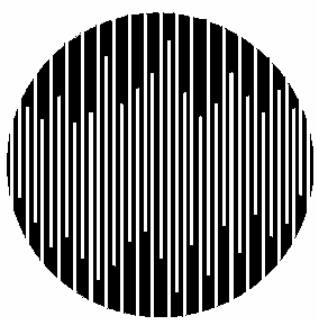
SUPERBRIDGE

Technical Reference
For Modicon PLCs



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Revision Notes

0.11A	10/30/95;LTM	First complete issue for beta version
0.20	02/08/96;BPM;LTM	Updates for ver 0.20 release
0.20A	06/12/96;LTM	Corrections at release build
0.99	03/08/98;LTM	Updates for ver 0.99 release
1.10	07/04/98;LTM	Updates for ver 1.10 release
1.14	06/13/00;RWM	Updated for 1.14 release

INTRODUCTION

SuperBridge (SB) is a software application that provides two-way communications between Merrick MC²/MC³ controllers (MCs) and Modicon's (MO) communication network Modbus Plus (MB+). Status and variables in MCs will appear on MB+ as integer and floating point holding registers in a MO controller, such as the 984 or Quantum series of MO controllers (PLC).

SB will run on an industrially hardened personal computer compatible platform (PC), under MS-DOS, with the addition of a MB+ communication adapter board. Up to 128 MCs can be connected one SB. On the MB+ network, SuperBridge will support messages, such as Read Holding Registers and Preset Multiple Registers. In addition, MC data can be automatically exchanged with one or more PLCs on MB+.

PLC connectivity

The ladder programmer can access MC data in two different ways:

- **Copy holding registers to a Modicon controller.** SuperBridge maintains MC data in the holding register area (4xxxx registers) in one or more PLCs. This imposes minimal burden on the ladder programmer and PLC memory resources. Holding registers are continuously updated in the PLCs by the SuperBridge with MC general status, status of digital inputs and outputs, feedrates, totals, alarms and other parameters. The ladder programmer can access an MC² keyboard and tag specific data items for monitoring and manipulation. The MCs are completely accessible to the PLC. This also means that the PLC can act as an advanced version of MasterSet and as a sophisticated sub-system to weighing controllers, all at the same time.
- **Slave message processing.** The PLC requests MC data from SB. This imposes minimal burden on the MB+ communications bandwidth and on the PLC performance. The ladder programmer creates rungs with MSTR instructions to read or write data from or to SB. This method gives the same level of control as does the copy method above, but the ladder logic programming effort is greater. For very large systems, this method has an advantage.

It is also possible to use a combination of the two methods.

Control Room software connectivity

Most modern control room or on-line QA monitoring software packages (MMIs) such as Rockwell Software's RSView and Intellution's Fix Dmacs for Windows support MO connectivity over MB+. This support is available regardless of the presence of a MO PLC system. The MMI accesses MC data just as any PLC data, normally using the "Slave message processing" method described above. This makes a MC/SB installation open to almost all modern, powerful control and QA systems.

MC Controllers connectivity

Up to 128 MC² or MC³ controllers can be connected to a SB, using using up to four RS-485, four-wire connections. MC² controllers must be equipped with a serial port option. A serial port can easily be added to an existing controller. Some older versions of the controller software must be upgraded. See Model Specific Information (page 17). The system response time will improve with decreasing number of MCs connected. If very fast response times are required, more than one SB can be installed on a MB+ network.

Hardware Requirements

SB runs on a personal computer, at least 386/25, with 2 Mbytes of RAM, 5 Mbytes of Hard Disk space and one available serial port, COM1 or COM2. The serial port must either be a RS-422 port, or an adapter must be used to convert RS-232C signal levels to RS-422. When many controllers are connected, a four port serial adapter can be used. Up to 32 MCs can be connected to one RS422 serial port. The PC has to be equipped with a Modicon SA-85 adapter, serving as an interface between the PC ISA bus and MB+.

SETTING UP A SYSTEM

Setting up a SB system includes the following steps:

1. Verify that existing MCs are equipped with a RS-485 Serial Port and have software application versions listed in Model Specific Information (page 20). If not, complete and/or upgrade.
2. Assign a MB+ node number for SB. See Assign Node Numbers (page 3)
3. In the PC, install SA-85 (Modicon part number AM-SA85-000) adapter and, if needed, a RS-232/RS-422 converter. See “Install the SA-85 Card” (page 4) and “Install RS-422 converter or adapter, if needed” (page 4)
4. Copy the SB software files to the PC hard disk and modify the PC configuration files if necessary. See Modify PC configuration (page 5)
5. Verify that SB starts up properly in the PC. See Verify SB startup (page 6).
6. Connect all MCs to SB. See MC Physical Connection (page 6).
7. Set up communication parameters in all MCs connected. See Setting Up communications with the MCs (page 6).
8. Configure SB for the number of MCs connected. See SB Configuration for MCs (page 7)
9. Verify that communications with the MCs work properly. See Verify MC communication (page 7)
10. If data is to be copied from SB to one or more PLCs, the file copy scheme must be set up and verified. Use the steps 11..14.
11. Reserve holding registers in the host PLC(s) to hold SB data. See Allocating Holding Registers (page 8).
12. Configure SB to read and write the holding register segments. See SB Configuration for Segment Copy (page 9)
13. Connect SB to the MB+ network. See Connecting SB to MB+ (page 9).
14. Verify that the register copy process works properly. See Verify MB+ Segment Copy (page 9)

INSTALLING SB SOFTWARE AND HARDWARE

If SB hardware and software are purchased entirely from Merrick, it comes installed and configured along with a specification sheet. The configuration may have to be altered as the system changes.

SB will run on a generic PC according to Hardware Requirements (page 2). If configuration data was available to Merrick before the time of shipment, the configuration file has already been prepared. In any case, a specification sheet is always shipped, indicating the current configuration.

Assign Node Numbers

SB will act as a PLC on MB+. As such, it must be assigned a MO style node number. Check that there are no node number conflicts on the MB+ network, and set the node number dip switch on the SA-85 adapter according to instructions in [2], page 43, if needed. If more than one SB resides on the MB+ network, they must all have different node numbers.

Install the SA-85 Card

Configure and install the SA-85 card in the SB host PC, according to instructions in [2], section 3.2. Since SB normally is the only application running on the host PC, it is recommended that the default settings are used, that is,

- Memory address: D400 ([2], page 45)
- Software Interrupt Setting: 5C. ([2], page 9)

The MB+ Node Number must also be set. See [2], page 43.

If a NetBios compatible network driver is loaded in the PC, software interrupt 5C can not be used. 5D or 60 are good alternatives. Note that changes must be made to the SB configuration file (SUPERB.INI) and to CONFIG.SYS.

If there are other devices that may cause a conflict with these settings, other settings can be examined. The corresponding configuration files (CONFIG.SYS and SUPERB.INI) must me altered accordingly. See Modify PC configuration (page 5).

Install RS-422 converter or adapter, if needed

If the host PC does not have a RS-422 serial port, a converter between RS-232 and RS-422 must be used. Alternatively, an internal RS-422 adapter board may be used. Make sure to disable the corresponding RS-232 COM port!

Merrick has successfully tested the ULTRA-485 serial port adapter from Industrial Computer Source, (619) 677 0877. Strappings for COM 1 for this board are:

- Port Adress to 3F8. SW1 = {On, On, On, Off}
- IRQ Jumper to IRQ4. E1 = {Jumper @ 4}
- Single Interrupt mode. E2 = {Jumper @ N}
- RS-422 mode. E5 = {Jumper @ 422}
- RS-422 mode. E3 = {Jumper @ 422}
- SIO-485 Mode. E4 = {Dip Shunt @ SIO-485}. This is not the default setting.
- Line terminations on. SW-2 = {(T,P,P,L,L) = (On, On, On, Off, Off)}.

For COM2, the following strappings would change to:

- Port Adress to 2F8. SW1 = {On, On, Off, On}
- IRQ Jumper to IRQ3. E1 = {Jumper @ 3}.

Install RS-422 multiport adapter, if needed

If more than 32 MCs are connected to the host PC serial port, or to increase performance, a multi-port RS-422 adapter must be used. Up to 4 serial ports, sharing a single interrupt (IRQ), are supported.

Merrick has successfully tested the FASTCOM422/4 serial multiport adapter from Industrial Computer Source, (619) 677 0877. Strappings tested for this board were:

- Port Adress Base to 280. SW1 = {On, On, Off, On, Off, On, On, On}
- IRQ 3, No IRQ Sharing. SW2 = {On, Off, On, Off, Off, Off, Off, Off}, SW3 = {Off, Off, Off, Off}. This is not the factory default setting. The factory default is IRQ5. In the test computer, IRQ5 was used by the A-B KT adapter. No COM2 port, which uses IRQ3, was installed in the test computer.

- CTS Handshaking disabled, No RTS Tx driver control. SW4 = {On, On, On, On, Off, Off, Off, Off}.

Modify PC configuration

The SB software files are distributed as a complete directory structure, including all configuration files. For a pre-configured system, the files are installed along with MS-DOS on the PC hard drive. In all other cases, the SB files are shipped on a 3½" floppy, and the files have to be copied onto the PC hard drive. MS-DOS, versions 5 or 6, must already be installed. To copy the SB files onto the hard drive insert the distribution diskette in the floppy drive (assumed to be drive A:), boot the PC, and at the C:\> prompt, type

```
XCOPY A:*.* /S /E /V
```

and hit return. The existing AUTOEXEC.BAT and CONFIG.SYS files will be overwritten and the following directories will be created:

\SUPERB	SB executable and configuration files
\MODICON	Modicon driver file and diagnostic programs
\DOC	Specific release or configuration text files.

MS-DOS files are assumed to reside in \DOS.

Three files deals with the SB configuration and are referenced below as

SUPERB.INI	\SUPERB\SUPERB.INI
AUTOEXEC.BAT	\AUTOEXEC.BAT
CONFIG.SYS	\CONFIG.SYS

They can all be edited with the MS-DOS editor 'EDIT'.

SUPERB.INI, with its many configuration entries, is described in detail in Configuration (page 44).

The default AUTOEXEC.BAT looks like this

```
REM     AUTOEXEC.BAT
REM     SuperBridge for Modicon Default
REM     10/30/95/LTM
PATH=C:\DOS;C:\MODICON;C:\SUPERB
CD SUPERB
MODRV
```

There is normally no reason to alter this file. The last two rows must always be present and unchanged.

This is the default CONFIG.SYS

```
REM     CONFIG.SYS
REM     SuperBridge for Modicon Default 0.99
REM     03/08/98/LTM
BUFFERS=15,0
FILES=8
DEVICE=C:\MODICON\MBPHOST.SYS /MD400 /N0 /S5C /R2
DEVICE=C:\DOS\INTERLNK.EXE
```

The INTERLNK driver load (line 9) is always attempted. It will fail if no Interlink server PC is connected to COM1. This is for the benefit of PC card Flash EPROM disk installations. The intersvr/interlnk utilities is the only way to transfer files to and from the SB host PC.

SB will always start at boot, showing its home screen. To be able to edit configuration files, exit SB by pressing F10.

Verify SB startup

Connect a VGA monitor and PC keyboard to the SB host PC and reboot. Watch for error messages as SB starts up. The load process can be made to run step-by-step by holding down the F8 key immediately after boot. If SB starts successfully, the SB home screen will appear.

If possible, run MBPSTAT ([2], page 143) on another device on the MB+ network. With the default settings, SB should appear an active node on MB+. MBPSTAT is can also be used in your local SB host PC, to verify that the SA-85 adapter is installed properly.

SETTING UP COMMUNICATIONS WITH THE MCS

The MC network is a four wire RS-485 Master-Slave polled communications loop. All MCs are slaves on the network, and are required to have a RS-485 serial port and a unique address, called "Controller Number" (CN). The CN is set up, along with other serial communications parameters, in each MC. SB is the master, and must have either a four wire RS-485 or a RS-422 serial port. All serial ports are connected along one shielded, 4 wire cable.

MC Physical Connection

Use a RS-422 type two pair, four wire shielded cable like Belden ERROR. One pair is used to carry signals from the SB transmitter to all MC receivers. The other pair is used to carry signals from all MC transmitters to the SB receiver. The following table lists connections. Check with the documentation for the RS-422 adapter used for the pinout.

SB Signal	ULTRA -485 Pin # (DB-25P)	FASTCOM 422/4 Pin # (DE-9 S)	MC³ Controller Terminal #	MC² Controller Pin # (DB-25S)	MC Signal
Tx+	24	4	3	22	Rx+
Tx-	25	5	4	23	Rx-
Rx+	12	8	1	24	Tx+
Rx-	13	9	2	25	Tx-
Shield	7	1	N.C.	11	Shield

Be careful when running the cable. Avoid power lines and other devices that might cause electrical disturbances. Maximum cable length is 1230 m (4000 ft). SB does not have to be connected at one end of the cable. Remove all termination resistors in the MC² serial ports. Add a 150Ω terminating resistor between the + and - lines for each pair at each end of the cable.

