

Microprocessor Controls

MP7650 Modbus Communications

Introduction

Modbus RS-485 communication may be added to the MP7650 controller on request. This communication will allow the user to poll information from the Transfer Switch on the current status, but READ only access is provided.

MP7650 Pin Out	RS-485 Connections
D0	T/R - (B)+
D1	T/R - (A)-
C	Ground

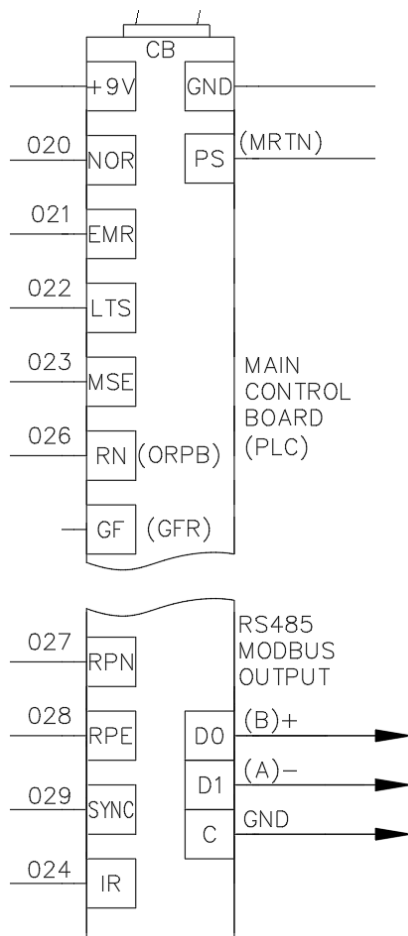


Figure 1 - MP7650 w/Modbus Communication

Modbus Specification - 09/11/2018

- The implementation is Modbus RTU.
- The electrical implementation is RS-485 "Two-Wire."
 - The connector is a 3-position "European style" unpluggable screw terminal.
 - The terminals are labeled D0, D1, and C.
 - The RS-485 is electrically isolated from the ATS Control circuitry, to 2500Vrms galvanic:
 - The RS-485 interface includes +/-15kV ESD protection.
- The following parameters are selectable as shown through the ATS Control's Menu System.
 - Address is selectable from 1 through 247; initial default is 205.
 - Baud rate is selectable as 9600, 19200, 38400, 57600, or 115200; initial default is 19200.
 - Parity is selectable as even, odd, or none; initial default is even.
- The Modbus mapping follows:

Notes:

- Unused items (bits/bytes/words) return 0.
- Time-of-day and Exerciser clock times are in 24-hour format.

Function 01 Read Coils (Discrete Outputs) Currently #1 through #38 readable.

- NPA - Normal Power Available
- EPA - Emergency Power Available
- SIN - System In Normal
- SIE - System In Emergency
- TE - Trip Emergency
- /TRBL - Not Trouble
- OE - Open Emergency
- TN - Trip Normal
- GF - Ground Fault
- NIA - Not in Automatic
- NBT - Normal Breaker Tripped
- EBT - Emergency Breaker Tripped
- ON - Open Normal
- AS - Auto Sync Enable
- ASIN - Auxiliary System In Normal

- | | | | |
|------------|--------------------------------------|------------|-------------------------------|
| 16. ASIE | - Auxiliary System In Emergency | 20. SYNC | - Source in Sync |
| 17. NRP | - Normal Reverse Power | 21. LOI | - Load Demand Inhibit |
| 18. ERP | - Emergency Reverse Power | 22. XIN | - Spare Input |
| 19. EW | - Emergency Withdrawn | 23. NAT | - Normal Switch In Test |
| 20. unused | | 24. EAT | - Emergency Switch In Test |
| 21. CE | - Close Emergency | 25. unused | |
| 22. AEB | - Emergency Bypassed | 26. unused | |
| 23. AEMR | - Auxiliary Emergency Available | 27. unused | |
| 24. ACBT | - Auxiliary Contacts Before Transfer | 28. unused | |
| 25. NT | - Normal Tripped | 29. BNBA | - Bypass Normal Bell Alarm |
| 26. ET | - Emergency Tripped | 30. SEBA | - Bypass Emergency Bell Alarm |
| 27. NW | - Normal Withdrawn | 31. BNW | - Bypass Normal Withdrawn |
| 28. unused | | 32. BEW | - Bypass Emergency Withdrawn |
| 29. ES | - Engine Start | | |
| 30. CN | - Close Normal | | |
| 31. ANB | - Auxiliary Normal Bypassed | | |
| 32. ANOR | - Auxiliary Normal Power Available | | |
| 33. NBBT | - Normal Bypass Breaker Tripped | | |
| 34. EBBT | - Emergency Bypass Breaker Tripped | | |
| 35. NBW | - Normal Bypass Withdrawn | | |
| 36. EBW | - Emergency Bypass Withdrawn | | |
| 37. NB | - Normal Bypassed | | |
| 38. EB | - Emergency Bypassed | | |

Function 02 Read Discrete Inputs – Currently #1 Through #32 readable.

