1.0 Overview

The new CPU-95 Display (791908-1) module incorporates data logging and a new half-duplex RS485 port that is Modbus RTU compliant.

2.0 Modbus RTU

2.1 Modbus RTU Overview

The CPU-95 Display Module follows the Modicon Modbus RTU standard.

2.2 Aux Port Setup

The Modbus configuration is accessed through the "AUX PORT SETUP" menu. It is found in the setup menu after the "RUN TEST MODE" menu.

```
 AUX PORT SETUP
Next  Esc  Enter
```

To enter the auxiliary port setup menus press "ENTER".
To continue to the datalog setup menu press "NEXT".
To exit press "ESC".

2.3 Aux Port Node Id

```
AUX PORT NODE ID
         1 ↑↓
```

Valid node id's are from 1 to 255.
To change the node id use the "↑" & "↓" keys.
To continue to the aux port mode menu press "NEXT".
To exit press "ESC".

2.4 Aux Port Mode

```
AUX PORT MODE ↑↓
ModBudRTU96008n1
```

To change the mode use the "↑" & "↓" keys.
To return to the aux port node id menu press "NEXT".
To exit press "ESC".
The supported baud rates are:
        300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k.
The supported parity(s) are:
        (n) none, (o) odd, & (e) even.
The only supported data bits is 8 with 1 stop bit.

2.5 Aux Port Diagnostic

By pressing the "DIAG" key on either the "AUX PORT MODE", "AUX PORT NODE ID", or the "AUX PORT SETUP" menu, the "MODBUS ERROR" menu will appear

```
    MODBUS ERROR
       NONE
```

To go to the "AUX PORT SETUP" menu press "NEXT".

To reset the error indicator back to none press "RESET".

To exit press "ESC".

This menu will display the last error reported by the modbus interpreter. The list of errors that are flagged are:

"CRC" the checksum of the incoming data was invalid.

"RCV BUF OVF" the incoming data was greater than 256 bytes.

"UKN FN

"INVALID ADDRESS" the received data contained an invalid address field.

"INVALID DATA LEN" the received data contained an invalid data length field.

"INVALID DATA" the received data contained an invalid data value.

t is currently busy.

"NONE" no errors encountered since last reset.

2.6 Modbus Special Functions

2.6.1   Identification (17):

Query:

NN 17 CRC CRC

NN = node number, 17 = ID function code, CRC CRC = two byte Modbus RTU CRC.

Response:

NN 17 18 00 RC VM Vm M M / D D / Y Y D S P - 9 5 CRC CRC

NN

to follow, RC = Run Condition, VM = Version Major, Vm = Version minor, an ASCII string that is the firmware date, DSP-95 ASCII string indicating the CPU-95 display module, & CRC CRC = two byte Modbus RTU CRC.

RC (run condition) is set to 0 anytime the display loses contact

operation.

VM & Vm are a two digit firmware version (ie 1.0).

2.6.2 Remote Operator Interface (ROI) (100):

Query:

NN = node number, 100 = ROI function code, KP is the single byte "Key Press" from the table below, CRC CRC = two byte Modbus RTU CRC.

"Key Press" Table
00 = NONE (returns current display)

01 = "↑"	02 = "DIAG"
03 = "MAN"	04 = "AUTO"
05 = "↓"	06 = "NEXT"
07 = "TIMING"	08 = "SETUP"
09 = "ESC"	10 = "RESET"
11 = "F2"	12 = "F1"
13 = "ENTER"	14 = "ALARM ACK"
15 = "F4"	16 = "F3"

Response:

NN 100 36 (16bytes 1st line of display) CR LF (16 bytes 2nd line) CR LF CRC CRC

NN = node number, 100 = ROI function code, 36 = number of bytes to follow, CR = Carriage Return, LF = Linefeed, 2 16 byte ASCII blocks that is the display, CRC CRC = two byte Modbus RTU CRC

2.6.3 Read Input Status Label (102):

Query:

NN 102 ADH ADL CRC CRC

NN = node number, 102 = function code, ADH:ADL = Two byte address of desired input status (1-512), CRC CRC = two byte Modbus RTU CRC.

Response:

NN 102 30 A S C I I S T R I N G CRC CRC

NN
follow, ASCIISTRING = returned label string for the requested input status, CRC CRC = two byte Modbus RTU CRC.

2.6.4 Read Input Register Label (104):

Query:

NN 104 ADH ADL CRC CRC

NN = node number, 102 = function code, ADH:ADL = Two byte address of desired input register (1-256), CRC CRC = two byte Modbus RTU CRC.

Response:

NN 104 30 A S C I I S T R I N G CRC CRC

NN
follow, ASCIISTRING = returned label string for the requested input register, CRC CRC = two byte Modbus RTU CRC.

2.6.5 Read Datalog (130):

Query:

NN 130 DLN CRC CRC

NN = node number, 130 = function code, DLN = datalog number from 0 to 100, CRC CRC = two byte Modbus RTU CRC.

Response:

NN 130 250 D A T A L O G CRC CRC

NN
follow, DATALOG = returned datalog, CRC CRC = two byte Modbus RTU CRC.

2.6.6 Read ASCII Capture (230):

Query:

NN 230 DLN CRC CRC

NN = node number, 130 = function code, DLN = datalog number from 0 to 100, CRC CRC = two byte Modbus RTU CRC.