If only one MC² is used, it is possible to use a RS-232 interface instead. This is useful for bench-testing SB, using a regular office PC, which normally has no RS-422 interface. The cable should have a DE-9S, for a 9 pin connector in the PC or a DB-25S, for a 25 pin connector in the PC in the PC end and a DB25P in the MC end. Use the following table for the pinout, and keep the cable length less than 25 feet at 19200 baud.

Signal, PC Side	PC COM port, 9 pin (DE-9P)	PC COM port, 25 pin (DB-25P)	MC² Serial port (DB-25S)
Rxd (PC reciever)	2	3	15
Txd (PC transmitter)	3	2	12
Ground	5	7	7
Shield	1	1	1

MC Communication Parameters

MC Communication parameters are set in the controllers themselves. They are:

1. Controller Number. Must be different for each controller. Start with 1 and continue up.
2. Baud Rate. Must be the same for all controllers. Set to the highest possible, normally 19200. Some older software versions only support up to 9600 baud. See Model Specific Information (page 17).
3. Parity. Must be set to “NO Par” in all MCs.
4. Data Bits. Must be set to 8 in all MCs.
5. Start character. Must be set to 10 in all MCs.
6. End character. Must be set to 13 in all MCs.

SB Configuration for MCs

SB configuration parameters are set in SUPERB.INI. See Configuration (page 44) At least Controllers in the [Sizes] Section (page 44) must be set. The rest of the parameters could normally be left at their default settings. Note that the CN is defaulted to Controller Index + 1. Controller Index always starts at zero and increments up by one per connected MC. CNs start at 1 and can have any numerical value up to 57.

See examples in [PortN] Sections (page 44) on how to use different COM ports and how to change the default baudrate from 19200. The default SUPERB.INI looks like this:

```
;       SUPERB.INI
;       SuperBridge for Modicon Default
;       10/30/95/LTM

[SIZES]
;       One serial port, five MCs
ComPorts = 1
Controllers = 5
Segments = 4

[IRQ]
;       Settings for COM2
PortVector = 0B
PIDMask = 08

[PORT1]
;       COM2, 9600 Baud
UartBase = 2F8
DlabReg = 000C

[PLCDEFAULT]
DefaultPath = DM.1.0.0.0.0

[DATASLAVE]
;       This line is mandatory
Path = DS.1.0.0.0.0
```

Verify MC communication

With all MCs connected and powered up, reboot SB and check The Home Screen (page 32). All MCs should be in “Run” mode and identified by model and version. An “Unknown” MC in the home screen has never been successfully contacted by SB. Let the system run for 15 minutes and check communications error statistics for each MC in the MC Data Screen (page 33). There should be no fatal errors and less than 100 communication errors. If the error rates are higher, check your cable and connections.

MC² controllers have indicators on the serial ports that can help troubleshoot communication problems. A yellow light blinks as telegrams are received by the MC². A green light blinks as

telegrams are transmitted back to SB. Newer MC models also have serial communications diagnostic screens, usable for troubleshooting. Here is a checklist that can be used if there are problems:

1. If a regular PC COM port is used, it can be tested by disconnecting the cable and short pins 2 and 3 (for both 9 pin and 25 pin connectors), while looking at the MC Combined Diagnostic Screen (page 35). While the pins are shorted, the “CsumErrs” parameters in row 7 should increment rapidly. When the short is opened, the “Timeouts” parameter in row 7 should increment slowly.
2. Check all communication parameters in all MCs. All parameters must be equal except the “Controller Number”, which must be different for all MCs.
3. Check the corresponding line parameter settings in SUPERB.INI. See [PortN] Sections (page 44).
4. All MC²s should show a blinking yellow light on the serial port, indicating that they are receiving telegrams from SB. If it does not blink at all, there are problems with the cable, SB serial port or RS-422 converter.
5. The green light should also blink. If there are more than one MCs in the system, it should not blink as often as the yellow light. If it does not blink at all, there are problems with the line parameters or controller number.
6. A LastFatalErr of -13 in the MC Combined Diagnostic Screen (page 35) indicates that the MC actually is returning telegrams, but the model and/or version is not supported by SB. An upgrade of either SB or the MC software version may be necessary. See Supported functions (page 17).

SETTING UP PLC CONTROLLERS FOR REGISTER COPY

If MC data are to be used in PLC ladder logic, a segment copy scheme can be enabled, where SB writes and reads holding registers, in segments from one or more PLCs. A segment is either a part of or an entire array. See PLC Holding Register Array Specification (page 10). Typically, one PLC is the host for SB, holding master versions of the two control arrays, Integer Control (IC) and Float Control (FC) that are red by SB . The host PLC normally also holds copies of the two report arrays, Integer Report (IR) and Float Report (FR) that are written by SB. In some installations several PLCs serve as hosts for MCs, and the segments are split between them. Segment copy is always attempted, from SB, when the Segments entry in the [Sizes] Section (page 44) is greater than zero.

Allocating Holding Registers

For successful holding register copy to take place, partitions in the holding register area (4xxxx registers) must be set aside for use by SB. Sizes (number of registers) are dependent of the number of MCs connected, see Controllers entry in the [Sizes] Section (page 44). To hold an entire array, partition sizes should be at least

- For copies of Integer Report (page 10), 8 times the number in Controllers entry in the [Sizes] Section (page 44).
- For master versions of Integer Control Array (page 12), 7 times the number in Controllers entry in the [Sizes] Section (page 44).
- For copies of Float Report Array (page 14), 16 times the number in Controllers entry in the [Sizes] Section (page 44).
- For master versions of Float Control Array (page 15), 6 times the number in Controllers entry in the [Sizes] Section (page 44).

The PLC holding register partitions do not have to have the same holding register numbers as the internal SB holding register arrays, which start at 40001 and continue up. It is a good idea to use the SB holding register numbers if they are free in the host PLC; it makes PLC programming easier, using this manual.

SB Configuration for Segment Copy

Segment copy is enabled by setting entries in SUPERB.INI. A Segments entry in the [Sizes] Section (page 44) greater than zero enables segment copy. Normally, four segments per six MCs are used. Using SB default segment parameters is highly recommended. See [PLCDefault] Section (page 46). At least the DefaultPath (page 46) needs to be set.

For complex installations with segment copy to multiple PLCs, each segment can be specified in detail in the [SegmentN] Section (page 47).

Connecting SB to MB+

MB+ network design is explained in [1]. To successfully maintain a system of PLCs, SBs and MMIs, a general knowledge in this area is required. Information about the physical installation of MB+ is covered in [1], page 33f and 93f.

Verify MB+ Segment Copy

With all MCs connected and powered up, the MB+ cable connected, the host PLCs powered up and configured, reboot SB and check The Home Screen (page 32). All MCs and segments should be in “Run” mode. Let the system run for 15 minutes and check rejects in the MB+ Segment Copy Diagnostic Screen (page 38). There should be no rejects in any segments, and the Time parameter should stay less than 110.

PLC HOLDING REGISTER ARRAY SPECIFICATION

MC Data in SB is available in PLC holding register arrays. They are:

- Integer Report (IR), containing read-only bit or integer oriented data from the MCs, such as inputs, outputs, alarms and communication status. In IR, there are 8 elements (8 registers) per connected MC.
- Integer Control (IC), containing read-write bit or integer oriented data for the MCs, containing parameter tags and function requests. In IC, there are 7 elements (7 registers) per connected MC.
- Float Report (FR), containing read-only floating point data from the MCs, such as tagged parameters, feedrates and totals. In FC, there are 8 elements (16 registers) per connected MC.
- Float Control (FC), containing read-write floating point data for the MCs, such as setpoints. In FC, there are 3 elements (6 registers) per connected MC.

Internally in SB, all arrays are located in a contiguous block of holding registers, starting at 40001. The array order is, with ascending holding register number, IR, IC, FR, FC.

Integer Report Array

SuperBridge will maintain an array of 4xxxx registers, with 8 elements per connected MC. The purpose of this array is to make bit or integer data available to the PLC ladder or MMI programmer. The array is read only. The first register address of the IR array is always 40001. The last register address in the IR array is 40001 + 8 * (MCs) - 1, where MCs is the number of MCs connected according to the Controllers entry in SUPERB.INI. See page 44.

The following is a specification of the 8 words belonging to a specific MC.

Note: The Modicon style of bit numbering is used. Most Significant Bit (MSB) = bit 1, while the Least Significant Bit (LSB) = bit 16

MC Status Word, IR:0,8,16..

The MC Status word indicates the operative status of the controller. Any bit set, except bit 12, indicates a potential problem. The bits are mapped as follows:

Bit 16 (0001) Off-line. The MC is taken off-line by the Off-line bit in the MC Control Word. If the Off-line bit in the MC Control Word, IC:4,11,18.. (page 13) is cleared (by the PLC or Control Room Software) this bit is cleared and the MC Status will change to "Reviving".

Bit 15 (0002) Coldstart. The MC has been cold-started, and is in the process of being brought on-line for normal operation.

Bit 14 (0004) Communications failure. The MC fails to respond to communications. Attempts are made periodically to revive the MC. During the revival attempt time, this bit is cleared and the MC status changes to "Reviving".

Bit 13 (0008) Reviving. An attempt is made to make the MC go on-line, either by a revival attempt from a communications failure or a change of state to 0 of the MC Control Word Off-line bit. When the revival attempt is concluded, this bit is cleared and the MC state changes to either "Coldstart", "Communications failure" or "On-line".

Bit 12 (0010) Always on. This bit is set every time a file copy takes place. It could be periodically cleared by the ladder logic and then checked to see that it is set by

SuperBridge. This would ensure that communication between SuperBridge and the PLC has not failed.

Bit 11 (0020) In menu. The MC menu system is engaged. This means that the effect of any remote keycode requests are unpredictable.

Bit 10 (0040) Material Starvation condition. The MC is in a state of low feedrate deviation alarm. Only MCs that supports feedrate can have this bit set. It can be used to take action on a feeder material starvation condition.

Bit 9 (0080) Recalibration. The MC has possibly been re-calibrated, since the rerate, calibrate or service menu has been accessed. This bit is set until the MC has been interrogated about scale factors and decimal point settings. When the interrogation is completed, the bit is cleared.

Bit 8 (0100) Internal Setpoint. The MC is not in communications setpoint mode. The Setpoint value in SetPoint, FC:0,3,6.. (page 15) is ignored by the MC. This bit is never set for MCs that do not support external setpoint, such as the 11.00.HP. Instead, a “setpoint” setting us used for other purposes for these models. See Setpoint (page 18) for details.

Bit 7 (0200) Tag Access problem. A MC register, tagged for continuous reporting, is either non-existent or read protected. Also, indication of difficulties downloading setpoints to the controller.

Bit 10 (0400) Internal Secondary Setpoint. The MC is not in communications setpoint mode for the secondary setpoint. The Secondary setpoint value in Secondary SetPoint, FC:2,5,8.. (page 15) is ignored by the MC. This bit is never set for MCs that do not support external setpoint, such as the 11.00.HP. Instead, a “setpoint” setting us used for other purposes for these models. See SetPoint, FC:0,3,6.. (page 15) for details.

Bit 5 - 1 Reserved.

MC Internal State, IR:1,9,17..

MCs with an internal state machine, such as 30.00.HP and 35.00.HP have an internal, numeric integer variable, describing its operational state. The value of this variable is available in this integer. For models that are continuous, such as 10.00.HP, 11.00.HP, 20.00.HP and 22.00, this value is always 0. The interrogation of this variable is a part of the fast loop. To find out about the internal state values, see Internal State, (page 20).

MC Digital I/O, IR:2,10,18..

The states of the physical inputs and outputs of the MC are available in this integer. The interrogation is a part of the fast loop. To find out about digital input and output designations, see Digital I/O (page 19). The MC physical I/O is mapped to the following bits:

Bit 16-9 State of physical (relay) outputs 1..8 at backplane board #1. A "1" indicates a closed relay output. Most MCs have only 7 relay outputs, 1..7.

Bit 8 - 5 State of physical inputs 1..4 at backplane board #1. A "1" indicates a closed input circuit.

Bit 4 - 1 State of physical inputs 1..4 at backplane board #2. A "1" indicates a closed input circuit.

Note that MC² controllers only have one backplane board.

MC General Alarms or Warnings, IR:3,11,19..

Any current general alarms or warnings in the MC is visible as a bit in this integer. MCs have a maximum of 16 general alarms or warnings. There is one bit per alarm. The interrogation is a part of the fast loop. To find out about MC general alarms, see General Alarms (page 18).

Request Done Bits, IR:4,12,20..

This integer contains the "Done" bits for requests set by the user in the MC Request Word. The Done bits are always set when a request has been completed. If the request caused an error, the Request Error Bits will indicate what kind of errors that were encountered. The bits are mapped in the same way as the bits in the MC Control Word, IC:4,11,18.., (page 13). The done bits for Download Setpoint, and Download Secondary Setpoint are set at the first successful setpoint download, and remain set until the request bit is cleared, or a problem occurs. Setpoints are downloaded only when they change.

Request Error Bits, IR:5,13,21..

This integer contains the "Error" bits for the last request executed in the MC Request Word. If no errors were encountered, all bits are cleared. The bits are mapped as follows:

Bit 16 (0001) MC is off-line or in communications failure. Request could not be performed.

Bit 15 (0002) The request is not supported for this MC model.