1. NOR - Normal Power Available
2. EMR - Emergency Power Available
3. NAX - Normal Switch Closed
4. EAS - Normal Switch Closed
5. EAX - Emergency Switch Closed
6. LTS - Load Test Switch Closed
7. ALTS - Auxiliary Load Test Switch Closed
8. MSE - Keypad Enabled
9. BAN - Bypass Normal Switch Closed
10. RN - Return to Normal
11. RD - Remote Disconnect
12. NBA - Normal Bell Alarm
13. EBA - Emergency Bell Alarm
14. GFR - Ground Fault Relay
15. NAW - Normal Switch Withdrawn
16. BEA - Bypass Emergency Switch Closed
17. PS - Peak Shave
18. RPN - Reverse Power Normal
19. RPE - Reverse Power Emergency

Function 03 Reading Holding Registers – Currently #1 through #62 readable.

1. Discrete Outputs #49-#64 (all currently unused).
 - Bit 0. Output #49.
 - Bit 1. Output #50.
 - Bit 2. Output #51.
 - Bit 3. Output #52.
 - Bit 4. Output #53.
 - Bit 5. Output #54.
 - Bit 6. Output #55.
 - Bit 7. Output #56.
 - Bit 8. Output #57.
 - Bit 9. Output #58.
 - Bit 10. Output #59.
 - Bit 11. Output #60.
 - Bit 12. Output #61.
 - Bit 13. Output #62.
 - Bit 14. Output #63.
 - Bit 15. Output #64.
2. Discrete Outputs #33-#48 (#39-#48 currently unused).
 - Bit 0. Output #33.
 - Bit 1. Output #34.
 - Bit 2. Output #35.
 - Bit 3. Output #36.
 - Bit 4. Output #37.
 - Bit 5. Output #38.
 - Bit 6. Output #39.
 - Bit 7. Output #40.
 - Bit 8. Output #41.
 - Bit 9. Output #42.



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- Bit 10. Output #43.
 - Bit 11. Output #44.
 - Bit 12. Output #45.
 - Bit 13. Output #46.
 - Bit 14. Output #47.
 - Bit 15. Output #48.
3. Discrete Outputs #17-#32
- Bit 0. Output #17.
 - Bit 1. Output #18.
 - Bit 2. Output #19.
 - Bit 3. Output #20.
 - Bit 4. Output #21.
 - Bit 5. Output #22.
 - Bit 6. Output #23.
 - Bit 7. Output #24.
 - Bit 8. Output #25.
 - Bit 9. Output #26.
 - Bit 10. Output #27.
 - Bit 11. Output #28.
 - Bit 12. Output #29.
 - Bit 13. Output #30.
 - Bit 14. Output #31.
 - Bit 15. Output #32.
4. Discrete Outputs #1-#16
- Bit 0. Output #1.
 - Bit 1. Output #2.
 - Bit 2. Output #3.
 - Bit 3. Output #4.
 - Bit 4. Output #5.
 - Bit 5. Output #6.
 - Bit 6. Output #7.
 - Bit 7. Output #8.
 - Bit 8. Output #9.
 - Bit 9. Output #10.
 - Bit 10. Output #11.
 - Bit 11. Output #12.
 - Bit 12. Output #13.
 - Bit 13. Output #14.
 - Bit 14. Output #15.
 - Bit 15. Output #16.
5. Discrete Inputs #33-#48 (all currently unused).
- Bit 0. Input #33.
 - Bit 1. Input #34.
 - Bit 2. Input #35.
 - Bit 3. Input #36.
 - Bit 4. Input #37.
 - Bit 5. Input #38.
 - Bit 6. Input #39.
 - Bit 7. Input #40.
 - Bit 8. Input #41.
 - Bit 9. Input #42.
 - Bit 10. Input #43.
 - Bit 11. Input #44.
 - Bit 12. Input #45.
 - Bit 13. Input #46.
 - Bit 14. Input #47.
 - Bit 15. Input #48.
6. Discrete Inputs #17-#32
- Bit 0. Input #17.
 - Bit 1. Input #18.
 - Bit 2. Input #19.
 - Bit 3. Input #20.
 - Bit 4. Input #21.
 - Bit 5. Input #22.
 - Bit 6. Input #23.
 - Bit 7. Input #24.
 - Bit 8. Input #25.
 - Bit 9. Input #26.
 - Bit 10. Input #27.
 - Bit 11. Input #28.
 - Bit 12. Input #29.
 - Bit 13. Input #30.
 - Bit 14. Input #31.
 - Bit 15. Input #32.
7. Discrete Inputs #1-#16.
- Bit 0. Input #1.
 - Bit 1. Input #2.
 - Bit 2. Input #3.
 - Bit 3. Input #4.
 - Bit 4. Input #5.
 - Bit 5. Input #6.
 - Bit 6. Input #7.
 - Bit 7. Input #8.
 - Bit 8. Input #9.
 - Bit 9. Input #10.
 - Bit 10. Input #11.
 - Bit 11. Input #12.
 - Bit 12. Input #13.
 - Bit 13. Input #14.



