from 12am to 11:54pm, and then reset at 12am each day. However, because the readings are in GMT, to get a true reading of accumulated rainfall in CST, the first 5 hours of accumulated rainfall must be deducted from the reading at 11:54pm, and then reading from 5am from the next day must be added to the accumulated total calculate the actual accumulated daily rainfall.

Reading No	Reading Name	Abbreviation	Description
	Time Stamp	TimeStamp	Time and date of 6-minute reading. The data format is yyyy-MM-dd hh:mm:ss. The timestamp is in Greenwich Mean Time, (GMT).
1	Poll Date	PollDate	The GMT month and numerical day of reading. For example "921" is September 21.
2	Poll Time	PollTime	The GMT hour and minute of the reading, using a 24-hour clock. For example "2354" is 11:54 pm.

3	Daily Accumulation	AccDaily	Accumulation from 12am to 11:54pm. This reading resets at 12am every day.
4	Temperature at rain station	Temp	The temperature inside the rain gauge unit / control panel, which will usually be higher than the outside temperature.
5	6-Minute Intensity	Int6Min	6 minute intensity, inches / hour, (6-minute raw data * 10, because there are 10 readings per hour if polled every 6 minutes)
6	18-Minute Intensity	Int18Min	18 minute intensity, inches / hour.
7	1-Hour Accumulation	Acc1Hr	Accumulation in last 60 minutes.
8	6-Hour Accumulation	Acc6Hr	Accumulation in last 360 minutes.
9	Water Level	Wtrlvl	N/A. Only used when gauges are also recording water levels at wells or damns.
10	24-Hour Accumulation	Acc24Hr	Accumulation in last 24 hours.
11	6-Minute Rise Rate	RR6Min	Rate in inch units that the water in the rain gauge bowel is rising. (The EAA rain gauges do not have a reader installed to record this reading, therefore, these readings are recorded as 0 inches.)
12	Battery Voltage	BVolt	Voltage of the unit as measured in VDC, (Volts Direct Current). The rain gauge station receives it's power from solar panels, therefore, the voltage is higher during the day than at night. An example of a battery with good voltage is 13, and an example of a battery with very low voltage is 10.
13	Error Notification	ErrFlag	Integer value that represents Error Code.