Bit 14 (0004) No access. The requested function could not be performed because of access restrictions.

Bit 13 (0008) Keyboard problems. A remote keyboard request was issued when the MC was not in root node. No remote keystroke was sent.

Bit 12 (0010) A MC register number is addressed that does not exist in the MC model.

Bit 11 (0020) The value used for updating a MC register is too large to fit in the actual MC register type.

Bit 10 - 1 Reserved.

Request Integer Result, IR:6,14,22..

This integer contains the result of a request for integer data. Data is valid when the corresponding Request Done bit is set and all Request Error Bits are cleared. Interpretation is dependent on which request was posted. See MC Control Word, IC:4,11,18.. (page 13), for details.

External Outputs, IR:7,15,23..

Logical outputs in some MC³ controllers can be mapped to up to 16 external outputs. They appear as bits in this word. External output 1 corresponds to bit 16 etc. This is useful when a physical output is not needed at the MC location, but must be monitored by the PLC.

Integer Control Array

SuperBridge will maintain an array of 4xxxx registers, with 7 elements per connected MC. The purpose of this array is to make it possible for the PLC ladder or MMI programmer to control the MC operation. The array has read and write access. The first register address of the IC array is 40001 + 8 * (MCs). The last register address in the IC array is 40001 + 15 * (MCs) - 1.

The following is a specification of the 7 words belonging to a certain MC.

Fast Tag MC Register Number, IC:0,7,14..

This is a numerical value of a MC register number in the MC. To find out about MC register numbers, see Useful MC Registers (page 21). If the value of this integer is not zero, the corresponding MC register will be polled in the fast loop. The value of the MC register will be available in the Fast tagged value, FR:0,8,16.. (page 15), as long as the MC is on-line and the Tag Access Problems bit in the MC Status Word, IR:0,8,16.. (page 10) is not set.

Slow Tag MC Register Number 1 - 3, IC:1-3,8-10,15-17..

These integers work just like the Fast Tag MC Register Number, but the corresponding MC registers will be polled in the slow loop. The value of the MC register will be available in Slow tagged values 1 - 3, FR:1-3,9-11,17-19.. (page 15), respectively.

MC Control Word, IC:4,11,18..

The bits in this integer are used to control status and issue function requests to SuperBridge. There is one function per bit. Requests may be accompanied by request parameters located in MC Request Integer Parameter IC:5,12,19.. (page 14) and/or MC Request Float Parameter, FC:1,4,7.. (page 15). Setting a Request bit (Bit 4 - 15) will result in the corresponding bit in Request Done Bits, IR:4,12,20.. (page 12) being set, when the request either has completed or caused an error. Only one request should be run at a time, in order not to confuse done bits and parameters. The following control status and requests are supported:

Bit 16 (0001) MC Off-line. Setting this bit will take the corresponding MC off-line. When done, the MC Status Word, IR:0,8,16.. (page 10), Bit 0, Off-line, will be set. Clearing this bit bill bring the MC on-line again. It is a good idea to set a MC that is currently not used off-line, since this speeds up the polling loops.

Bit 15 (0002) Download setpoints. This bit will cause any value (including zero) in SetPoint, FC:0,3,6.. (page 15) to be downloaded, when needed, as a setpoint to the MC.

Bit 14-13 Reserved.

Bit 12 (0010) Send remote keyboard keycode. The code for the key must be present in the MC Request Integer Parameter IC:5,12,19.., (page 14). Multiple keycodes can be "added" together, having the effect of pressing multiple keys on the MC² keyboard simultaneously. The keyboard mapping is:

Bit	MC^2 keyboard key	Hex Code	Binary Code
16	"1"	0001	0000 0000 0000 0001
15	"2"	0002	0000 0000 0000 0010
14	"3"	0004	0000 0000 0000 0100
13	"4"	0008	0000 0000 0000 1000
12	"5"	0010	0000 0000 0001 0000
11	"6"	0020	0000 0000 0010 0000
10	"7"	0040	0000 0000 0100 0000
9	"8"	0080	0000 0000 1000 0000
8	"9"	0100	0000 0001 0000 0000
7	"0"	0200	0000 0010 0000 0000
6	"↑"	0400	0000 0100 0000 0000
5	"←"	0800	0000 1000 0000 0000
4	"→"	1000	0001 0000 0000 0000
3	"↓"	2000	0010 0000 0000 0000
2	"X"	4000	0100 0000 0000 0000
1	"ENT"	8000	1000 0000 0000 0000

Possible errors bits are 0 and 3. See Request Error Bits, IR:5,13,21.. (page 12)

Bit 11 (0020) Request MC register contents. The numerical value of the MC register number must be present in the MC Request Integer Parameter IC:5,12,19.. (page 14). Upon completion, bit 5 of Request Done Bits, IR:4,12,20.. (page 12), will be set. If no errors occurred, the content of (value in) the MC register will be present in Request Float Result FR:6,14,22.. (page 15). Possible errors bits are 0 and 2. See Request Error Bits, IR:5,13,21.. (page 12).

Note. An easier and more efficient method of getting the content of a MC register is to tag it. See Fast Tag MC Register Number, IC:0,7,14.. (page 13) and Slow Tag MC Register Number 1 - 3, IC:1-3,8-10,15-17.. (page 13)

Bit 10 (0040) Update MC register contents. The MC register number to update must be present in the MC Request Integer Parameter IC:5,12,19.. (page 14). The numerical value of new MC register content must be present in MC Request Float Parameter, FC:1,4,7.. (page 15) Upon completion, bit 6 of the Request Done Bits, IR:4,12,20.. (page 12), will be set. Possible errors bits are 0 and 2. See Request Error Bits, IR:5,13,21.. (page 12)

Bit 9 (0080) Clear all general alarms or warnings. This has the same effect as pressing the 'Clear General Alarms' button on the MC² or the 'ACK ALL' touchpad on the MC³. The MC General alarm or warning output will go to OFF state, and the MC general alarm or warning indicator will go off. Note that Fault indicators, existing in the MC³ models 30.10.EX, 30.20.EX and 24.10.EX will not be cleared, using this request bit.

Bit 8 (0100) Clear the subtotal. This has the same effect as pressing the 'Clear Subtotal' button on the MC. Possible error bit is 2. See Request Error Bits, IR:5,13,21.. (page 12)

Bit 9 (0200) Download secondary (batch) setpoints. This bit will cause any value (including zero) in Secondary SetPoint, FC:2,5,8.. (page 15) to be continuously downloaded as a secondary (batch) setpoint to the MC.

Bit 8..1 Reserved

MC Request Integer Parameter IC:5,12,19..

This integer is used to hold request parameters. See MC Control Word, IC:4,11,18.. (page 13).

External Inputs, IC:6,13,20..

Logical inputs in some MC³ controllers can be mapped to up to 16 external inputs. They appear as bits in this word. External input 1 corresponds to bit 16 etc. This is useful when the PLC controls the MC inputs directly.

Float Report Array

SuperBridge will maintain an array of 4xxxx registers, with 8 floating point elements (16 holding registers) per connected MC. The purpose of array is to make floating point data available to the PLC ladder or MMI programmer. The file is read only. The first register address of the FR array is 40001 + 15 * (MCs). The last register address in the FR array is 40001 + 31 * (MCs) - 2.

The following is a specification of the 8 floats belonging to a certain MC.

Fast tagged value, FR:0,8,16..

This float contains the value of the MC register tagged in Fast Tag MC Register Number, IC:0,7,14.. (page 13). The value is updated in the fast loop.

Slow tagged values 1 - 3, FR:1-3,9-11,17-19..

These float contains the values in the MC registers tagged in Slow Tag MC Register Number 1 - 3, IC:1-3,8-10,15-17.. (page 13) The values are updated in the slow loop.

Process Value, FR:4,12,20..

The value in this float depends on the MC model. It is normally the feedrate. See Process Value (page 18). The value is updated in the fast loop.

Total, FR:5,13,21..

All MC applications support a totalizer. The current total is available in this float. The value is updated in the fast loop.

Request Float Result FR:6,14,22..

This float contains the value resulting from a request. See MC Control Word, IC:4,11,18.., page 13

Reserved, FR:7,15,23..

This float is reserved for future expansion.

Float Control Array

SuperBridge will maintain an array of 4xxxx registers, with 3 floating point elements (6 registers) per connected MC. The purpose of this array is to make it possible for the PLC-5 ladder or MMI programmer to control set-points and download MC register values. The file has read and write access. The first register address of the FC array is 40001 + 31 * (MCs). The last register address in the FC array is 40001 + 37 * (MCs) - 2.

The following is a specification of the three floats belonging to a certain MC.

SetPoint, FC:0,3,6..

The value in this float will be downloaded to the MC as the current setpoint, if bit 1 in the MC Control Word, IC:4,11,18.., page 13 is set. See also Bit 9 of MC Status Word, IR:0,8,16.., page 10

MC Request Float Parameter, FC:1,4,7..

The value in this float is used to hold request parameters. See MC Control Word, IC:4,11,18.., page 13.

Secondary SetPoint, FC:2,5,8..

The value in this float will be downloaded to the MC as the current secondary setpoint, if bit 9 in the MC Control Word, IC:4,11,18.., page 13 is set. See also Bit 10 of MC Status Word, IR:0,8,16.., page 10. Only MC³ 24.96.EX.D or later or 30.20.EX.Beta or later supports secondary (batch) setpoints.

SLAVE MESSAGES PROCESSING SPECIFICATION

SB will act as a PLC when receiving messages from a MB+ master that request reading and writing data to and from the four data arrays. Control files (IC and FC) can be read from and written to. Report file (IR and FR) can only be read. Modicon MB+ messages are specified in [2], appendix 1, page 159. Functions 0x03, “Read Holding Registers”, page 166, 0x06, “Preset Single Register”, page 169 and 0x10, “Preset Multiple Registers”, page 179, are supported. Issuing messages that are not supported by SB will generate an exception response 0x01, meaning “Illegal function for the addressed slave”. See [2], page 184.

Read Holding Registers

See [2], page 166. This is function 0x03. In the PLC MSTR instruction, the corresponding function is 2, “Read Data”. Data will be returned if the requested holding register range is within any of the SB arrays. Note that the SB arrays make up a contiguous block of holding registers. The request can cross array boundaries. Note that the source holding register number in the MSTR data block has the “4” in the 4xxxx reference omitted. See [3], page 222. If the request contains holding registers beyond the SB arrays, exception code 02, “Illegal data address within the information field for the addressed slave” is returned. See [2], page 184. The same exception code is returned if the request spans more than 125 holding registers.

Preset Multiple Registers

See [2], page 178. This is function 0x10. In the PLC MSTR instruction, the corresponding function is 1, “Write Data”. Data will be accepted if the requested holding register range is within the IC or FC array. The request can not cross array boundaries. Note that the target holding register number in the MSTR data block has the “4” in the 4xxxx reference omitted. See [3], page 222. If the request contains holding registers outside the IC or FC arrays, exception code 02, “Illegal data address within the information field for the addressed slave” is returned. See [2], page 184. The same exception code is generated if the request spans more than 100 holding registers. If the “# of registers set” field (byte 4 and 5) does not correspond to the “# of bytes in the data buffer” (byte 6) in the query, exception code 03, “Illegal data value in the information field for the addressed slave” is returned. See [2], page 184.

Preset Single Registers

See [2], page 169. This is function 0x06. Data will be accepted if the requested holding register is within the IC or FC array. If the requested register is outside the IC or FC arrays, exception code 02, “Illegal data address within the information field for the addressed slave” is returned. See [2], page 184.

MODEL SPECIFIC INFORMATION

SuperBridge was released years after the MC² weighing controller. For some older versions of the controller software applications, full support is not available. This chapter explains limitations and application specific information that relates to specific MC² models.

SUPPORTED FUNCTIONS

The following table lists any limitations of SuperBridge operation in relation to different MC² and MC³ models and versions. Models not listed here are not supported at all.

Model	External I/O	Set Points	Pacing	Req. Reg	Update register	Max Baud	Notes
20.00.K	No	One	Yes	Yes	Yes	9600	
22.00.B	No	One	Yes	Yes	Yes	19200	
30.00.D	No	One	Yes	Yes	Yes	9600	Note 1
10.00.HP.O,A,B	No	No	No	No	No	9600	Note 2
10.00.HP.C, D	No	Note 3	No	Yes	Yes	19200	
11.00.HP.A	No	Note 3	No	Yes	Yes	19200	
20.00.HP.O,A,B	No	Note 4	Yes	Note 5	Note 5	9600	Note 2
20.00.HP.C	No	One	Yes	Yes	Yes	19200	
30.00.HP.O,A-D	No	One	Yes	Yes	Yes	19200	
35.00.HP.O,A	No	One	Yes	Yes	Yes	19200	
24.96.EX.O,A	No	One	Yes	Yes	Yes	19200	
24.96.EX.B	Yes	One	Yes	Yes	Yes	19200	
24.95.EX.D	Yes	Two	Yes	Yes	Yes	19200	
30.10.EX.Beta	Yes	One	Yes	Yes	Yes	19200	
30.10.X.O	Yes	One	Yes	Yes	Yes	19200	
30.20.EX.Beta	Yes	Two	Yes	Yes	Yes	19200	
24.10.EX.Beta	Yes	One	Yes	Yes	Yes	19200	
24.10.EX.O	Yes	Two	Yes	Yes	Yes	19200	

Note 1: An error in the 30.00.D application makes it impossible for SuperBridge to detect the fact that the scale is rerated, calibrated or altered in the diagnostics menu.