Response:

NN 130 90 A S C I I S T R I N G CRC CRC

NN
follow, ASCIISTRING = returned ASCII Capture, CRC CRC = two byte Modbus RTU CRC.

2.7 Modbus Register List

```
10001 ="IGN SHUTDOWN FLAG              "
10002 ="IGN WARNING FLAG               "
10003 ="IGN FAULT FLAG                 "
10004 ="IGN FIRED FLAG                 "
10005 ="IGN ALARM OUTPUT ACTIVATED     "
10006 ="IGN FIRING FLAG                "
10007 ="IGN PICKUPS OK                 "
10008 ="IGN ENGINE ROTATING            "
10009 ="spare                          "
10010 ="spare                          "
10011 ="spare                          "
10012 ="ONE STEP ACTIVE NOW            "
10013 ="ENERGY LEVEL E1 NOW            "
10014 ="ENERGY LEVEL E2 NOW            "
10015 ="ENERGY LEVEL E3 NOW            "
10016 ="MULTI STRIKE    NOW            "
10017 ="FAULT NO GEAR TOOTH SIGNAL     "
10018 ="FAULT NO MAGNETIC RESET SIGNAL"
10019 ="FAULT NO CYCLE RESET SIGNAL    "
10020 ="FAULT WRONG NUMBER OF TEETH    "
10021 ="FAULT OVERSPEED SHUTDOWN       "
10022 ="spare                          "
10023 ="spare                          "
10024 ="FAULT FIRMWARE CHECKSUM ERR    "
10025 ="spare                          "
10026 ="spare                          "
10027 ="spare                          "
10028 ="spare                          "
10029 ="WARN 4-20 LOOP OUT OF RANGE    "
10030 ="spare                          "
10031 ="WARN EEPROM CHECKSUM FAIL      "
10032 ="WARN FAIL DETECT DISP MODULE   "
10033 ="spare                          "
10034 ="WARN HI VOLTAGE                "
10035 ="WARN NO SECONDARY SPK          "
10036 ="WARN LO FROM ENGINE            "
10037 ="WARN HI FROM ENGINE            "
10038 ="WARN LO VOLTAGE                "
10039 ="WARN PRIMARY SHORT             "
10040 ="WARN PRIMARY OPEN              "
10041 ="PROTECTION ENABLED      EEPROM"
10042 ="SERIAL RETARD ENABLED   EEPROM"
```

```
10043 ="RPM RETARD MAP ENABLED   EEPROM"
10044 ="4-20ma RET MAP ENABLED   EEPROM"
10045 ="BASE ENERGY E1 SELECT    EEPROM"
10046 ="BASE ENERGY E2 SELECT    EEPROM"
10047 ="BASE ENERGY E3 SELECT    EEPROM"
10048 ="MULTI-STRIKE SELECT      EEPROM"
10049 ="FIRE CONFIRM OUTPUT 1 = FIRING"
10050 ="SHUTDOWN OUTPUT   0 = SHUTDOWN"
10051 ="ALARM OUTPUT        0 = ALARM"
10052 ="spare                          "
10053 ="TRANSCODER         0=4X 1=8X"
10054 ="SKIP CONTROL (internal)        "
10055 ="CMDPAGE2 (internal)            "
10056 ="TWO CYCLE                      "
10057 ="spare                          "
10058 ="spare                          "
10059 ="spare                          "
10060 ="CHKPAGE2 (interal)             "
10061 ="MISC INPUT                     "
10062 ="MISC REMOTE INPUT              "
10063 ="spare                          "
10064 ="spare                          "
10065 ="20 OUTPUT MODULE               "
10066 ="18 OUTPUT MODULE               "
10067 ="DUAL CAPACITOR MODULE          "
10068 ="WITH FILTER MODULE             "
10069 ="spare                          "
10070 ="spare                          "
10071 ="spare                          "
10072 ="spare                          "
10073 ="MISC. 0=USE ONESTEP            "
10074 ="MISC. 0=FIRE MAXENERGY         "
10075 ="MISC. 0=FIRE MULTISTRIKE       "
10076 ="spare                          "
10077 ="RPM < 200 USE ONESTEP          "
10078 ="RPM < 200 FIRE MAX ENERGY      "
10079 ="RPM < 200 FIRE MULTI           "
10080 ="spare                          "