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- Bit 14. Input #15.
- Bit 15. Input #16.
- 8. TSP Firmware Major Version.
- 9. TSP Firmware Sub-Version.
- 10. TSP Firmware date: Msb = year – 2000; lsb month (January 1).
- 11. MBP Firmware Major Version.
- 12. MBP Firmware Sub-version.
- 13. MBP Firmware date: Msb = year – 2000; lsb month (January 1).
- 14. unused
- 15. ATS Configuration.
- 16. Msb Led Type Code.
Lsb = Mode (Off = 0, Automatic 1, Hand Crank 2, Load Test 3).
- 17. unused
- 18. Nonvolatile Background Fault Flags:
 - Bit 0. Close Emergency fault.
 - Bit 1. Close Normal fault.
 - Bit 2. Open Emergency fault.
 - Bit 3. Both Closed fault.
 - Bit 4. Both Closed fault.
 - Bit 5. Bypass fault.
 - Bit 6. Ground fault.
 - Bit 7. Normal Reverse Power fault.
 - Bit 8. Emergency Reverse Power fault.
 - Bit 9. Single Phase fault.
 - Bit 10. Remote Disconnect fault.
 - Bit 11. Bell Alarm fault.
 - Bit 12. Trip Emergency.
 - Bit 13. Trip Normal.
 - Bit 14. unused
 - Bit 15. unused
- 19. Nonvolatile Background Trouble Flags:
 - Bit 0. Synchronization Failure trouble.
 - Bit 1. Ground trouble.
 - Bit 2. Normal Reverse Power trouble.
 - Bit 3. Emergency Reverse Power trouble.
 - Bit 4. unused.
 - Bit 5. unused.
 - Bit 6. unused.
 - Bit 7. unused.
 - Bit 8. unused.
 - Bit 9. unused.
 - Bit 10. unused.
- Bit 11. unused.
- Bit 12. unused.
- Bit 13. unused.
- Bit 14. unused.
- Bit 15. unused.
- 20. Nonvolatile Foreground Flags:
 - Bit 0. Clear indicates memory corruption not yet acknowledged by the operator.
 - Bit 1. Indicates that the ATS automatically adjusts for Daylight Savings Time.
 - Bit 2. Indicates U2 preference for a Utility-to-Utility ATS.
 - Bit 3. Indicates transfer desired upon synchronization failure timeout.
 - Bit 4. unused.
 - Bit 5. unused.
 - Bit 6. unused.
 - Bit 7. unused.
 - Bit 8. unused.
 - Bit 9. unused.
 - Bit 10. unused.
 - Bit 11. unused.
 - Bit 12. unused.
 - Bit 13. unused.
 - Bit 14. unused.
 - Bit 15. unused.
- 21. unused.
- 22. unused.
- 23. TOES timer setting, in centi-seconds (0 if timer unused).
- 24. TOES timer time remaining, in centi-seconds (0 if timer unused or inactive).
- 25. TDE timer setting, in centi-seconds (0 if timer unused).
- 26. TDE timer time remaining, in centi-seconds (0 if timer unused or inactive).
- 27. TDBT timer setting, in centi-seconds (0 if timer unused).
- 28. TDBT timer time remaining, in centi-seconds (0 if timer unused or inactive).
- 29. SPPT timer setting, in centi-seconds (0 if timer unused).
- 30. SPPT timer time remaining, in centi-seconds (0 if timer unused or inactive).