Note 2: This application should be updated to the latest version when used with SuperBridge.

Note 3: See Setpoint (page 18).

Note 4: An error in the 20.00.HP.O, A and B applications makes it impossible for SuperBridge to detect the fact that the controller is taken out of “Comm Setpoint Mode”.

Note 5: Some scaling problems exist for some registers. If bit 6 or 7 in the register property word is set, unpredictable results can occur. See Useful MC Registers, page 21.

PROCESS VALUE

The process value is, with the following exceptions, the feedrate, as displayed in the root node of the controller. The exceptions are:

11.00.HP Current Gross Weight, with high resolution.

35.00.HP Actual Batch Total for last batch weighed out.

SETPOINT

The setpoint value is, with the following exceptions, used as the feedrate setpoint, when the controller is in “Comm Setpoint” mode. The exceptions are:

10.00.HP The setpoint value is transferred to the High Feedrate alarm limit.

11.00.HP The setpoint value is transferred to the weight value for limit switch number 3.

35.00.HP The setpoint value is used as the batch setpoint when the controller is in “Comm Setpoint” mode.

GENERAL ALARMS

The General Alarm bits are mapped out according to the following table. Detailed information about the meaning of the alarms is available in the operations manual for the controllers. Warnings mapping in the MC³ models 24.10.EX, 30.10.EX and 30.20 EX depend on which inputs or outputs are qualified for warning. The bit order can be found by displaying the warning screen in the controller, when it has been configured

Controller	Bit	Meaning
20.00.K	1	Overflow
	2	A/D Overrange
	3	Auto-Tare Reject
	4	Master Comm Lost
	6	Display Failure
	7	Display Failure
30.00.D	0	A/D Overrange
	1	Hopper Empty
	2	Slow Fill
	3	Over Fill
	4	Master Comm Lost
	6	Display Failure
	7	Display Failure
22.00	4	Master Comm Lost
	6	Display Failure
	7	Display Failure
10.00.HP	1	A/D Overrange
	2	Auto-Tare Reject
	3	Master Comm Lost
	4	A/D Underrange
	5	Display Failure
	6	Display Failure

Controller	Bit	Meaning
	7	HPAD Not Set-Up
	8	Test OverFlow
11.00.HP	1	Scale Overload
	2	Scale Underload
	3	A/D Underrange
	4	A/D Overrange
	5	Bad Tare
	7	HPAD Not Set
	8	Bad Low Display
	9	Comm Lost
20.00.HP	1	A/D Overrange
	2	Auto-Tare Reject
	3	Master Comm Lost
	4	A/D Underrange
	5	Display Failure
	6	Display Failure
	7	HPAD Not Set-Up
	8	Test OverFlow
30.00.HP	1	Scale Overload
	2	Scale Underload
	3	A/D Underrange
	4	A/D Overrange

Controller	Bit	Meaning
	5	Slow Fill
	6	Hopper Empty
	7	HPAD Not Set
	8	Bad Low Display
	9	Comm Lost
	11	Overfill
	14	No HPAD Data
35.00.HP	1	Scale Overload
	2	Scale Underload
	3	A/D Underrange
	4	A/D Overrange
	5	Stable Timeout
	6	Batch Timeout
	7	HPAD Not Set
	8	Bad Low Display
	9	Comm Lost
	10	Slow Fill
	11	Fill When Batch
	14	No HPAD Data
24.96.EX	1	Belt Load Over Limit

Controller	Bit	Meaning
	2	Belt Load Under Limit
	3	PCAD Near Zero
	4	PCAD Near Full
	5	Zero Tracking off Limits
	6	PCAD discrepancy, load cells do not agree
	7	PCAD not setup
	8	Tachos do not comply
	9	Comm Lost
	10	Remote Setpoint Out Of Range
	11	No Speed Detected
	12	Analog input out of range.
	13	MC³ Display Not Responding
	14	No Data from PCAD

DIGITAL I/O

The Digital I/O bits are mapped out according to the following table. Detailed information is available in the operations manual for the controllers. MC³ controllers are capable of mapping logical inputs and outputs to physical I/O points. The actual mapping must be examined using the 'Digital Inputs' and 'Digital Outputs' mapping screens on the controller.

Controller	I/O	Bit	Meaning
20.00.K	O	0	High Alarm
	O	1	Low Alarm
	O	2	Low Speed Cut off
	O	4	In Control
	O	6	General Alarm
	I	8	Soft Start
	I	9	Control Master Reset
30.00.D	O	0	High Alarm
	O	1	Low Alarm
	O	2	Filling
	O	3	Slow Fill
	O	4	In Control
	O	5	Feeder Running

Controller	I/O	Bit	Meaning
	O	6	General Alarm
	I	8	Soft Start
	I	9	Control Master Reset
	I	10	Remote Fill
22.00	O	0	High Alarm
	O	1	Low Alarm
	O	4	In Control
	O	6	General Alarm
	I	8	Soft Start
	I	9	Control Master Reset
10.00.HP	O	0	High Alarm
	O	1	Low Alarm

Controller	I/O	Bit	Meaning
	O	2	Low Speed Cut off
	O	4	Calibration
	O	6	General Alarm
11.00.HP	O	0	In Center Zero
	O	1	Scale Stable
	O	2	Print Complete
	O	3	Limit Switch 1
	O	4	Limit Switch 2
	O	5	Limit Switch 3
	O	6	General Alarm
	I	8	Print String A
	I	9	Print String B
	I	10	Clear Sub-Total
	I	11	Tare
20.00.HP	O	0	High Alarm
	O	1	Low Alarm
	O	2	Low Speed Cut off
	O	4	In Control
	O	6	General Alarm
	I	8	Soft Start
	I	9	Control Master Reset
30.00.HP	O	0	High Alarm
	O	1	Low Alarm
	O	2	Filling
	O	3	Slow Fill
	O	4	In Control
	O	5	Feeder Running
	O	6	General Alarm
	I	8	Soft Start
	I	9	Control Master Reset

Controller	I/O	Bit	Meaning
	I	10	Remote Fill
35.00.HP	O	0	Fast Feed
	O	1	Fine Feed
	O	2	Fill valve open
	O	3	Batch Out Of Tolerance
	O	4	Ready For Start
	O	5	Batch Complete
	O	6	General Alarm
	I	8	Remote Print
	I	9	Start Batch
	I	10	Stop / Reset Batch
MC³	O	0	Rack 1 Output 1
	O	1	Rack 1 Output 2
	O	2	Rack 1 Output 3
	O	3	Rack 1 Output 4
	O	4	Rack 1 Output 5
	O	5	Rack 1 Output 6
	O	6	Rack 1 Output 7
	O	7	Rack 1 Output 8
	I	8	Rack 1 Input 1
	I	9	Rack 1 Input 2
	I	10	Rack 1 Input 3
	I	11	Rack 1 Input 4
	I	12	Rack 2 Input 1
	I	13	Rack 2 Input 2
	I	14	Rack 2 Input 3
	I	15	Rack 2 Input 4

Note that the status of unused digital inputs in MCs are reported to the MC Digital I/O, IR:2,10,18.. (page 11), even if they are not used by the MC application. They can be used as remote inputs for the ladder logic.

INTERNAL STATE

Some cyclic controller applications have an internal state variable, useful for indication of what's going on in. The state variable is numerical, and can not be used for bit monitoring.

30.00.HP

State	Meaning
0	Check for fill requirement at startup

State	Meaning
1	Prepare for normal feed

State	Meaning
2	Wait for filter values to stabilize
3	Normal LIW feed
4	Prepare for a fill cycle
5	Filling
6	Check for auto-fill condition
7	Preparations after fill cycle
8	Stabilization time after filling

State	Meaning
9	Prepare for normal feed after filling
10	Prepare for cleanout cycle
11	Run cleanout cycle to low weight
12	Run Cleanout cycle (time) after low weight
12	Waiting for fill after cleanout complete

35.00.HP

State	Meaning
0	Test for autofill
1	Stopped by button 7, "STOP BATCH"
2	Ready for start of new batch
3	Preparing for a batch
4	Prepare for mandatory wait before stable
5	Wait before stable, before batching
6	Stable check before batching
7	Check if fast feed needed
8	Start fast feed
9	Fast feeding
10	Check if skip fine feed
11	Start fine feed

State	Meaning
12	Fine feeding
13	Init wait after feed
14	Wait before stable after batching
15	Wait for stable after batching
16	Calc weight batched out so far
17	Calculate new preact
18	Prepare for filling
19	Arm timer before filling
20	Wait before fill
21	Wait for stability for filling
22	Start filling
23	Filling, check for overfill, done
24	Stop filling

USEFUL MC REGISTERS

All MC² and MC³ applications contain a numbered table of parameters, called MC registers. They are useful in a SuperBridge environment for monitoring and control purposes. In the following sections, the content of the MC registers for the different applications are listed, along with the property word. The property word describes access rules, decimal places and scaling of the MC registers.

The property word has the following layout:

Bit 15..14 Internal storage format, according to the following table:

Bit 15	Bit 14	Storage format
0	0	long (32 bit integer)
0	1	char (8 bit integer)
1	0	int (16 bit integer)
1	1	float (32 bit IEEE floating point)

Bit 13..10 Not used

Bit 9 Set if the MC register is initialized to zero at controller cold start.

Bit 8 Set if the MC register is included in the MC register checksum, that is, is safely retained when the controller is powered down.

Bit 7..6 At least one of the bits are set if the MC register is scaled. SuperBrigde will unscale the MC register and convert it into a float.

Bit 5..4 Access mask. 00: Read and write permitted. 01: Read permitted. Write permitted if needle switch 1 is open on the display board, or the 'Extended Access' logical input is ON in the MC³. 10: Read access only. 11: No access.

Bit 3..0 Decimal place codes.
0..4: 0..4 decimal places, respectively.
5..9 according to the values in MC registers 005..009, respectively, with the exception of models 20.00.K and 22.00, where the number of decimal places for code 009 is found in MC register 170, and 30.00.D, where the number of decimal places for code 009 is found in MC register 134.

20.00.K

Reg	Prop	Register Content
002	8110	Scale Factor for load indication
005	8110	# Dec places for speed
006	8110	# Dec places for feedrate
007	8110	# Dec places for belt length
008	8110	# Dec places for load
020	0107	Belt length
021	0148	Design load
026	0146	Design Feedrate
029	0105	Design belt speed
030	0148	Tare Load
031	0248	Net load
032	0248	Gross load
033	0109	Sub total
034	0109	Total
037	0205	Belt speed
039	0100	Tacho pulse counter
040	0246	Feedrate
041	0246	High resolution feedrate
083	8010	Power down counter
089	8210	General alarm status bits
118	0105	Internal speed setpoint
119	0101	Manual setpoint, %
120	0146	Internal feedrate setpoint
121	4000	Setpoint selector
122	0101	External rate ratio %
123	0101	Controller Prop Band, %
124	0100	Controller Integral, s/reset

Reg	Prop	Register Content
125	0102	Controller derivative, s
136	8202	Controller output, %
137	0202	Rate component of change in controller output, %
138	0202	Proportional component of change in controller output, %
139	0202	Integral component of change in controller output, %
163	8101	Low alarm delay, s
164	8101	Low setpoint deviation alarm limit, %
165	8101	High setpoint deviation alarm limit, %
166	8101	High alarm delay, s
170	8100	# Dec places for belt total
182	0106	High feedrate alarm limit
183	0106	Low feedrate alarm limit
184	0105	High speed alarm limit
185	0105	Low speed alarm limit
186	8100	Alarm mode selector
187	8100	Totalizer cutoff mode selector
188	8100	Cutoff value, %
189	8101	Cutoff delay, s
210	8102	Allowed change in autotare, %
212	8101	Min load for autotare, %
214	8100	Autotare enable selector

Reg	Prop	Register Content
216	8101	Autotare delay, s

22.00.B

Reg	Prop	Register Content
006	8110	# Dec places for feedrate
014	8101	Totalization cut-off, %
015	8101	Totalization cut-off flag
026	0146	Design feedrate
027	0146	Blend feedrate
033	0109	Subtotal
034	0109	Total
035	0100	Remainder for subtotal
036	0100	Remainder for total
040	0246	Feedrate
041	0246	High Resolution feedrate
089	8210	General alarm status bits
110	0101	Manual speed setpoint, %
111	0146	Internal setpoint
112	4000	Setpoint selector
113	0101	Setpoint multiplier, %
115	0101	Controller Prop Band, %
116	0101	Controller Integral, rep/min
117	0102	Controller derivative, s

Reg	Prop	Register Content
125	8202	Controller output, %
126	0202	Rate component of change in controller output, %
127	0204	Proportional component of change in controller output, %
128	0202	Integral component of change in controller output, %
163	8101	Low alarm delay, s
164	8101	Low setpoint deviation alarm limit, %
165	8101	High setpoint deviation alarm limit, %
166	8101	High alarm delay, s
187	8100	Totalization cut-off flag
188	8101	Totalization cutoff value, %
189	8101	Cutoff delay, %
202	0106	Actual setpoint