10081 ="spare                          "
10082 ="spare                          "
10083 ="spare                          "
10084 ="spare                          "
10085 ="WITH OFFSET                    "
```

```
10086 ="TEST DENY (internal)        "
10087 ="TEST ACT (internal)         "
10088 ="TEST REQ (internal)         "
10089 ="spare                (A or A1)"
10090 ="WARN HI VOLTAGE      (A or A1)"
10091 ="WARN NO SECONDARY SPK(A or A1)"
10092 ="WARN LO FROM ENGINE  (A or A1)"
10093 ="WARN HI FROM ENGINE  (A or A1)"
10094 ="WARN LO VOLTAGE      (A or A1)"
10095 ="WARN SHORTED PRIMARY (A or A1)"
10096 ="WARN OPEN PRIMARY    (A or A1)"
10097 ="spare                (B or A2)"
10098 ="WARN HI VOLTAGE      (B or A2)"
10099 ="WARN NO SECONDARY SPK(B or A2)"
10100 ="WARN LO FROM ENGINE  (B or A2)"
10101 ="WARN HI FROM ENGINE  (B or A2)"
10102 ="WARN LO VOLTAGE      (B or A2)"
10103 ="WARN SHORTED PRIMARY (B or A2)"
10104 ="WARN OPEN PRIMARY    (B or A2)"
10105 ="spare                (C or B1)"
10106 ="WARN HI VOLTAGE      (C or B1)"
10107 ="WARN NO SECONDARY SPK(C or B1)"
10108 ="WARN LO FROM ENGINE  (C or B1)"
10109 ="WARN HI FROM ENGINE  (C or B1)"
10110 ="WARN LO VOLTAGE      (C or B1)"
10111 ="WARN SHORTED PRIMARY (C or B1)"
10112 ="WARN OPEN PRIMARY    (C or B1)"
10113 ="spare                (D or B2)"
10114 ="WARN HI VOLTAGE      (D or B2)"
10115 ="WARN NO SECONDARY SPK(D or B2)"
10116 ="WARN LO FROM ENGINE  (D or B2)"
10117 ="WARN HI FROM ENGINE  (D or B2)"
10118 ="WARN LO VOLTAGE      (D or B2)"
10119 ="WARN SHORTED PRIMARY (D or B2)"
10120 ="WARN OPEN PRIMARY    (D or B2)"
10121 ="spare                (E or C1)"
10122 ="WARN HI VOLTAGE      (E or C1)"
10123 ="WARN NO SECONDARY SPK(E or C1)"
10124 ="WARN LO FROM ENGINE  (E or C1)"
10125 ="WARN HI FROM ENGINE  (E or C1)"
10126 ="WARN LO VOLTAGE      (E or C1)"
10127 ="WARN SHORTED PRIMARY (E or C1)"
10128 ="WARN OPEN PRIMARY    (E or C1)"
```

```
10129 ="spare                 (F or C2)"
10130 ="WARN HI VOLTAGE       (F or C2)"
10131 ="WARN NO SECONDARY SPK(F or C2)"
10132 ="WARN LO FROM ENGINE   (F or C2)"
10133 ="WARN HI FROM ENGINE   (F or C2)"
10134 ="WARN LO VOLTAGE       (F or C2)"
10135 ="WARN SHORTED PRIMARY (F or C2)"
10136 ="WARN OPEN PRIMARY     (F or C2)"
10137 ="spare                 (K or D1)"
10138 ="WARN HI VOLTAGE       (K or D1)"
10139 ="WARN NO SECONDARY SPK(K or D1)"
10140 ="WARN LO FROM ENGINE   (K or D1)"
10141 ="WARN HI FROM ENGINE   (K or D1)"
10142 ="WARN LO VOLTAGE       (K or D1)"
10143 ="WARN SHORTED PRIMARY (K or D1)"
10144 ="WARN OPEN PRIMARY     (K or D1)"
10145 ="spare                 (L or D2)"
10146 ="WARN HI VOLTAGE       (L or D2)"
10147 ="WARN NO SECONDARY SPK(L or D2)"
10148 ="WARN LO FROM ENGINE   (L or D2)"
10149 ="WARN HI FROM ENGINE   (L or D2)"
10150 ="WARN LO VOLTAGE       (L or D2)"
10151 ="WARN SHORTED PRIMARY (L or D2)"
10152 ="WARN OPEN PRIMARY     (L or D2)"
10153 ="spare                 (M or E1)"
10154 ="WARN HI VOLTAGE       (M or E1)"
10155 ="WARN NO SECONDARY SPK(M or E1)"
10156 ="WARN LO FROM ENGINE   (M or E1)"
10157 ="WARN HI FROM ENGINE   (M or E1)"
10158 ="WARN LO VOLTAGE       (M or E1)"
10159 ="WARN SHORTED PRIMARY (M or E1)"
10160 ="WARN OPEN PRIMARY     (M or E1)"
10161 ="spare                 (N or E2)"
10162 ="WARN HI VOLTAGE       (N or E2)"
10163 ="WARN NO SECONDARY SPK(N or E2)"
10164 ="WARN LO FROM ENGINE   (N or E2)"
10165 ="WARN HI FROM ENGINE   (N or E2)"
10166 ="WARN LO VOLTAGE       (N or E2)"
