

5R7-001 SERIAL COMMUNICATIONS

REV A

Definitions:

All numeric values are in hexadecimal format.

Use lowercase ASCII characters.

(stx)	Start of text character (*) 2a hex.
(etx)	End of text character (carriage return) or 0d hex.
(ack)	Acknowledge character (^) 5e hex.
AA	Address characters are ASCII characters from 0 through 9 or a through f. Use 00 for the universal recognized address.
CC	Command characters are ASCII characters from 0 through 9 or a through f.
DDDDDDDD	Hex "two's complement" return or send value. 1d = 00000001 -1d = ffffffff
SS	8 bit (modulo 256) checksum of characters sent represented as two ascii hex characters "excludes (stx),(etx)".

Controlling Computer would send:

(stx)AACCCDDDDDDSS(etx)

If it's address received Temp Controller would respond with:

(stx)DDDDDDDDSS (ack)

If checksum is not correct Temp Controller would respond with:

(stx)XXXXXXXXc0 (ack)

The following is a description of checksum calculation for the unit to help show the transmission of characters.

The (stx) is the * and the (etx) is the carriage return.

I will take the example code from the command list and break it down.

To send the Set Temperature of 10.00 Deg to controller.

Fixed Decimal Set Temp is multiplied by 100 to prepare to send.

Convert 1000d to hex which is 03e8

Send: (stx)001c000003e8b4(etx)

Receive: (stx)000003e8c0(ack)

The '0' character ascii value is 48 decimal, the '1' is 49, the '3' is 51, the 'e' is 101, the 'c' is 99 and the '8' is 56.

The checksum would be calculated as follows:

'0' '0' '1' 'c' '0' '0' '0' '0' '0' '3' 'e' '8'

48+48+49+99+48+48+48+48+48+51+101+56=692.

692mod256 is 180 decimal.

convert 180 decimal to hex is b4.

The characters "b4" are the checksum to send with the command and value string.

Make sure to use lower case characters.

I. JP4 Communications Parameters

- A. Baud Rate 9600
- B. No Parity
- C. 1 Start Bit 1 Stop Bit

II. Serial Commands

1. INPUT1 (controlled input value)

Write Command: NA
Read Command: 01 hex
Interpret: Divide returned fixed point temp value by 100.0 and
convert to deg decimal value.

Example:

Receive 10.00 deg temp from unit (sensor type == 1).

Send *00010000000041(etx)

Rec *000003e8c0^

convert hex 000003e8 returned to decimal ==(1000)
divide by 100.0 ==(10.00)

2. DESIRED CONTROL VALUE(set value)

Write Command: NA
Read Command: 03 hex
Interpret: This command returns the set value determined by Input2
or as a fixed value set by communications. See 1. Above
for interpretation .

3. POWER OUTPUT

Write Command: NA
Read Command: 02 hex or 04 hex
Interpret: -511 represent -100% output.
0 returned is 0% output.
511 represent 100% output.

4. ALARM STATUS

Write Command: NA
Read Command: 05 hex
Interpret: 0 returned means no alarms.
Bit 0==1 means HIGH ALARM.
Bit 1==1 means LOW ALARM.
Bit 2==1 means COMPUTER CONTROLLED ALARM.
Bit 3==1 means OVER CURRENT DETECTED.
Bit 4==1 means OPEN INPUT1.
Bit 5==1 means OPEN INPUT2.

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Bit 6==1 means DRIVER LOW INPUT VOLTAGE .

5. INPUT 2

Write Command: NA
Read Command: 06 hex
Interpret: Input 2 reading as a thermistor temperature sensor.

6. OUTPUT CURRENT COUNTS

Write Command: NA
Read Command: 07 hex
Interpret: Output Current detection in a/d counts.

7. ALARM TYPE

Write Command: 0x28
Read Command: 0x41
Interpret: 0 returned means no alarms.
1 returned means Tracking Alarm Mode.
2 returned means Fixed Alarm Mode.
3 returned means Computer Controlled Alarm Mode (see write command 0x2f).

8. SET TYPE DEFINE (desired control temp “set temp” input definition)

Write Command: 0x29
Read Command: 0x42
Interpret: 0 returned means computer communicated set value.
1 returned means Potentiometer Input.
2 returned means 0 to 5v Input.
3 returned means 0 to 20ma Input.
4 Differential set:
Desired Control Value=Temp2 + Computer Set.
Range of values settable via commands 0x20 & 0x21.
5 returned means set value is from optional JP3 display.

9. SENSOR TYPE

Write Command: 0x2a
Read Command: 0x43
Interpret: 0 TS141 5K
1 TS67 OR TS136 15K
2 TS91 10K
3 TS165 230K
4 TS104 50K
5 TP53 YSI H 10K

10. CONTROL TYPE

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Write Command: 0x2b
Read Command: 0x44
Interpret: 0 is deadband control.
1 is PID control.
2 is Temp2 controls output power via write command 0x1c
(Range -511=-100% output power 511=100% output power).

11. CONTROL OUTPUT POLARITY

Write Command: 0x2c
Read Command: 0x45
Interpret: 0 is HEAT WP1+ and WP2-.
1 is HEAT WP2+ and WP1-.

12. POWER ON/OFF

Write Command: 0x2d
Read Command: 0x46
Interpret: 0 is off
1 is on.

13. OUTPUT SHUTDOWN IF ALARM

Write Command: 0x2e
Read Command: 0x47
Interpret: 0 is no shutdown upon alarming.
1 is to shutdown main output drive upon alarming.

