# 泵站RTU传感器驱动代码使用说明

## 串口命令说明

串口AT指令详情见《泵站RTU通信协议V2.0.1（20200221）.pdf》。

历史数据存储实现方案说明：

1. Flash管理引入开源Key-Value数据库：EasyFlash；具有Flash磨损平衡、掉电保护、值类型支持**任意类型、长度无限制**等特性。
2. 使用Key-Value方式存储采集数据；每次采集的数据第一个8字节存储采集时间，采用UTC格式格式(当前时间距离1970年1月1日0时0分0秒的秒数)；后续数据按对应的uartXvariable列表顺序存储；各个485总线的数据分开存储；
3. 每次采集的数据Key命名方式：uXdN；X表示总线编号，取值[1，4]；

N为历史数据编号，范围[1，4096]；只保存最近4096次的采集数据；

1. 历史数据编号N采用FIFO策略：当保存的历史数据条数少于4096条时，N按采集次数顺序递增；当保存的历史数据条数达到4096条后，N重新赋值为1；
2. 使用Key名称history\_fifo\_info来记录当前FIFO记录的【条目个数】、【起始N】、【结束N】。
3. 每条历史数据解析方式：通过配置的uartXvariable、uartXvariablecnt、uartXlength知道变量个数、变量名、变量数据长度，第一个8字节为UTC时间，后续数据按【变量顺序】和【变量数据长度】顺序读取即可。

## 历史数据AT输出和上报格式说明

1. 统一使用JSON字符串格式。
2. 为了避免各路总线变量名同名冲突，每条采集数据按uXdN分组表示。(其中X和N的含义见上一节)。
3. 数据内容采用HEX字符串格式，如：0x01 0x02 0x03 转换成HEX字符串为 “010203”。

## 示例

1、存储数据

uart1variablecnt=5

uart1variable="tem,cod,toc,acer,hello"

uart1length=0x0002 0x0002 0x0002 0x0002 0x0002

u1d1=

uart2variablecnt=5

uart2variable="tem,cod,toc,acer,hello"

uart2ength=0x0002 0x0002 0x0002 0x0002 0x0002

u2d1=

uart3variablecnt=5

uart3variable="tem,cod,toc,acer,hello"

uart3length=0x0002 0x0002 0x0002 0x0002 0x0002

u3d1=

uart4variablecnt=5

uart4variable="tem,cod,toc,acer,hello"

uart4length=0x0002 0x0002 0x0002 0x0002 0x0002

u4d1=

2、上报数据

u1d1:{"tem":""}

2B 67 65 74 68 69 73 74 6F 72 79 64 61 74 61 3A 20 03 13 12 DA B1 FE 74 65 6D FE DA B1 B0 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE DA B1 B0 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 65 6E 64 64 FE 3B 1A BE B0 41 00 00 FE 74 65 6D FE 00 00 FF FF FE 63 6F 64 FE 1A BE B0 41 FE 74 6F 63 FE 00 00 00 00 FE 61 63 65 72 FE 65 6E 64 20 FE 68 65 6C 6C 6F FE 03 20 03 13 FE 3B 20 03 13 11 4A 79 FE 74 65 6D FE 4A 79 9B 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 4A 79 9B 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 DA DD FE 74 65 6D FE DA DD 9B 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE DA DD 9B 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 6A 05 FE 74 65 6D FE 6A 05 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 6A 05 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 0A 30 FE 74 65 6D FE 0A 30 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 0A 30 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 AA 57 FE 74 65 6D FE AA 57 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE AA 57 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 4A 3F FE 74 65 6D FE 4A 3F 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 4A 3F 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 DA A9 FE 74 65 6D FE DA A9 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE DA A9 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 EA AC FE 74 65 6D FE EA AC 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE EA AC 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 2A BF FE 74 65 6D FE 2A BF 9C 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 2A BF 9C 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 DA 29 FE 74 65 6D FE DA 29 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE DA 29 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 7A 51 FE 74 65 6D FE 7A 51 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 7A 51 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 1A 39 FE 74 65 6D FE 1A 39 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 1A 39 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 9A A0 FE 74 65 6D FE 9A A0 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 9A A0 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 5A CB FE 74 65 6D FE 5A CB 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 5A CB 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 5A CB FE 74 65 6D FE 5A CB 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 5A CB 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 7A 17 FE 74 65 6D FE 7A 17 9E 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 7A 17 9E 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 0A FC FE 74 65 6D FE 0A FC 9D 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 0A FC 9D 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 7A 1A FE 74 65 6D FE 7A 1A 9E 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 7A 1A 9E 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 DA 72 FE 74 65 6D FE DA 72 9E 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE DA 72 9E 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 9A A3 FE 74 65 6D FE 9A A3 9E 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 9A A3 9E 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 1A FF FE 74 65 6D FE 1A FF 9E 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 1A FF 9E 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 EA 3B FE 74 65 6D FE EA 3B 9F 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE EA 3B 9F 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 9A 63 FE 74 65 6D FE 9A 63 9F 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 9A 63 9F 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 1A 45 FE 74 65 6D FE 1A 45 9F 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 1A 45 9F 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 CA AC FE 74 65 6D FE CA AC 9F 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE CA AC 9F 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 4A CE FE 74 65 6D FE 4A CE 9F 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 4A CE 9F 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 4A CE FE 74 65 6D FE 4A CE 9F 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 4A CE 9F 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 6A 17 FE 74 65 6D FE 6A 17 A0 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 6A 17 A0 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 2A 48 FE 74 65 6D FE 2A 48 A0 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 2A 48 A0 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 11 9A 26 FE 74 65 6D FE 9A 26 A0 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE 9A 26 A0 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 12 AA 66 FE 74 65 6D FE AA 66 A0 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE AA 66 A0 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 20 03 13 12 BA 6C FE 74 65 6D FE BA 6C A0 41 FE 63 6F 64 FE 00 00 FF FF FE 74 6F 63 FE BA 6C A0 41 FE 61 63 65 72 FE 00 00 00 00 FE 68 65 6C 6C 6F FE 00 00 00 00 FE 3B 0D 0A