10167 ="WARN SHORTED PRIMARY (N or E2)"
10168 ="WARN OPEN PRIMARY     (N or E2)"
10169 ="spare                 (P or F1)"
10170 ="WARN HI VOLTAGE       (P or F1)"
10171 ="WARN NO SECONDARY SPK(P or F1)"
```

```
10172 ="WARN LO FROM ENGINE   (P or F1)"
10173 ="WARN HI FROM ENGINE   (P or F1)"
10174 ="WARN LO VOLTAGE       (P or F1)"
10175 ="WARN SHORTED PRIMARY (P or F1)"
10176 ="WARN OPEN PRIMARY     (P or F1)"
10177 ="spare                 (R or F2)"
10178 ="WARN HI VOLTAGE       (R or F2)"
10179 ="WARN NO SECONDARY SPK(R or F2)"
10180 ="WARN LO FROM ENGINE   (R or F2)"
10181 ="WARN HI FROM ENGINE   (R or F2)"
10182 ="WARN LO VOLTAGE       (R or F2)"
10183 ="WARN SHORTED PRIMARY (R or F2)"
10184 ="WARN OPEN PRIMARY     (R or F2)"
10185 ="spare                 (S or K1)"
10186 ="WARN HI VOLTAGE       (S or K1)"
10187 ="WARN NO SECONDARY SPK(S or K1)"
10188 ="WARN LO FROM ENGINE   (S or K1)"
10189 ="WARN HI FROM ENGINE   (S or K1)"
10190 ="WARN LO VOLTAGE       (S or K1)"
10191 ="WARN SHORTED PRIMARY (S or K1)"
10192 ="WARN OPEN PRIMARY     (S or K1)"
10193 ="spare                 (T or K2)"
10194 ="WARN HI VOLTAGE       (T or K2)"
10195 ="WARN NO SECONDARY SPK(T or K2)"
10196 ="WARN LO FROM ENGINE   (T or K2)"
10197 ="WARN HI FROM ENGINE   (T or K2)"
10198 ="WARN LO VOLTAGE       (T or K2)"
10199 ="WARN SHORTED PRIMARY (T or K2)"
10200 ="WARN OPEN PRIMARY     (T or K2)"
10201 ="spare                 (U or L1)"
10202 ="WARN HI VOLTAGE       (U or L1)"
10203 ="WARN NO SECONDARY SPK(U or L1)"
10204 ="WARN LO FROM ENGINE   (U or L1)"
10205 ="WARN HI FROM ENGINE   (U or L1)"
10206 ="WARN LO VOLTAGE       (U or L1)"
10207 ="WARN SHORTED PRIMARY (U or L1)"
10208 ="WARN OPEN PRIMARY     (U or L1)"
10209 ="spare                 (V or L2)"
10210 ="WARN HI VOLTAGE       (V or L2)"
10211 ="WARN NO SECONDARY SPK(V or L2)"
10212 ="WARN LO FROM ENGINE   (V or L2)"
10213 ="WARN HI FROM ENGINE   (V or L2)"
10214 ="WARN LO VOLTAGE       (V or L2)"
```

```
10215 ="WARN SHORTED PRIMARY (V or L2)"
10216 ="WARN OPEN PRIMARY    (V or L2)"
10217 ="spare                (     M1)"
10218 ="WARN HI VOLTAGE      (     M1)"
10219 ="WARN NO SECONDARY SPK(     M1)"
10220 ="WARN LO FROM ENGINE  (     M1)"
10221 ="WARN HI FROM ENGINE  (     M1)"
10222 ="WARN LO VOLTAGE      (     M1)"
10223 ="WARN SHORTED PRIMARY (     M1)"
10224 ="WARN OPEN PRIMARY    (     M1)"
10225 ="spare                (     M2)"
10226 ="WARN HI VOLTAGE      (     M2)"
10227 ="WARN NO SECONDARY SPK(     M2)"
10228 ="WARN LO FROM ENGINE  (     M2)"
10229 ="WARN HI FROM ENGINE  (     M2)"
10230 ="WARN LO VOLTAGE      (     M2)"
10231 ="WARN SHORTED PRIMARY (     M2)"
10232 ="WARN OPEN PRIMARY    (     M2)"
10233 ="spare                (     N1)"
10234 ="WARN HI VOLTAGE      (     N1)"
10235 ="WARN NO SECONDARY SPK(     N1)"
10236 ="WARN LO FROM ENGINE  (     N1)"
10237 ="WARN HI FROM ENGINE  (     N1)"
10238 ="WARN LO VOLTAGE      (     N1)"
10239 ="WARN SHORTED PRIMARY (     N1)"
10240 ="WARN OPEN PRIMARY    (     N1)"
10241 ="spare                (     N2)"
10242 ="WARN HI VOLTAGE      (     N2)"
10243 ="WARN NO SECONDARY SPK(     N2)"
10244 ="WARN LO FROM ENGINE  (     N2)"
10245 ="WARN HI FROM ENGINE  (     N2)"
10246 ="WARN LO VOLTAGE      (     N2)"
10247 ="WARN SHORTED PRIMARY (     N2)"
10248 ="WARN OPEN PRIMARY    (     N2)"

30001 ="ENGINE RPM    1RPM/BIT        "
30002 ="MAX SEEN RPM 10RPM/BIT        "
30003 ="OVERSPEED SETTING 10/BIT      "