30.00.D

Reg	Prop	Register Content
002	8110	Scale Factor for weight indication
006	8110	# Dec places for feedrate
008	8110	# Dec places for weight
014	8101	Total cut-off value, %
015	8101	Total cut-off flag
019	8100	Auto-fill flag
021	0108	Fill weight
023	0108	Heel point
024	0101	Stabilization time, s
025	0148	Design weight
026	0146	Design feedrate
027	0101	Fill time, s
028	8101	Empty weight, %
029	8101	Clean-out time, s

Reg	Prop	Register Content
030	0148	Tare weight
031	0248	Net weight
032	0248	Gross weight
033	0109	Sub total
034	0109	Total
040	0246	Feedrate
041	0246	High resolution feedrate
083	8010	Power down counter
089	8210	General alarm status bits
100	0101	Manual setpoint, %
101	0146	Internal feedrate setpoint
102	4000	Setpoint selector
103	0101	External rate ratio %
104	0101	Controller Prop Band, %

Reg	Prop	Register Content
105	0102	Controller Integral, s/reset
106	0102	Controller derivative, s
110	8202	Controller output, %
111	0202	Rate component of change in controller output, %
112	0202	Proportional component of change in controller output, %
113	0202	Integral component of change in controller output, %
127	8101	Low alarm delay, s

Reg	Prop	Register Content
128	8101	Low setpoint deviation alarm limit, %
129	8101	High setpoint deviation alarm limit, %
130	8101	High alarm delay, s
134	8100	# Dec places for belt total
152	0106	High feedrate alarm limit
153	0106	Low feedrate alarm limit
154	8100	Feedrate alarm mode selector

10.00.HP

Reg	Prop	Register Content
002	0110	Scale Factor
005	8110	# Dec places for speed
006	8110	# Dec places for feedrate
007	8110	# Dec places for belt length
008	8110	# Dec places for load
009	8110	# Dec places for total
021	4100	HPAD cal setting
022	4100	HPAD gain setting
023	4100	HPAD tare setting
024	8110	HPAD ticks per sample
031	0200	Raw HPAD counts
038	0148	Design Load
040	0106	Design feedrate
042	0106	Blend feedrate
044	0105	Design belt speed
045	0107	Belt length
046	0100	Pulses per belt rev
050	0148	Tare counts
051	0248	Net belt load
052	0248	Gross belt load
053	0205	Belt Speed
055	0200	Tacho pulse counter
057	0206	Feedrate
058	0206	High resolution feedrate
065	0119	Subtotal

Reg	Prop	Register Content
066	0119	Total
067	0118	Remainder for subtotal
068	0118	Remainder for total
132	8010	Power down counter
139	8210	General alarm status bits
217	0106	High feedrate alarm limit
218	0106	Low feedrate alarm limit
219	0105	High speed alarm limit
220	0105	Low speed alarm limit
221	8100	Alarm mode selector
222	8101	Low alarm delay, s
225	8101	High alarm delay, s
230	8100	Totalizer cutoff mode selector
231	8101	Cutoff value, %
232	8101	Cutoff delay, %
235	8102	Allowed change in autotare, %
236	8101	Min load for autotare, %
237	8100	Autotare enable selector
238	8101	Autotare delay, s

11.00.HP

Reg	Prop	Register Content
003	0110	Scale Factor
005	8110	# Dec places for weight
006	8110	# Dec places for total
007	8110	# Dec places for enhanced resolution
021	4110	HPAD cal setting
022	4110	HPAD gain setting
023	4110	HPAD tare setting
025	8110	HPAD fixed ticks per sample
028	8210	External sync pulse counter
029	8110	External sync pulse divider
030	8110	Min ticks per samples external sync
031	8110	Max ticks per samples external sync
032	8110	External sync mode selector
038	0117	Design weight
039	0117	Overweight limit
040	0117	Underweight limit
041	0227	Absolute weight
042	0227	Gross weight
043	0227	Net weight
045	0227	Last stable weight

Reg	Prop	Register Content
046	0220	Raw HPAD counts
051	8220	Scale stable flag
055	0116	Total
056	0116	Subtotal
057	0117	Remainder for total
058	0117	Remainder for subtotal
076	4200	Printer transmitter status
082	0100	Item number for printout
083	0100	Item number increment
118	8010	Power down counter
124	8210	Actual alarm status
190	8110	Number of samples for stability
191	0107	Permitted span for stability
192	0107	Weight interval for center zero
230	0197	Zero tracking weight
231	0107	Max change in zero tracking weight
232	0107	Max zero tracking weight

20.00.HP, 24.81.HP

Reg	Prop	Register Content
002	0110	Scale Factor
005	8110	# Dec places for speed
006	8110	# Dec places for feedrate
007	8110	# Dec places for belt length
008	8110	# Dec places for load
009	8110	# Dec places for total
021	4100	HPAD cal setting
022	4100	HPAD gain setting
023	4100	HPAD tare setting
024	8110	HPAD ticks per sample
031	0200	Raw HPAD counts
038	0148	Design Load
040	0106	Design feedrate
042	0106	Blend feedrate

Reg	Prop	Register Content
044	0105	Design belt speed
045	0107	Belt length
046	0100	Pulses per belt rev
050	0148	Tare counts
051	0248	Net belt load
052	0248	Gross belt load
053	0205	Belt Speed
055	0200	Tacho pulse counter
057	0206	Feedrate
058	0206	High resolution feedrate
065	0119	Subtotal
066	0119	Total
067	0118	Remainder for subtotal
068	0118	Remainder for total

Reg	Prop	Register Content
139	8210	General alarm status bits
186	0105	Internal speed setpoint
187	0101	Manual setpoint, %
188	0106	Internal feedrate setpoint
189	4110	Setpoint selector
190	0101	External rate ratio %
191	0206	Analog input feedrate setpoint
192	0205	Analog input speed setpoint
193	0101	Controller Prop Band, %
194	0101	Controller Integral, rep/min
195	0102	Controller derivative, s
200	0202	Last controller raw output, %
203	8101	Max controller acceleration, %/s
204	8101	Max controller deceleration, %/s
210	0202	Controller output, %
211	0202	Rate component of change in controller output, %
212	0204	Proportional component of change in controller output, %
213	0202	Integral component of change in controller output, %

Reg	Prop	Register Content
214	0101	Belt speed used for tare and calibration procedures
217	0106	High feedrate alarm limit
218	0106	Low feedrate alarm limit
219	0105	High speed alarm limit
220	0105	Low speed alarm limit
221	8100	Alarm mode selector
222	8101	Low alarm delay, s
223	8101	Low setpoint deviation alarm limit, %
224	8101	High setpoint deviation alarm limit, %
225	8101	High alarm delay, s
230	8100	Totalizer cutoff mode selector
231	8101	Cutoff value, %
232	8101	Cutoff delay, %
235	8102	Allowed change in autotare, %
236	8101	Min load for autotare, %
237	8100	Autotare enable selector
238	8101	Autotare delay, s

30.00.HP

Reg	Prop	Register Content
003	0110	Scale Factor
005	8110	# Dec places for weight
006	8110	# Dec places for total
007	8110	# Dec places for enhanced resolution
008	8110	# Dec places for feedrate
021	4110	HPAD cal setting
022	4110	HPAD gain setting
023	4110	HPAD tare setting
025	8110	HPAD fixed ticks per sample
028	8210	External sync pulse counter
029	8110	External sync pulse divider
030	8110	Min ticks per samples external sync
031	8110	Max ticks per samples external sync

Reg	Prop	Register Content
032	8110	External sync mode selector
040	0117	Design Weight
041	0117	Overweight limit
042	0117	Underweight limit
043	0118	Design feedrate
045	0227	Gross weight
054	8220	Scale stable flag
055	0116	Total
056	0116	Subtotal
057	0117	Remainder for total
058	0117	Remainder for subtotal
112	8200	Calibration menu flag
113	8210	General alarm status bits
121	8110	Number of samples for stability
122	0107	Permitted span for stability

Reg	Prop	Register Content
140	4110	Setpoint Selector
141	0112	External rate ratio %
142	0118	Internal setpoint
143	0111	Manual setpoint in %
144	0218	Analog input setpoint
145	0118	Communications setpoint
146	0118	Preliminary comm setpoint
147	0218	Actual (used) setpoint
150	0100	State variable for LIW machine
151	8200	Manual fill request flag
165	8100	Alarm mode
166	0101	Low alarm delay
167	0101	High alarm delay
168	0118	Low rate alarm
169	0118	High rate alarm
170	0101	Low setpoint deviation %
171	0101	High setpoint deviation %
175	0117	Empty weight
176	0117	Heel Point
177	0117	Fill Weight

Reg	Prop	Register Content
200	0218	Actual Feedrate
205	0101	Controller Prop Band in percent
206	0101	Controller repeats/minute
207	0102	Controller rate time in s
212	0202	Last Controller raw output in percent
215	8101	Max Acceleration percent/sec
216	8101	Max deceleration percent/sec
217	0202	Controller output signal
218	0202	Rate component of change in controller output
219	0204	Prop component of change in controller output
220	0202	Integer component of change in controller output
221	0100	Zero counts
226	0107	Calibration weight

35.00.HP

Reg	Prop	Register Content
003	0110	Scale Factor
005	8110	# Dec places for weight
006	8110	# Dec places for total
007	8110	# Dec places for enhanced resolution
021	4110	HPAD cal setting
022	4110	HPAD gain setting
023	4110	HPAD tare setting
025	8110	HPAD fixed ticks per sample
028	8210	External sync pulse counter
029	8110	External sync pulse divider
030	8110	Min ticks per samples external sync
031	8110	Max ticks per samples external sync
032	4110	External sync mode selector
038	0117	Design weight
039	0117	Overweight limit
040	0117	Underweight limit
042	0227	Gross weight

Reg	Prop	Register Content
043	0227	Net weight
045	0227	Last stable weight
046	0220	Raw HPAD counts
051	8220	Scale stable flag
055	0116	Total
056	0116	Subtotal
057	0117	Remainder for total
058	0117	Remainder for subtotal
075	4200	Printer transmitter status
082	0100	Item number for printout
083	0100	Item number increment
124	8210	Actual alarm status
190	8110	Number of samples for stability
191	0107	Permitted span for stability
215	8100	Fill request flag
218	0197	Current batch total
223	0112	External rate ratio, %
224	0115	External batch setpoint
225	0115	Internal batch setpoint

Reg	Prop	Register Content
226	0115	External batch setpoint
227	0115	Comm batch setpoint
228	8100	Setpoint selector
229	0117	Batch tolerance
230	8100	Batch state variable
238	0117	Heel point
241	0117	Fill weight
242	0117	Current preact
243	0117	Max preact change
244	0117	Max preact absolute
245	0110	Preact adaptation, %
246	8101	Preact block selector

Reg	Prop	Register Content
247	0101	Wait time before checking stability, s
248	0101	Max wait time for stability, s
249	0101	Max batch time, s
250	0101	Max fill time, s
251	8100	Ticks per sample when feeding
252	8100	Ticks per sample default
254	0101	Fine feed desired time
256	0117	Min batch weight
257	0117	Max batch weight
259	0115	Previous batch total

24.96.EX

Reg	Prop	Register Content
003	C114	Scale Factor
005	8110	# Dec places for belt load
006	8110	# Dec places for Total
007	8110	# Dec places for belt length
008	8110	# Dec places for feedrate
009	8110	# Dec places for belt speed
020	C115	Design Belt Load
021	C118	Design Feedrate
022	C119	Design Speed
094	8010	Power Down Counter
096	8200	Actual Alarm Status
116	8200	Tacho 1 Counter
118	8200	Tacho 2 Counter
124	C100	Allowed Tacho Diff %
170	C221	Raw Load
173	C225	Net Load
175	C221	Raw PCAD count Average
176	C221	Raw PCAD #1 Counts
177	C221	Raw PCAD #2 Counts
180	0116	Current Total
181	0116	Current Subtotal

Reg	Prop	Register Content
184	C105	Totalization Cutoff Belt Load
240	C105	Overload Alarm Limit
241	C105	Underload Alarm Limit
261	C229	Belt Speed
263	C117	Belt Length
264	C111	Tacho Pulses for one Rev
270	C101	Controller Gain Comp
271	C103	Controller Integral Comp
272	C102	Controller Derivative Comp
342	C115	Zero Load
354	C105	Current Zero Track Load
356	C115	Max permitted increment of Zero Track Load
357	C115	Max Zero Track Load
372	C105	Chain Load for Calibration
441	0200	Analog Output 1
442	0200	Analog Output 2
445	0200	Analog Input 1

30.10.EX

Reg	Prop	Register Content
003	C114	Scale Factor
005	8110	# Dec places for weight
006	8110	# Dec places for Total
008	8110	# Dec places for feedrate

Reg	Prop	Register Content
020	C115	Design Weight
021	C118	Design Feedrate
022	C119	Design Speed
094	8010	Power Down Counter