14. FIXED DESIRED CONTROL SETTING

Write Command: 0x1c
Read Command: 0x50
Interpret: Divide returned fixed point temp value by 100.0 and convert to deg decimal value.

15. PROPORTIONAL BANDWIDTH

Write Command: 0x1d
Read Command: 0x51
Interpret: Fixed-point temperature bandwidth in deg .
Multiply desired bandwidth by 100.
1 deg . Bandwidth would be 100 decimal.
20 deg . Bandwidth would be 2000.

16. INTEGRAL GAIN

Write Command: 0x1e
Read Command: 0x52
Interpret: Fixed-point gain in Repeats/min.
Multiply desired integral gain by 100.
.01 rep/min would be 1 decimal.

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1.00 rep/min would be 100 decimal.

17. DERIVATIVE GAIN

Write Command: 0x1f
Read Command: 0x53
Interpret: Fixed-point gain in minutes.
Multiply desired derivative gain by 100.
.01 min would be 1 decimal.
1.00 min would be 100 decimal.

18. LOW EXTERNAL SET RANGE

Write Command: 0x20
Read Command: 0x54
Interpret: Value mapped to zero voltage of Input2.

19. HIGH EXTERNAL SET RANGE

Write Command: 0x21
Read Command: 0x55
Interpret: Value mapped to 5volt or max. voltage of Input2.

20. ALARM DEADBAND

Write Command: 0x22
Read Command: 0x56
Interpret: Temperature Input1 must move to toggle alarm output.

21. HIGH ALARM SETTING

Write Command: 0x23
Read Command: 0x57
Interpret: Temperature reference to compare against Input1 for high alarm output.

22. LOW ALARM SETTING

Write Command: 0x24
Read Command: 0x58
Interpret: Temperature reference to compare against Input1 for low alarm output.

23. CONTROL DEADBAND SETTING

Write Command: 0x25
Read Command: 0x59
Interpret: Temperature or count span Input1 must move to toggle control output.

24. INPUT1 OFFSET

Write Command: 0x26

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Read Command: 0x5a
Interpret: Value to offset Input1 by in order to calibrate external sensor if desired.

25. INPUT2 OFFSET

Write Command: 0x27
Read Command: 0x5b
Interpret: Value to offset Input2 by in order to calibrate external sensor if desired.

26. HEAT MULTIPLIER

Write Command: 0x0c
Read Command: 0x5c
Interpret: This multiplies the heater percentage of power to offset it's effectiveness.
100 is a multiplier of 1.00

27. COOL MULTIPLIER

Write Command: 0x0d
Read Command: 0x5d
Interpret: This multiplies the cooling percentage of power to offset it's effectiveness.
100 is a multiplier of 1.00

28. OVER CURRENT COUNT COMPARE VALUE

Write Command: 0x0e
Read Command: 0x5e
Interpret: This is the count compare value which determines an over current condition. Current is roughly 2.5A/count.

29. ALARM LATCH ENABLE

Write Command: 0x2f
Read Command: 0x48
Interpret:
1 is latching enabled.
0 is latching disabled.
If Alarm Type is = to 3 then
1 is Computer Alarm On.
0 is Computer Alarm Off.

30. COMMUNICATION ADDRESS

Write Command: 0x30
Read Command: 0x49
Interpret:

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Range of value 1 to 255

This is the AA value in the communication string for RS485 setup.

30. ALARM LATCH RESET

Write Command: 0x33

Read Command: NA

Interpret: Send this command to reset the alarm latches.

31. CHOOSE SENSOR FOR ALARM FUNCTION

Write Command: 0x31

Read Command: 0x4a

Interpret: 0 is for the Control Sensor Input.
1 is for the Input2 Secondary Input.

32. CHOOSE °C or °F TEMPERATURE WORKING UNITS

Write Command: 0x32

Read Command: 0x4b

Interpret: 0 is °F
1 is °C

33. EEPROM WRITE ENABLE or DISABLE

Write Command: 34 hex

Read Command: 4c hex

Interpret: 0 is disable eeprom writes
1 is enable eeprom writes

Note: This function is always stored to eeprom.

Function Description: Upon a power-up or reset condition the controller performs an initialization of the above variables with write commands which transfers their last written state stored in non-volatile memory (eeprom) to appropriately referenced static ram locations. This action is performed so the controller can run at a quicker pace due to the slow access of eeprom. The “EEPROM WRITE ENABLE value 1” command allows all the above variables with write commands to have mirror storage of their communicated value. The “EEPROM WRITE DISABLE value 0” command does not allow this mirror storage and only stores the value to the appropriate static ram location. By doing this you have the ability to change the run-time values and configuration and not impact your desired power-up state. This will also alleviate a possible problem if you do a large number (>1000000) of writes to any eeprom location.

34. OVER CURRENT CONTINUOUS

Write Command: 0x35

Read Command: 0x4d

Interpret: 1 is continuous retry when over current detected.

0 allows the RESTART ATTEMPTS value to be used.

35. OVER CURRENT RESTART ATTEMPS

Write Command: 0x0f

Read Command: 0x5f

Interpret:

Range of value 0 to 30000

This is the amount of times the controller will attempt to restart the output after an over current condition is detected.

36. JP3 DISPLAY ENABLE

Write Command: 0x36

Read Command: 0x4e

Interpret:

1 display function enabled.

0 display function disabled.