30004 ="FAULT GEAR TEETH              "
30005 ="4-20 ANALOG INPUT 0.098ma/bit "
30006 ="COUNTS TO DEGREES SCALER      "
30007 ="GLOGAL  TIMING DISPLAY VALUE  "
30008 ="MANUAL  RETARD SETTING        "
```

```
30009 ="ONESTEP RETARD SETTING         "
30010 ="ANALOG  RETARD FROM TABLE      "
30011 ="RPM     RETARD FROM TABLE      "
30012 ="SERIAL  RETARD FROM REMOTE     "
30013 ="MAX INDIVIDUAL OFFSET          "
30014 ="STANDARD INDIVIDUAL OFFSET     "
30015 ="REFERENCE ANGLE OF RESET PIN   "
30016 ="NUMBER OF CYLINDERS            "
30017 ="ENGINE AVERAGE DIAG            "
30018 ="LO SPARK DIAG   THRESHOLD      "
30019 ="HI SPARK DIAG   THRESHOLD      "
30020 ="NO SPARK DIAG   THRESHOLD      "
30021 ="LO FROM ENGINE THRESHOLD       "
30022 ="HI FROM ENGINE THRESHOLD       "
30023 ="spare                          "
30024 ="E2 ENABLE        THRESHOLD     "
30025 ="E2 DISABLE       HYSTERISIS    "
30026 ="E3 ENABLE        THRESHOLD     "
30027 ="E3 DISABLE       HYSTERISIS    "
30028 ="CYL TIMING OFFSET (A or A1)    "
30029 ="CYL TIMING OFFSET (B or A2)    "
30030 ="CYL TIMING OFFSET (C or B1)    "
30031 ="CYL TIMING OFFSET (D or B2)    "
30032 ="CYL TIMING OFFSET (E or C1)    "
30033 ="CYL TIMING OFFSET (F or C2)    "
30034 ="CYL TIMING OFFSET (K or D1)    "
30035 ="CYL TIMING OFFSET (L or D2)    "
30036 ="CYL TIMING OFFSET (M or E1)    "
30037 ="CYL TIMING OFFSET (N or E2)    "
30038 ="CYL TIMING OFFSET (P or F1)    "
30039 ="CYL TIMING OFFSET (R or F2)    "
30040 ="CYL TIMING OFFSET (S or K1)    "
30041 ="CYL TIMING OFFSET (T or K2)    "
30042 ="CYL TIMING OFFSET (U or L1)    "
30043 ="CYL TIMING OFFSET (V or L2)    "
30044 ="CYL TIMING OFFSET (    M1)     "
30045 ="CYL TIMING OFFSET (    M2)     "
30046 ="CYL TIMING OFFSET (    N1)     "
30047 ="CYL TIMING OFFSET (    N2)     "
30048 ="CAVG (A or A1)                 "
30049 ="CAVG (B or A2)                 "
30050 ="CAVG (C or B1)                 "
30051 ="CAVG (D or B2)                 "
```

```
30052 ="CAVG (E or C1)            "
30053 ="CAVG (F or C2)            "
30054 ="CAVG (K or D1)            "
30055 ="CAVG (L or D2)            "
30056 ="CAVG (M or E1)            "
30057 ="CAVG (N or E2)            "
30058 ="CAVG (P or F1)            "
30059 ="CAVG (R or F2)            "
30060 ="CAVG (S or K1)            "
30061 ="CAVG (T or K2)            "
30062 ="CAVG (U or L1)            "
30063 ="CAVG (V or L2)            "
30064 ="CAVG (     M1)            "
30065 ="CAVG (     M2)            "
30066 ="CAVG (     N1)            "
30067 ="CAVG (     N2)            "
30068 ="DIAG OFFSET (A or A1)     "
30069 ="DIAG OFFSET (B or A2)     "
30070 ="DIAG OFFSET (C or B1)     "
30071 ="DIAG OFFSET (D or B2)     "
30072 ="DIAG OFFSET (E or C1)     "
30073 ="DIAG OFFSET (F or C2)     "
30074 ="DIAG OFFSET (K or D1)     "
30075 ="DIAG OFFSET (L or D2)     "
30076 ="DIAG OFFSET (M or E1)     "
30077 ="DIAG OFFSET (N or E2)     "
30078 ="DIAG OFFSET (P or F1)     "
30079 ="DIAG OFFSET (R or F2)     "
30080 ="DIAG OFFSET (S or K1)     "
30081 ="DIAG OFFSET (T or K2)     "
30082 ="DIAG OFFSET (U or L1)     "
30083 ="DIAG OFFSET (V or L2)     "
30084 ="DIAG OFFSET (     M1)     "
30085 ="DIAG OFFSET (     M2)     "
30086 ="DIAG OFFSET (     N1)     "
30087 ="DIAG OFFSET (     N2)     "
30253 ="YEAR AS AN INTEGER        "
30254 ="MONTH/DAY AS AN INTEGER   "
30255 ="HOUR/MINUTE AS AN INTEGER "
30256 ="KEY COMMAND REGISTER      "

40256 ="KEY COMMAND REGISTER      "
```