Reg	Prop	Register Content
096	8200	Actual Alarm Status
166	C115	Weight Span for Stability
167	C225	Last Stable Weight
168	C110	# of Samples for Stability Determination
170	C221	Raw Weight
172	C225	Net Weight
175	C221	Raw PCAD count Average
176	C221	Raw PCAD #1 Counts
177	C221	Raw PCAD #2 Counts
180	0116	Current Total
181	0116	Current Subtotal
245	C105	Overweight Alarm Limit
246	C105	Underweight Alarm Limit
265	C101	Controller Gain Comp

Reg	Prop	Register Content
266	C103	Controller Integral Comp
267	C102	Controller Derivative Comp
286	8110	# of Average Filter Slots
291	8110	# of Loss Slots
293	C115	Empty Weight
294	C115	Heel Point Weight
296	C115	Fill Point Weight
302	0110	Max AutoFill Time
303	0110	Max Time for Cleanout
336	C115	Zero Load from Zero Procedure
342	C115	Calibration Weight
391	0200	Analog Output 1
392	0200	Analog Output 2
395	0200	Analog Input 1

24.10.EX

Reg	Prop	Register Content
003	C114	Scale Factor
005	8110	# Dec places for belt load
006	8110	# Dec places for Total
007	8110	# Dec places for belt length
008	8110	# Dec places for feedrate
009	8110	# Dec places for belt speed
020	C115	Design Belt Load
021	C118	Design Feedrate
022	C119	Design Speed
094	8010	Power Down Counter
104	8200	Fault bits
105	8200	Warning bits
116	8200	Tacho 1 Counter
118	8200	Tacho 2 Counter
124	C100	Allowed Tacho Diff %
170	C221	Raw Belt Load
173	C225	Net Belt Load
175	C221	Raw PCAD count Average
176	C221	Raw PCAD #1 Counts
177	C221	Raw PCAD #2 Counts
180	0116	Current Total
181	0116	Current Subtotal

Reg	Prop	Register Content
184	0105	Totalization Cutoff Belt Load
238	C105	Overload Alarm Limit
240	C105	Underload Alarm Limit
261	C229	Belt Speed
263	C117	Belt Length
264	C111	Tacho Pulses for one Rev
270	C101	Controller Gain Comp
271	C103	Controller Integral Comp
272	C102	Controller Derivative Comp
342	C115	Zero Load
354	C105	Current Zero Track Load
356	C115	Max permitted increment of Zero Track Load
357	C115	Max Zero Track Load
372	C105	Chain Load for Calibration
441	0200	Analog Output 1
442	0200	Analog Output 2
445	0200	Analog Input 1

DIAGNOSTIC SCREENS

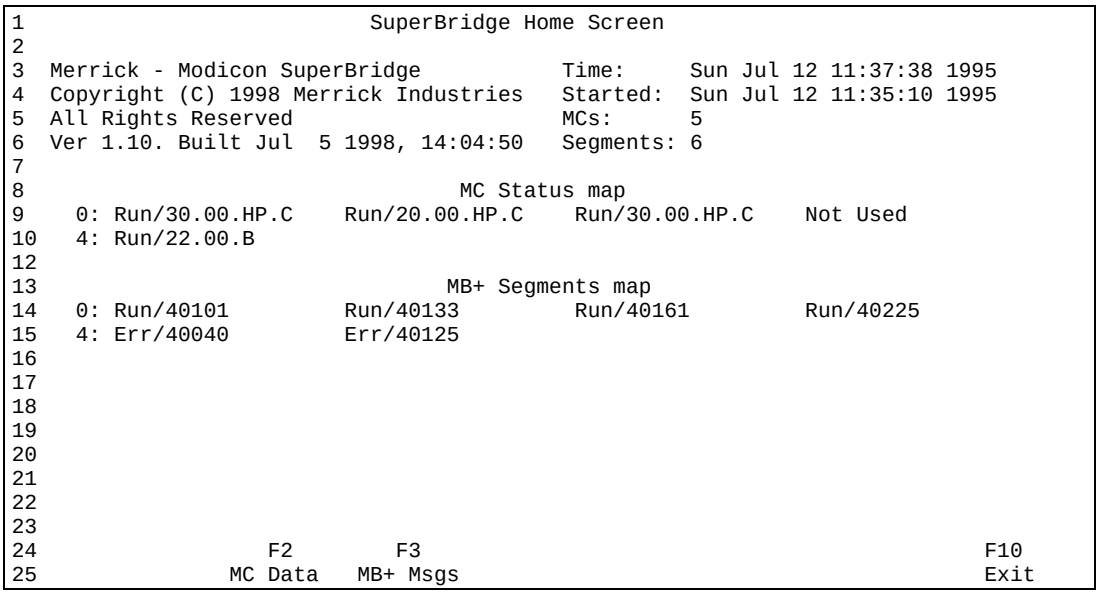
If a VGA compatible monitor and a PC keyboard is connected to the SB host PC, several diagnostic screens are available. They are usable for verification, troubleshooting, checking ladder and MMI programming, and for editing data in the Integer Control (IC) and Float Control (FC) arrays. Note that with the exception of the Home Screen, there is a SB performance penalty associated with the diagnostic display. For all screens in this section, the following SUPERB.INI was used:

```
;       SUPERB.INI
;       10-30-95/LTM Modicon Manual Example Setup

[SIZES]
;       Only one port supported in beta version
ComPorts = 1
Controllers = 5
Segments = 6

[IRQ]
;       Settings for COM1
PortVector = 0C
PIDMask = 10

[PORT1]
;       COM1, 19200 Baud
UartBase = 3F8
DlabReg = 0006

[ADAPTER]
SWInterrupt = 5D

[MC3]
Used = 0

[PLCDEFAULT]                    ;Default host controller
DefaultPath = DM.1.0.0.0.0

[SEGMENT0]                      ;PLC addresses are offset 100 from SB
DestAddress = 40101

[SEGMENT1]
DestAddress = 40133

[SEGMENT2]
DestAddress = 40161

[SEGMENT3]
DestAddress = 40225

[SEGMENT4]                      ;First MC IR data
SourceAddress = 40001
DestAddress = 40040
Elements = 8
TfrType = IR
Path = DM.2.1.0.0.0             ;Path to secondary PLC

[SEGMENT5]                      ;First MC FR data
SourceAddress = 40061
DestAddress = 40125
Elements = 8
TfrType = FR
Path = DM.2.1.0.0.0             ;Path to secondary PLC

[DATASLAVE]
Path = DS.1.0.0.0.0
```

- There are five MCs in this system; one of them, MC Index 3, is not used.
- SB reports to and is being controlled by a Quantum 140, at path DM.1.0.0.0.0.

- Data in the report files IR and FR for the first controller are also reported to a PLC at path DM.2.1.0.0.0. The PLC is turned off, to demonstrate errors in the MB+ communication.
- A Excel workbook is interrogating SB via MODLINK and a SA-85 adapter. One of the DDE links will cause an exception return from SB.

THE HOME SCREEN



This screen show overview status for SB. It is also the default and preferred screen during normal operations, since the SB performance penalty is minimal.

Displayed information:

Line	Keyword	Explanation
3..6 Left		Revision, copyright and build data for the SB software application.
3	Time:	Current time in the SB host PC.
4	Started:	The time in SB host PC at which SB was started.
5	MCs:	Number of configured MCs.
6	Segments:	Number of configured MB+ file copy segments.
8f	MC Status map	Communication status and application models/versions for all configured MCs. Possible status are Run (running, no communication problems), Ofl (taken off-line), Not Used, Rev (communications reviving attempt in progress) and Err (Communication problems). Four MCs are shown per screen line.
11f	MB+ Segments map	Communication status and first destination holding register number for all configured MB+ File Copy segments. Possible status are Run (running, no communication problems) and Err (Communication problems). Four segments are shown per screen line.

Function keys:

F2 Switch to MC Data Screen (page 33)

F3 Switch to MB+ Slave Messages Diagnostics Screen (page 42)

F10 Stop SB and return to the DOS prompt

MC DATA SCREEN

```
1                        MC Data, Controller Index 0
2
3  Number of MCs connected       5              Comm Errors logged  0
4  MC in use (1 = YES, 0 = NO)   1              Fatal Comm Errors   0
5  MC WatchDog (0.1 s ticks)     200            State Machine Index 12
6  MC Revive Time (ms)           20000          MC Model/Version    30.00.HP.C
7  MC Controller Number          1              MC Current Status   Running
8
9  IR Elems   40001  Stat  MCSt  DI/O  LRMS  RDON  RERR  RRES  XOUT
10 Pending:          0100  0003  0378  0260  0000  0000  0000  0000
11 Completed:        0000  0000  0000  0000  0000  0000  0000  0000
12 IC Elems   40041  FTag  Stg1  Stg2  Stg3  MCCT  RINT  EXIN
13 Pending:          002D  0090  0093  00D9  0000  0002  0000
14 Completed:        0000  0000  0000  0000  0000  0000  0000
15 Edit Ints (hex): [    ][    ][    ][    ][    ][    ][    ]
16 FR Elems   40076          FTag          Stg1          Stg2          Stg3
17 Pending:                34.307         0.000      1000.000         4.960
18 FR Elems   40084    ProcessVal          Total    ReqFResult          RSRV
19 Pending:              1004.000      2625.390         0.000         0.000
20 FC Elems   40156      SetPoint     ReqFParam  Sec SetPoint
21 Pending:              1000.000         0.000         0.000
22 Edit Floats:     [            ][            ][            ]
23
24     F1           F2        F3                              F6      F7    F10
25  Home Screen  MC Diags  MB+ Msgs                        Next MC Prev MC  Exit
```

The MC Data Screen shows status information and current array data for one MC. It is also possible to edit the local SB content of the two control arrays IC and FC. If segment copy is enabled for these arrays, editing is meaningless, since the edited data item will be overwritten by the next segment read.

Line	Keyword	Explanation
1		MC Controller index for data currently displayed
3	Number of MCs connected	Number of configured MCs.
4	In Use	A 0 indicates the data for the MC is allocated, but never used. There is normally no controller at all with this index.
5	MC WatchDog:	The value of the local MC WatchDog timer in 0.1 s. See WatchDog (page 45)
6	MC Revive Time	How often (in ms) SB will attempt to re-establish communication with a MC that has had a fatal (non-recoverable) communication error. See ReviveTime (page 45)
7	MC Controller Number	The local MC controller Number setting. See MC Communication Parameters (page 7) and ControllerNumber (page 44)
3	Comm Errors logged	How many recoverable (non-fatal) communication error that have occurred for this MC since SB was started.
4	Fatal Comm Errors	How many fatal (non-recoverable) communication error that have occurred for this MC since SB was started.
5	State Machine index	Used for telephone support. This value rapidly scans through a seemingly random number of values.
6	MC Model/Version	MC application program model and version. “Unknown” if the no successful communication has taken place with the MC or if the model

Line	Keyword	Explanation
		and version is unknown to SB (not supported)
7	MC Current Status	Possible status are Running (running, no communication problems), off-line (taken off-line), NotUsed, Reviving (communications reviving attempt in progress) and CommErr (Communication problems).
9-11	IR Elems	Integer Report data from the IR array.. See Integer Report (page 10). Hexadecimal representation. “Pending” means actual current data in SB. Completed means the last data successfully copied to a PLC.
12-15	IC Elems	Integer Control data from the IC array. See Integer Control Array (page 12). Hexadecimal representation. “Pending” means actual current data in SB. Completed means that the action required by the data has been initiated. It is possible to edit IC elements, using tab/backtab to move the cursor to the field to edit, enter digits (Hex) and hit return.
16-19	FR Elems	Floating Point Report data from the FR array. See Float Report Array (page 14). “Pending” means actual current data in SB. Note that the holding register reference increments with two for every float. The first float, “FTag” starts at holding register 40041. The second, “Stg1” starts at 40043, etc.
12-15	FC Elems	Floating Point Control data from the FC array. See Float Control (page 15). “Pending” means actual current data in SB. It is possible to edit FR elements, using tab/backtab to move the cursor to the field to edit, enter digits (including minus sign and decimal point) and hit return. Note that the holding register reference increments with two for every float.