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31. TDN timer setting, in centi-seconds (0 if timer unused).
32. TDN timer time remaining, in centi-seconds (0 if timer unused).
33. TDR timer setting, in milli-minutes (0 if timer unused).
34. TDR timer time remaining, in milli-minutes (0 if timer unused or inactive).
35. TDEC timer setting, in milli-minutes (0 if timer unused).
36. TDEC timer time remaining, in milli-minutes (0 if timer unused or inactive).
37. MRT timer setting, in milli-minutes (0 if timer unused).
38. MRT timer time remaining, in milli-minutes (0 if timer unused or inactive).
39. SFT timer setting, in milli-minutes (0 if timer unused).
40. SFT timer time remaining, in milli-minutes (0 if timer unused or inactive).
41. unused.
42. unused.
43. unused.
44. unused.
45. unused.
46. unused.
47. unused.
48. unused.
49. unused.
50. unused.
51. unused.
52. unused.
53. unused.
54. unused.
55. Msb Current Year – 2000 (0 if the clock is not set).
Lsb Current Month, starting with January = 1 (0 if the clock is not set).
56. Msb Current Date (0 if the clock is not set).
Lsb Current Day, starting with Sunday = 1 (0 if the clock is not set).
57. Msb Current Hour (0 if the clock is not set).
Lsb Current Minute (0 if the clock is not set).
58. Msb Current Second (0 if the clock is not set).
Lsb Interrupt Number within the current second, 0 through 199 (200 is possible rarely).
59. unused.
60. Exerciser Flags:
 - Bit 0. Indicates exercising is without load.
 - Bit 1. Indicates Sunday is an exercise day.
 - Bit 2. Indicates Monday is an exercise day.
 - Bit 3. Indicates Tuesday is an exercise day.
 - Bit 4. Indicates Wednesday is an exercise day.
 - Bit 5. Indicates Thursday is an exercise day.
 - Bit 6. Indicates Friday is an exercise day.
 - Bit 7. Indicates Saturday is an exercise day.
 - Bit 8. Indicates exercising occurs during the 1st seven days of each month (dates 1-7).
 - Bit 9. Indicates exercising occurs during the 2nd seven days of each month (dates 8-14).
 - Bit 10. Indicates exercising occurs during the 3rd seven days of each month (dates 15-21).
 - Bit 11. Indicates exercising occurs during the 4th seven days of each month (dates 22-28).
 - Bit 12. Indicates exercising occurs during any remaining days each month (dates 29-31).
 - Bit 13. unused.
 - Bit 14. unused.
 - Bit 15. unused.
61. Exercise beginning time of day: Msb = hour; Lsb minute.
62. Exercise duration in minutes (0 through 1440).

MP7650 - Field Replaceable Unit (F.R.U.)



Figure 2



Figure 3



Figure 4



Figure 5

Microprocessor System Specifications

MP7650 Microprocessor System	
Operating Voltage	12Vdc or 24Vdc
Power Consumption: Passive Monitoring	24 ~ 48 VA ≅ 2A @ Selected Voltage
Power Consumption: Operating MC Units	Max Inrush: 260 VA
Power Consumption: Operating IC Units	Max Inrush: 500 VA
Customer Connection Contact Type	Form "C" Dry Contacts [C, NO, NC]
Customer Connection Contact Rating	10 Amps Max Contacts
Ambient Temperature: Operating	-20°C to +60°C [-4°F to 140°F]
Ambient Temperature: Storage	-40°C to +80°C [-40°F to 176°F]
Humidity	5 to 85% RH, no condensation
Weight	51.5 oz., 3.2 lbs. (F.R.U.)
Industrial Control Equipment	UL 1008 Listed
Construction	Solid State Circuitry
Dimensions (W x H x D)*	7" x 10 ³ / ₈ " x 1 1/2"
Mounting (W x H)*	7 1/2" x 7"

* Reference Figure 5.

Microprocessor System Order Guide

MP7650 Microprocessor System (w/Modbus RS-485) Part Numbers	
Field Replaceable Unit, F.R.U.	70LSEMP1850050
HMI Overlay for Front of Door Fixed IC or MC Units Drawout IC Units	58NPTOL7678000 58NPTOL7678001
Keypad	43XYMKP4408300
Relay Interface Board, RIB	70LSEMP1857400
ICE Cube Relays, 12Vdc 1 Pole 2 Pole Hold Down Spring	32IDEDC1940001 32IDEDC1940002 43IDESP1940180
ICE Cube Relays, 24Vdc 1 Pole 2 Pole Hold Down Spring	32IDEDC1940004 32IDEDC1940005 43IDESP1940180
Power Supply Board, PSB	70LSEMP1857301
Communication Ribbon Cable IC Units, 100" MC Units, 72"	70LSEMP1858526 70LSEMP1857526
Standard Control Switches Keypad Enable, KPE Override Pushbutton, ORPB Load Test Switch, LTS	02CASTS1673562, Maintained 02CASPBP1673561, Momentary 02CASPBP1673561, Momentary