2.8 Key Command Definition (40256)

Register 40256 can be written to with a set of specific ingnition related actions. This register will only works for single register writes (function code 06). If the CPU-95 Display module is currently executing a key command (either from a previous modbus write or from the keypad), the modbus exception "BUSY" (06) will be returned.

2.8.1 Key Commands

```
0x01FE  Increment global retard
0x02FD  Decrement global retard
0x03FC  Enable current loop
0x04FB  Disable current loop
0x05FA  Enable RPM retard
0x06F9  Disable RPM retard
0x07F8  Enable serial retard
0x08F7  Disable serial retard
0x09F6  Enable EEPROM protection
0x0AF5  Disable EEPROM protection
0x0BF4  Increment Energy Setting
0x0CF3  Decrement Energy Setting
0x0DF2  Enable Multistrike
0x0EF1  Disable Multistrik
0x0FF0  Increment Overspeed
0x10EF  Decrement Overspeed
0x11EE  Increment reset position
0x12ED  Decrement reset position
0x13EC  Ignition fault reset
0x14EB  Ignition alarm acknowledge
0x15EA  Save current cylinder offsets to EEPROM
0x16E9  Reset manual offsets to 0 in EEPROM
0x17E8  Begin Test Mode
0x18E7  Abort Test Mode
0x19E6  Increment Test Type
0x1AE5  Decrement Test Type
0x1BE4  Increment onestep retard
0x1CE3  Decrement onestep retatd
0x1DE2  Increment ignition idcode
0x1EE1  Decrement ignition idcode
0x1FE0  Increment diagnostic lo spark voltage
0x20DF  Decrement diagnostic lo spark voltage
0x21DE  Increment diagnostic hi spark voltage
0x22DD  Decrement diagnostic hi spark voltage
0x23DC  Increment diagnostic no spark voltage
0x24DB  Decrement diagnostic no spark voltage
```

```
0x25DA  Increment diagnostic lo from engine threshold
0x26D9  Decrement diagnostic lo from engine threshold
0x27D8  Increment diagnostic hi from engine threshold
0x28D7  Decrement diagnostic hi from engine threshold
0x2BD4  Increment E2 enable threshold
0x2CD3  Decrement E2 enable threshold
0x2DD2  Increment E2 hysteresis threshold
0x2ED1  Decrement E2 hysteresis threshold
0x2FD0  Increment E3 enable threshold
0x30CF  Decrement E3 enable threshold
0x31CE  Increment E3 hysteresis threshold
0x32CD  Decrement E3 hysteresis threshold
0x33CC  Reset diagnostic offsets for all cylinders
0x40BF  Increment cylinder timing (A or A1)
0x41BE  Increment cylinder timing (B or A2)
0x42BD  Increment cylinder timing (C or B1)
0x43BC  Increment cylinder timing (D or B2)
0x44BB  Increment cylinder timing (E or C1)
0x45BA  Increment cylinder timing (F or C2)
0x46B9  Increment cylinder timing (K or D1)
0x47B8  Increment cylinder timing (L or D2)
0x48B7  Increment cylinder timing (M or E1)
0x49B6  Increment cylinder timing (N or E2)
0x4AB5  Increment cylinder timing (P or F1)
0x4BB4  Increment cylinder timing (R or F2)
0x4CB3  Increment cylinder timing (S or K1)
0x4DB2  Increment cylinder timing (T or K2)
0x4EB1  Increment cylinder timing (U or L1)
0x4FB0  Increment cylinder timing (V or L2)
0x50AF  Increment cylinder timing (  or M1)
0x51AE  Increment cylinder timing (  or M2)
0x52AD  Increment cylinder timing (  or N1)
0x53AC  Increment cylinder timing (  or N2)
0x609F  Decrement cylinder timing (A or A1)
0x619E  Decrement cylinder timing (B or A2)
0x629D  Decrement cylinder timing (C or B1)
0x639C  Decrement cylinder timing (D or B2)
0x649B  Decrement cylinder timing (E or C1)
0x659A  Decrement cylinder timing (F or C2)
0x6699  Decrement cylinder timing (K or D1)
0x6798  Decrement cylinder timing (L or D2)
0x6897  Decrement cylinder timing (M or E1)
0x6996  Decrement cylinder timing (N or E2)
```

```
0x6A95  Decrement cylinder timing (P or F1)
0x6B94  Decrement cylinder timing (R or F2)
0x6C93  Decrement cylinder timing (S or K1)
0x6D92  Decrement cylinder timing (T or K2)
0x6E91  Decrement cylinder timing (U or L1)
0x6F90  Decrement cylinder timing (V or L2)
0x708F  Decrement cylinder timing (  or M1)
0x718E  Decrement cylinder timing (  or M2)
0x728D  Decrement cylinder timing (  or N1)
0x738C  Decrement cylinder timing (  or N2)
0xC03F  Increment diagnostic offset (A or A1)
0xC13E  Increment diagnostic offset (B or A2)
0xC23D  Increment diagnostic offset (C or B1)
0xC33C  Increment diagnostic offset (D or B2)
0xC43B  Increment diagnostic offset (E or C1)
0xC53A  Increment diagnostic offset (F or C2)
0xC639  Increment diagnostic offset (K or D1)
0xC738  Increment diagnostic offset (L or D2)
0xC837  Increment diagnostic offset (M or E1)
0xC936  Increment diagnostic offset (N or E2)
0xCA35  Increment diagnostic offset (P or F1)
0xCB34  Increment diagnostic offset (R or F2)
0xCC33  Increment diagnostic offset (S or K1)
0xCD32  Increment diagnostic offset (T or K2)
0xCE31  Increment diagnostic offset (U or L1)
0xCF30  Increment diagnostic offset (V or L2)
0xD02F  Increment diagnostic offset (  or M1)
0xD12E  Increment diagnostic offset (  or M2)
0xD22D  Increment diagnostic offset (  or N1)
0xD32C  Increment diagnostic offset (  or N2)
0xE01F  Decrement diagnostic offset (A or A1)
0xE11E  Decrement diagnostic offset (B or A2)
0xE21D  Decrement diagnostic offset (C or B1)
0xE31C  Decrement diagnostic offset (D or B2)
0xE41B  Decrement diagnostic offset (E or C1)
0xE51A  Decrement diagnostic offset (F or C2)
0xE619  Decrement diagnostic offset (K or D1)
0xE718  Decrement diagnostic offset (L or D2)
0xE817  Decrement diagnostic offset (M or E1)
0xE916  Decrement diagnostic offset (N or E2)
0xEA15  Decrement diagnostic offset (P or F1)
0xEB14  Decrement diagnostic offset (R or F2)
0xEC13  Decrement diagnostic offset (S or K1)
```

```
0xED12  Decrement diagnostic offset (T or K2)
0xEE11  Decrement diagnostic offset (U or L1)
0xEF10  Decrement diagnostic offset (V or L2)
0xF00F  Decrement diagnostic offset (  or M1)
0xF10E  Decrement diagnostic offset (  or M2)
0xF20D  Decrement diagnostic offset (  or N1)
0xF30C  Decrement diagnostic offset (  or N2)
```