Function keys:

F1	Switch to The Home Screen (page 32)
F2	Switch to MC Combined Diagnostic Screen (page 35)
F3	Switch to MB+ Slave Messages Diagnostics Screen (page 42)
F6	Switch to the MC with the next controller index
F7	Switch to the MC with the previous controller index
F10	Stop SB and return to the DOS prompt

MC COMBINED DIAGNOSTIC SCREEN

```
1                 MC Combined Diagnostic Port 0 Controller Index 0
2
3  RxPtr:   0  RxData: 3000000000000000006d
4  TxPtr:   6  TxData: 2d6a
5  Used         1|State        3|LastErr      0|FatalErrs     1|LastFatErr   -7
6  ParErrs      0|OvrErrs      1|FrameErrs    0|BreakErrs     0|BufOverrs     0
7  Timeouts     6|CsumErrs     0|BusyErrs     0|AccessErrs    0|BadFncErrs    0
8  BadataErrs   0|FormatErrs   0|RFrmErrs     0|RLimErrs      0|NotSupErrs    0
9  ErrErrs      0|CurrSlave    1|CurrTelegram 7|TimerTicks    0|RetryCount    0
10 MaxRetries   2|PortIndex    0|ActiveMC     1|                |
11
12 Used        1|State         0|TgmState    26|SlowState    29|TagIndex      1
13 LastAck     0|AccessNakOK   0|Rescaled     0|TimeOut       6|WatchDog    200
14 IdNum      38|VerNum       67|ModelIdx    17|Pacing        0|RegProp    0000
15 RegNum    150|Port          0|StartChar    A|EndChar       D|ControllerNr  1
16 Errors      3|LastErr      -7|FatalErrs    0|LastFatalErr  0|DownTime      0
17 RevTime    20|InPuts     0003|OutPuts   0078|Alarms     0260|NumRegs     313
18 RQRobin     3|SetDlsa       1|SetDlsc      1|LastSp    6.395|KeyLocked     0
19 Decimal Points 2 2 3 0 0     |RegValue                    3|Scalef    21885
20 Total              1119.3000|ProcV                994.0000|
21 Bezel [      994] [Feedrate g/min  ] YLed:40 GLed:FD
22
23
24     F1           F2        F3       F4         F5         F6      F7    F10
25  Home Screen  A-B Copy  MC Data  Next Port  Prev Port  Next MC Prev MC  Exit
```

This screen shows communications related data for one communications port (Serial port in the SB host PC) and for one MC. The upper part of the screen shows port data, the lower MC data. Since SB currently only supports one serial port, the port index is always 0. It is mostly used by Merrick for telephone support and for SB internal trouble-shooting. Some entries are useful for general trouble trouble-shooting. They are listed here:

Line	Keyword	Explanation
5	Used	A 0 indicates the data for the port is allocated, but never used.
5	Last Err	Last communication error encountered on this port. See Numerical Error Values (page 37)
5	FatalErrs	How many fatal (non-recoverable) communication error that have occurred for this port since SB was started.
5	LastFatErr	Last fatal (non-recoverable) communication error encountered on this port. See Numerical Error Values (page 37)
6-8		Individual statistics for each possible communication error on the port. See Numerical Error Values (page 37)
10	ActiveMC	There is at least one MC on this port that is active, that is, not Off-line or Not Used.
12	Used	A 0 indicates the data for the MC is allocated, but never used. There is normally no controller at all with this index.
12	State	Communication status. The numerical value of “MC Current Status” in MC Data Screen (page 33)
12	TgmState	Used for telephone support. This value rapidly scans through a seemingly random number of values. See also MC Data Screen (page 33)
13	WatchDog	The value of the local MC WatchDog timer in 0.1 s. See WatchDog (page 45)

Line	Keyword	Explanation
14	IDNum	The numerical value of the application model. Displayed if retrieved, even if the specific application is not supported by SB.
14	VerNum	The numerical value of the application version. Displayed if retrieved, even if the specific version is not supported by SB.
14	ModelIdx	A 0 here indicates that there is no support for this application/version combination.
14	Pacing	The controller is in pace mode. See also Bit 7 in MC Control Word, IC:4,11,18.. (page 10)
15	ControllerNr	The local MC controller Number setting. See MC Communication Parameters (page 7) and ControllerNumber (page 45)
16	Errors	How many recoverable (non-fatal) communication error that have occurred for this MC since SB was started. Same as “Comm Errors logged” in MC Data Screen (page 33)
16	LastErr	Last communication error encountered on this MC. See Numerical Error Values (page 37)
16	FatalErrs	How many fatal (non-recoverable) communication errors that have occurred for this port since SB was started.
16	LastFatalErr	Last fatal (non-recoverable) communication error encountered on this MC. See Numerical Error Values (page 37)
16	DownTime	How many ms this MC has waited for revival attempt after a fatal communication error.
17	RevTime	How often (in ms) SB will attempt to re-establish communication with a MC that has had a fatal (non-recoverable) communication error. See ReviveTime (page 45)
17	InPuts	Hexadecimal representation of the MC physical inputs. See Digital I/O (page 19)
17	OutPuts	Hexadecimal representation of the MC physical outputs. See Digital I/O (page 19)
17	Alarms	Hexadecimal representation of the MC Alarm bits. See General Alarms (page 18)
17	NumRegs	The highest possible MC register number in this MCs model/version. See Useful MC Registers (page 21)
18	SetDlsa	Number of attempts to download a setpoint to an MC
18	SetDlsc	Number of successful downloads of a setpoint to an MC
18	LastSp	Value of the last downloaded setpoint to the MC
18	Leylocked	1 if keyboard/touchpad is locked, else 0
19	DecimalPoints	Current values of the five MC decimal point settings.
20	Total	Current value of the MC Total. See Total, FR:5,13,21.. (page 15)
20	ProcV	Current value of the MC Process Value. See Process Value, FR:4,12,20.. (page 15)
21	Bezel	For a MC², First field is a copy of what is displayed in the upper (seven segment) display. Second field is a copy of what is displayed in the lower (alphanumeric) display.
21	YLed	Hexadecimal representation of the state of the yellow LEDs in the MC² front panel.
21	GLed	Hexadecimal representation of the state of the green LEDs and square red light in the MC² front panel.

Function keys:

F1 Switch to The Home Screen (page 32)

F2 Switch to MB+ Segment Copy Diagnostic Screen (page 38)

F3 Switch to MC Data Screen (page 33)

F4 Switch to port data for the next serial port (No effect in this version)

F4 Switch to port data for the previous serial port (No effect in this version)

F6 Switch to the MC with the next controller index

F7 Switch to the MC with the previous controller index

F10 Stop SB and return to the DOS prompt

Numerical Error Values

This is a list of the numerical values that can appear in a communication error field:

Value	Name	Explanation
2	OvrErr	Serial communications Overrun error
4	ParErr	Serial communications parity error
8	FrameErrs	Serial communications framing error
16	BreakErr	Serial communications break condition detected
-1	FormatErr	The MC detected an telegram with a bad format
-2	BusyErr	The MC can't perform the service requested in the telegram at this time
-3	AccessErr	The MC can't perform the service requested in the telegram because of access restrictions
-4	BadataErr	The MC can't perform the service requested in the telegram because parameter(s) are out of the legal limit
-5	PowUp	The controller has been rebooted and needs comm re-initialization
-6	BadFncErr	The requested function is unknown by this MC
-7	TimeOuts	SB timed out waiting for a MC response
-11	RFrmErr	Bad format in MC return telegram
-12	RLimErr	Parameter(s) in MC return telegram are out of the legal limit
-13	NotSupErr	The MC Model/Version combination is not supported by SB.

MB+ SEGMENT COPY DIAGNOSTIC SCREEN

```
1                          MB+ Segment Copy Diagnostics
2
3  ErrCall:
4  ErrMsg:
5  Segments      6|CurrSeg       1|SWInterrupt  5D|DefaultPath DM.1.0.0.0.0
6  Paths         2|ExitFlag      0|ResetRet      0|
7
8  Seg SAddr DAddr El Typ Sta Path Exc Accepts Rejects Time Last Completed
9    0 40001 40101 40  IR Run    0   0      52       0    0 Oct 30 13:33:58 1995
10   1 40041 40133 35  IC Run    0   0      51       0    0 Oct 30 13:33:57 1995
11   2 40076 40161 40  FR Run    0   0      51       0    0 Oct 30 13:33:58 1995
12   3 40156 40225 15  FC Run    0   0      51       0    0 Oct 30 13:33:58 1995
13   4 40001 40040  8  IR Err    1   0       0      50    0 Never
14   5 40061 40125  8  FR Err    1   0       0      50    0 Never
15
16
17
18
19
20
21
22
23
24     F1           F2        F3        F4         F5                      F10
25  Home Screen  MB+ Paths MC Diags  Next Page  Prev Page                  Exit
```

This screen shows status for some central MB+ communication parameters and for each segment defined for MB+ segment copy. See SB Configuration for Segment Copy (page 9) The ErrCall field in line 3 gives a textual representation of the last error encountered while attempting to communicate over the DH+ network. Parameters in the segment list are:

Parameter	Explanation
Seg	Segment number. “N” in [SegmentN] Section (page 47)
SAddr	First source holding register address in the SB array involved in the segment copy. See SourceAddress (page 47). This address must be an element in IR, IC, FR or FC.
DesAddr	First destination holding register address in the target PLC involved in the segment copy. See DestAddress (page 47)
El	Number of elements in the segment. Must be less than 100 for IR and IC, and less than 50 for FR and FC. See Elements (page 47)
Typ	Data type for the file transfer. PLC Holding Register Array Specification (page 10). Possible values are IR, meaning integers copied to the PLC; IC, meaning integers copied from the PLC; FR, meaning floats copied to the PLC and FC, meaning floats copied from the PLC.
Sta	Status for the segment copy process. Possible values are “Run” and “Err”.
Path	Index for the path used for this segment copy process. Path information is available in MB+ Path Diagnostics Screen (page 40).
Exc	Exception code received for the last segment copy attempt. Possible values are 0: no problems, 1: the MB+ function used for segment copy (Preset Multiple Registers or Read Holding Registers) is not supported by the PLC, 2: invalid register address in the target PLC, 3: invalid data field in the MB+ telegram, 4: the target PLC is not on-line and 5: the path to the target PLC could not be opened. Exception code 5 normally indicates a problem with the local SA-85 adapter.
Accepts	Number of successful segment copy transactions since SB was started.

Parameter	Explanation
Rejects	Number of unsuccessful segment copy attempts since SB was started.
Time	Transfer time in ms for the last segment copy transaction
Last Completed	Date and time for the last successful segment copy transaction.

Function keys:

F1	Switch to The Home Screen (page 32)
F2	Switch to MB+ Path Diagnostics Screen (page 40
F3	Switch to MC Combined Diagnostic Screen (page 35)
F4	Switch to next page of segment information. No effect if all segment lines fit on one page.
F5	Switch to previous page of segment information. No effect if all segment lines fit on one page.
F10	Stop SB and return to the DOS prompt

MB+ PATH DIAGNOSTICS SCREEN

```
1                          MB+ Paths Diagnostics
2
3  ErrCall:
4  ErrMsg:
5  Segments      6|CurrSeg       2|SWInterrupt  5D|DefaultPath DM.1.0.0.0.0
6  Paths         2|ExitFlag      0|ResetRet      0|
7
8  Path Statistics     O Seg S Snd Rec Exc  Snds  Rcvs Opens Touts NList
9  0:DM.1.0.0.0.0      Y   2 1   0   0   0  6630  6733     1   103     0
10 1:DM.2.1.0.0.0      Y   5 1   0  18   4   113 53049   114 52936   113
11
12 NCB Statistics      Name             CO RE TY RT ST ISnds IRecs OSnds ORecs
13 0:DM.00.00.00.00.00                  95  0  1  0 14     0     0     0     0
14 1:DM.00.00.00.00.00                  B0  0  2  0 14     0     0     0     0
15
16
17
18
19
20
21
22
23
24     F1           F2        F3                                          F10
25  Home Screen  MB+ Msgs  MB+ Copy                                       Exit
```

This diagnostic screen is available as a part of the beta test program. It may go away in the production release. It deals mostly with internal MB+ driver diagnostics and SB internal error statistics counters. Some useful fields:

Line	Keyword	Explanation
5	Segments	Number of specified segments for segment copy. See Segments (page 44).
5	CurrSeg	The index of the segment that is currently being subject to a copy transaction.
5	SWInterrupt	The SA85 adapter software interrupt used. ([2], page 9).
5	DefaultPath	The default SB path used for processing segment copy.
6	Paths	Number of paths used for master processing. There is one path per target PLC.
8-10	Path Statistics	Path index and path string defined for the segment.
8-10	O	Y if the path is open. N if the path is closed. An open path does not necessarily indicate that the PLC is responding.
8-10	Seg	Segment index for the segment currently being processed for this path.
8-10	S	The state of the internal SB slave processor state machine.
8-10	Snd	Result of the last attempt to send a MB+ telegram from SB for this path. 0 indicates no problems. Other values are listed in [2], pages 102..104.
8-10	Rec	Result of the last attempt to receive a MB+ telegram to SB for this path. 0 indicates no problems. Other values are listed in [2], pages 102..104.
8-10	Exc	Last exception code for this path. 0 indicates no problems. Other possible values are 1: the MB+ function used for segment copy (Preset Multiple Registers or Read Holding Registers) is not supported by the PLC, 2: invalid register address in the target PLC, 3: invalid data field in the MB+ telegram, 4: the target PLC is not on-line and 5: the path to the target PLC could not be opened. Exception code 5 normally indicates a problem with the local SA-85 adapter.
8-10	Snds	Number of attempts to send a MB+ telegram from SB for this path.

Line	Keyword	Explanation
8-10	Rcvs	Number of attempts to receive a MB+ telegram to SB for this path.
8-10	Opens	How many times the path has been opened. Should normally be 1. A high number indicates communication problems.
8-10	Touts	Number of attempts to receive a MB+ telegram to SB for this path, resulting in a time-out condition.
8-10	NList	Number of attempts to send a MB+ telegram to SB for this path, resulting in a no-response condition, indicating that the target PLC is not on-line.

Lines 12-14 contains no useful information.