3.0 Datalog

3.1 Datalog Overview

The datalogs contain all the information as it is read from the CPU-95 ignition. The datalog capacity is 100. Newer logs are always accessed starting at 1 with the oldest log being 100. A datalog 0 exists and is the most "current" data set from the CPU-95 ignition. The datalog is read by a special modbus function code that is covered in the Modbus section of this document. Datalogging is done at specified intervals and events. Changes in state of the CPU-95 ignition diagnostics or configuration will cause an event to occur. An event is a datalog but it is flagged as an event. Along with the binary data log there is an associated "ASCII Capture". A description of the datalog and ASCII capture can be found at the end of this document. The datalogging datalog sub-system.

3.2 Datalog Setup

The new datalogs added a new menu with 5 sub-menus to the display. The datalog setup menu is found after the "AUX PORT SETUP" menu.

```
 DATALOG SETUP
Next  Esc  Enter
```

To enter the datalog setup menus press "ENTER".
To continue to the BARGRAPH menu press "NEXT".
To exit press "ESC".

3.3 Current Date

```
 CURRENT DATE
↑09↓12/2001
```

To change the current month use the "↑" & "↓" keys.
To proceed to change the current day press "ENTER".
To proceed to the current time menu press "NEXT".
To exit press "ESC".

```
     CURRENT DATE
     09↑12↓2001
```

To change the current day use the "↑" & "↓" keys.
To proceed to change the current year press "ENTER".
To proceed to the current time menu press "NEXT".
To exit press "ESC".
Note:

   The CPU-95 Display module does not correct for leap year. A manual adjustment will
   need to be made at that time.

```
     CURRENT DATE
     09/12↑2001↓
```

To change the current year use the "↑" & "↓" keys.
To proceed to change the current month press "ENTER".
To proceed to the current time menu press "NEXT".
To exit press "ESC".

3.4 Current Time

```
     CURRENT TIME
     ↑08↓00:00
```

To change the current hour use the "↑" & "↓" keys.
To proceed to change the current minute press "ENTER".
To proceed to the datalog interval menu press "NEXT".
To exit press "ESC".

```
     CURRENT TIME
     08↑00↓00
```

To change the current minute use the "↑" & "↓" keys.
To proceed to change the current hour press "ENTER".
To proceed to the datalog interval menu press "NEXT".
To exit press "ESC".
Note:

3.5 Datalog Interval

```
DATALOG INTERVAL
    ↑↓ 5min.
```

To change the datalog interval use the "↑" & "↓" keys.
To proceed to the datalog power-up menu press "NEXT".
To exit press "ESC".
The datalog intervals are:
    1min., 2min., 5min. 10min., 15min., 30min., 1h., 2h., 4h., 8h., 12h., & 24h.

3.6 Datalog Power-Up

```
DATALOG POWER-UP
↑ RETAIN/erase ↓
```

Pressing the "↑" key activates the RETAIN feature. In this mode, the datalogs are preserved.
Pressing the "↓" key activates the ERASE feature. In this mode, the datalogs are cleared on
power-up.
To proceed to the log after stop menu press "NEXT".
To exit press "ESC".

3.7 Log After Stop

```
LOG AFTER STOP?
   ↑ yes/NO ↓
```

Pressing the "↑" sets this option to YES. In this mode, datalogging is continuous.
Pressing the "↓" sets this option to NO. In this mode, datalogging is only done when the ignition
senses rotation.
To proceed to the track timing menu press "NEXT".
To exit press "ESC".
Note:
    Setting this option to NO does not prevent events from being logged.

3.8 Track Timing

```
┌─────────────────────────┐
│   TRACK TIMING?         │
│   ↑ yes/NO ↓            │
└─────────────────────────┘
```

Pressing the "↑" sets this option to YES. In this mode, timing changes generate an event log.
Pressing the "↓" sets this option to NO
log.
To proceed to the current date menu press "NEXT".
To exit press "ESC".
Note:
    Setting this option to NO does not prevent timing from being recorded in the datalogs.

3.9 Datalog Content

Byte(s)	Description
0,1	Year, same as modbus 30253
2,3	Month/Day same as modbus 30254
4,5	Hour/Minute same as modbus 30255
6	ASCII Flag 'D' for datalog, 'E' for event
7-38	32bytes (2 lines) of the ignition's user comments
39	Bitfield; Modbus 10049-10056, LSB-MSB respectively
40	Bitfield; Modbus 10001-10008, LSB-MSB respectively
41	Bitfield; Modbus 10041-10048, LSB-MSB respectively
42	Bitfield; Modbus 10057-10064, LSB-MSB respectively
43	Bitfield; Modbus 10073-10080, LSB-MSB respectively
44	Bitfield; Modbus 10009-10016, LSB-MSB respectively
45	Bitfield; Modbus 10065-10072, LSB-MSB respectively
46	Bitfield; Modbus 10017-10024, LSB-MSB respectively
47	Bitfield; Modbus 10025-10032, LSB-MSB respectively
48	Bitfield; Modbus 10033-10040, LSB-MSB respectively
49	Bitfield; Modbus 10081-10088, LSB-MSB respectively
50	Engine Average Diagnostic, Modbus 30017
51-52	spare
53	Ignition ID code
54	Test Type
55-56	RPM, Modbus 30001
57	RPM, 10RPM/bit
58	Max RPM, 10RPM/bit, Modbus 30002
59	Overspeed RPM setting, Modbus 30003
60-61	Actual gear teeth counted
62	spare

```
63              Number of cylinders
64-65           Fault Gear Teeth, Modbus 30004
66              Diagnostic lo spark voltage, Modbus 30018
67              Diagnostic hi spark voltage, Modbus 30019
68              Diagnostic no spark voltage, Modbus 30020
69              4-20 Analog Input 0.98ma/bit, Modbus 30005
70-71           Counts to degrees sclaer, Modbus 30006
72-73           Reference angle of reset pin, Modbus 30015
74-75           Global timing display value, Modbus 30007
76              Manual retard, Modbus 30008
77              Onestep retard, Modbus 30009
78              Analog retard from table, Modbus 30010
79              RPM retard from table, Modbus 30011
80              Serial retard from remote, Modbus 30012
81              Global retard
82              Max individual offset, Modbus 30013
83              Standard individual offset, Modbus 30014
84              Watchdog reset counter
85-104          Cylinder timing offset, Modbus 30028-30047
105             E3 enable threshold, Modbus 30026
106             E3 enable hysteresis, Modbus 30027
107             E2 enable threshold, Modbus 30024
108             E2 enable hysteresis, Modbus 30025
109             spare
110             Hi from engine threshold, Modbus 30022
111             Lo from engine threshold, Modbus 30021
112             Shorted primary threshold
113             Open primary threshold
114-133         Individual diagnostics, Modbus 10089-10248
134-153         Raw cylinder spark numbers
154-173         Cylinder average spark numbers, Modbus 30048-30067
174-193         Individual diagnostic offsets, Modbus 30068-30087
194-250         spare
```

4.0 BarGraph

4.1 BarGraph Overview

The cylinder spark diagnostic can now be viewed as a bargraph.

4.2 BarGraph Setup

The bargraph added a new menu with 2 sub-menus to the display. The bargraph setup menu is found after the "DATALOG SETUP" menu.

```
 BARGRAPH SETUP
Next   Esc   Enter
```

To enter the bargraph setup menus press "ENTER".
To continue back to the MULTISTRIKE menu press "NEXT".
To exit press "ESC".

4.3 BarGraph Low Limit

Sets the low value for the bargraph. The low limit span is from 0 to the LOW SPARK THRESHOLD VOLTAGE

```
 BARGRAPH LIMIT
  LOW 100↑↓
```

To adjust the low limit value use the "↑" & "↓" keys.
To continue to the high "BARGRAPH LIMIT" press "NEXT" or "ENTER"
To exit press "ESC".

4.4 BarGraph High Limit

Sets the high value for the bargraph. The high limit span is from the HIGH SPARK THRESHOLD VOLTAGE to 255
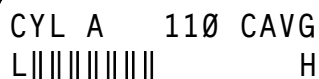
```
 BARGRAPH LIMIT
  HIGH 100↑↓
```

To adjust the high limit value use the "↑" & "↓" keys.
To continue to the low "BARGRAPH LIMIT" press "NEXT" or "ENTER"
To exit press "ESC".

4.5 Viewing the BarGraph

Begin from either the "cylinder spark data screen 'F1'" or the "offset adjustment screen 'F4'" and
structed using the instantaneous spark
data. The cylinder average data is provided as a reference.

```
CYL A   11Ø CAVG
L‖‖‖‖‖‖‖‖‖‖         H
```

To view the next cylinder press "F2" or "NEXT"
To view the cylinder spark data press "F1".
To view the cylinder offset adjustments press the "F4".
To exit press "ESC".

5.0 Value Protection Password

5.1 Value Protection Password Overview

The value protection feature can be protected by a password. The password must be configured
from the PC terminal software prior to use. If a password is programmed, the password must first
keyed in before value protection can be enabled or disabled. The password is 5 digits composed
of "F1" for 1, "F2" for 2, "F3" for 3 & "F4" for 4.

5.2 Protection Lock Screen

The "PROTECTION LOCK" menu will appear ahead of the Value Protection screen if a password
has been programmed into the unit. Upon successful entry of the password, the "VALUE
PROTECTION" menu will appear.

```
PROTECTION LOCK
 *****  Next Esc
```

To enter the password press "F1", "F2", "F3", or "F4".
To continue back to the "VIEW IGN. SETUP" menu press "NEXT".
To exit press "ESC".

5.3 Protection Lock Invalid Screen

If an incorrect password is entered, this screen will be displayed..

```
PROTECTION LOCK
    INVALID
```

The display will return to the home screen after 1 second.

6.0 Test Mode Option

6.1 Test Mode Option Overview

The test mode can be removed from the unit during programming from the PC as an option for those who do not want or do not use the "TEST" feature. When this option is enabled, the "RUN TEST MODE" menu that normally appears after the "VIEW IGN. SETUP" is removed and cannot be accessed.