Function keys:

F1	Switch to The Home Screen (page 32)
F2	Switch to MB+ Slave Messages Diagnostics Screen (page 42)
F3	Switch to MB+ Segment Copy Diagnostic Screen (page 38)
F10	Stop SB and return to the DOS prompt

MB+ SLAVE MESSAGES DIAGNOSTICS SCREEN

```
1                      MB+ Slave Messages Diagnostics
2
3  Messages  On|ErrorMsgs  On|Status   Run|LastMsg Oct 30 16:39:31 1995
4  LastRec    0|LastSnd     0|LasExc     0|Path DS.1.0.0.0.0
5  OkPMs    550|OkPSs       0|OkRMs   3235|Snds  3925|Rcvs 13784
6  BadPMs   140|BadPSs      0|BadRMs     0|NoSu     0|NoLi     0
7
8  RH 40076(FR:000) - 40091(FR:007), 16 registers
9  RH 40041(IC:000) - 40047(IC:006), 7 registers
10 RH 40156(FC:000) - 40161(FC:002), 6 registers
11 PM 40158(FC:001) - 40159(FC:001), 2 registers
12 PM 40156(FC:000) - 40157(FC:000), 2 registers
13 PM Exc 2 {01 10 00 4B 00 02 04 00 00 ..}
14 RH 40001(IR:000) - 40008(IR:007), 8 registers
15 RH 40076(FR:000) - 40091(FR:007), 16 registers
16 RH 40041(IC:000) - 40047(IC:006), 7 registers
17 RH 40156(FC:000) - 40161(FC:002), 6 registers
18 RH 40001(IR:000) - 40008(IR:007), 8 registers
19 RH 40076(FR:000) - 40091(FR:007), 16 registers
20 RH 40041(IC:000) - 40047(IC:006), 7 registers
21 RH 40156(FC:000) - 40161(FC:002), 6 registers
22 PM Exc 2 {01 10 00 4B 00 02 04 00 00 ..}
23
24     F1           F2        F3        F4         F5         F6      F7    F10
25  Home Screen  MC Data   MB+ Paths Stop Tgm   Start Tgm  Stop Er Start Er Exit
```

This screen shows status for some central MB+ communication parameters and for the last 15 slave messages received by SB. See Slave Messages Processing Specification (page 16). The upper part of the screen contains some status information:

Parameter	Explanation
Messages	“Off” or “On” Indicates if good messages are logged to the lower part of the screen or not. See F4 and F5 below.
ErrorMsgs	“Off” or “On” Indicates if invalid messages are logged to the lower part of the screen or not. See F6 and F7 below.
Status	“Run” or “Err” indicating the operational status of the message processor
Last Msg	Time and date for the last slave message processed.
LastRec	Result of the last attempt to receive a MB+ telegram to SB. 0 indicates that a message was received with no problems. 5 indicates that no message was waiting to be processed. Other values are listed in [2], pages 102..104.
LastSnd	Result of the last attempt to send a MB+ telegram from SB. 0 indicates no problems. Other values are listed in [2], pages 102..104.
LastExc	Last exception code returned. 0 indicates no problems. Other possible values are 1: the MB+ function requested is not supported by the SB, 2: invalid register address in SB, 3: invalid data field in the MB+ telegram, 4: the requesting PLC went off-line and 5: the slave path in SB could not be opened. Exception code 5 normally indicates a problem with the local SA-85 adapter.
Path	The SB internal path for processing slave messages.
OkPMs	Number of ‘Preset Multiple Registers’ messages successfully processed.
OkPSs	Number of ‘Preset Single Register’ messages successfully processed.
OkRMs	Number of ‘Read Holding Registers’ messages successfully processed.
Snds	Number of attempts to send a MB+ telegram from SB.
Rcvs	Number of attempts to receive a MB+ telegram to SB.
BadPMs	Number of ‘Preset Multiple Registers’ messages unsuccessfully processed.
BadPSs	Number of ‘Preset Single Register’ messages unsuccessfully processed.

Parameter	Explanation
BadRMs	Number of ‘Read Holding Registers’ messages unsuccessfully processed.
NoSu	Number of messages received not supported by SB, generating exception 01
NoLi	Number of attempts to send a MB+ response telegram from SB, resulting in a no-response condition, indicating that the querying PLC went off-line.

The lower part of the screen shows data for the last 16 received slave messages. The row beneath the last message in blank. The screen does not scroll. A row for a good message contains what kind of message received, see Slave Messages Processing Specification (page 16), the range of holding registers and the number of holding registers. A row for a bad message contains the kind of message, the exception code generated and the beginning of the message body itself, in hex. The second byte is the function code: 03 for Read Holding Registers, 06 for Preset Single Register and 10 for Preset Multiple Registers.

In this example (Row 13 and 22), a Preset Multiple Register message was received. The message body layout is described in detail in [2], page 179. Note that the message description in this specification starts with the second byte in the message body. The first holding register requested is 004B hex, 75 decimal, which corresponds to holding register 40076. This holding register in the FR array, and consequently read only. An exception code 2 (invalid address for this PLC) was generated.

Function keys:

F1	Switch to The Home Screen (page 32).
F2	Switch to MC Data Screen (page 33).
F3	Switch to MB+ Path Diagnostics Screen (page 40).
F4	Stop logging good messages
F5	Start logging good messages
F6	Stop logging error messages
F7	Start logging error messages
F10	Stop SB and return to the DOS prompt

CONFIGURATION

SB is completely configurable via the configuration file, SUPERB.INI. The file can be edited using a text editor. It is loaded every time the SB application is started up. The file is divided into sections with a format similar to Windows initializations files.

[SIZES] SECTION

The sizes section deals with the size of the SB application, such as number of connected MCs.

ComPorts

Depending on how many MCs are connected, one or more RS-422 serial ports are used for the MC connections. If more than one port is used, a multiport adapter is installed in the SB host PC. This entry specifies the number of ports used. Default is 1.

Controllers

This entry specifies the number of connected MCs. Default is 5.

Segments

If automatic segment copy is desired, this entry must have a non-zero value. It describes how many copy segments that are to be active. In the default case of five MCs or less, this value is normally four, since four different arrays are involved: IR, IC, FR and FC. If more than five MCs are connected each individual array must be divided up in segments, normally one segment per six MCs. Default is calculated as

$$\text{Segments} = 4 \cdot \text{INT}\left[\left(\text{Controllers} + 4\right) / 6\right],$$

where INT is the integer part of the argument. See also SB Configuration for Segment Copy (page 9). To completely disable segment copy, set this entry to zero.

[IRQ] SECTION

This section deals with hardware and interrupt properties of the serial ports used for MC communications. The ports are assumed to share one interrupt.

PortVector

This is the interrupt vector number for the port in hex. Use 0B for COM2 (default) or 0C for COM1.

PIDMask

This is the mask word used for the Priority Interrupt Decoder interrupt request mask bit. Use 08 for COM2 (default) and 10 for COM1.

[PORT*N*] SECTIONS

SB communicates with MCs using a single COM port (COM 1..4) or using a multiport adapter. The multiport adapter can have up to four serial ports, on different I/O addresses, and must share a common IRQ line. This section specifies properties for the communication ports used for each port. *N* can be 0, 1, 2 or 3, but must be less than the ComPorts entry in the [Sizes] Section, page 44.

UartBase

Base address for the UART, port *N*, hexadecimal. Default is 2F8 for section [Port0], which is the base address for COM2 in a normal PC. COM1 normally has base address 3F8. Sections [Port1]..[Port3] does not have a default; the base address for those ports have to be specified when a multiport adapter is used.

DLABReg

This entry indirectly specifies the baud rate used for each port. It is possible to run different ports with different baud rates. Old MC² applications supports baud rates up to 9,600, newer up to 19,200, and MC³ can communicate up to 38,400 baud. The entry is in hexadecimal format. Default is 0C for 9,600 baud. Use the following table:

Baud Rate	DLABReg value
4,800	0018
9,600	000C
19,200	0006
38,400	0003

Retries

This is the number of times SB will try to recover from a MC communication error. Default is 2. Increase this number if the communication lines are very long and noise is present. There is a performance penalty associated with high values.

[MC*N*] SECTIONS

These sections define properties associated with a particular MC. *N* is the controller index, which start at 0 and end at Controllers (page 44) minus one.

Used

Valid entries are 0 and 1. 1 is default. A 0 means the controller with index N is never to be used. This is useful when data must be allocated for a growing number of controllers, and the MO holding register references must remain the same.

Timeout

This is the time in PC ticks (Approx. 52 ms) that SB waits for responses from MCs. Default is 6.

WatchDog

An MC can be set to generate a general alarm if SB communication becomes silent for a set time. This time (in 0.1 s increments) is set here. Default is 200, corresponding to 20s. If this value is set to zero, the MC will never generate a general alarm for lost SB communication.

ReviveTime

If a fatal communication error occurs for a MC, SB will ignore it (to avoid performance degradation), and later attempt to re-establish communications. This is the time (in ms) that SB will wait. Default is 20000, corresponding to 20s.

ControllerNumber

The controller number is set in the MC. MCs on the same port may must all have different controller number. Default is the controller index (*N*) plus one.

Port

The index of the serial port to which the controller in connected. If a single serial port is used, do add a port entry. Valid entries are 0..ComPorts - 1.

[MODATA] SECTION

For applications where there is no PLC-based control file, initial data can be set for every element in the IC and FC arrays. This is typically done for MC register tags, setpoints and other control information. Default is that all elements of IC and FC are initialized to zero. Entries in the section have the format

Element = Value

Element must be a valid holding register number within IC or FC. Values are hexadecimal for IC and floating point numbers (including decimal points and minus signs) for FC. Example:

```
[MODATA]
40041 = C8                    ; Actual weight fast tagged in controller index 0
40156 = 12.33                 ; Setpoint for controller index 0
40145 = 2                     ; Set “download setpoint” bit for controller index 0
```

If segment copy is configured for IC and FC, the data that are initialized will probably be overwritten.

[PLCDEFAULT] SECTION

In this section, global defaults can be set for all register copy segments. It is to avoid having to specify every parameter for every segment. Normally, this is the only place that segment parameters have to be specified.

DefaultPath

The default PLC path for the target PLC. The path string must always start with DM. if no Path entry exist in the [SegmentN] Section (page 47), this path will be used. Default is DM.1.0.0.0.0.

MCPerSegment

This in the number of MCs that is associated with a set of copy segments. Default (and maximum) is 6. For a 14 MC installation, the segments will be arranged as follows with a MCPerSegment setting of 4 and 6, receptively:

MCPerSegment = 4			MCPerSegment = 6		
Segment	First Holding Register	Elements	Segment	First Holding Register	Elements
0	40001	32	0	40001	48
1	40113	28	1	40113	42
2	40211	32	2	40211	48
3	40435	12	3	40435	18
4	40033	32	4	40049	48
5	40141	28	5	40155	42
6	40275	32	6	40307	48
7	40447	12	7	40453	18
8	40065	32	8	40097	16
9	40169	28	9	40197	14
10	40339	32	10	40403	16

MCPerSegment = 4			MCPerSegment = 6		
Segment	First Holding Register	Elements	Segment	First Holding Register	Elements
11	40459	12	11	40471	6
12	40097	16			
13	40197	14			
14	40403	16			
15	40471	6			

[SEGMENT*N*] SECTION

This section contains entries for the segment copy map. *N* is the segment index. A default table of segment information is established when SB starts up. The segment composition can be completely overwritten in this section. See example in Diagnostic Screens (page 30). Some parameters in the default segment layout are settable with entries in the [PLCDefault] Section (page 46) The following rules apply for the default segment table:

SourceAddress	First element associated with the first controller in this segment. See MCPerSegment (page 46). There are four segments per set of MCs
DestAddress	Same as SourceAddress
Elements	Depends on the MCPerSegment setting. Using the default (6), 48 for IR, 42 for IC, 48 for FR and 18 for FC.
TfrType	IR, IC FR or FC, depending on what array the segment belongs to.
Path	According to the entry in DefaultPath in the [PLCDefault] Section (page 46).
TimePeriod	1000, corresponding to 1 s.

SourceAddress

This is the holding register reference in SB of the first element for segment *N*. It must be an existing element in within the R, IC FR or FC arrays.

DestAddress

This is the holding register reference for the first element of the segment *N* in the target PLC It must be an existing holding register, set aside for the SB segment, not necessarily equal to the internal SB holding register. See Allocating Holding Registers (page 8).

Elements

Number of elements for segment *N*. Max 100 for IC and IR, 50 for FC and FR. Every element in FR and FC takes two holding registers.

Path

Path to the target PLC for segment *N*. Different segments may have different target PLCs. See example in Diagnostic Screens (page 30). Normally the target host PLC carrying the control arrays (IC and FC) is set up as DefaultPath is the [PLCDefault] Section (page 46). Other PLCs have their paths defined here. Note that the path string must start with ‘DM.’. For information about MB+ paths, consult [1], page 141.

TimePeriod

This entry is the time, in ms, between file copy attempts. Default is 1000, one attempt every second.

MBPTimeout

Max allowed time for a MB+ transaction to complete on 0.5 s increment. Default is 20, corresponding to 10 s.

TfrType

Specifies the what kind of segment copy that shall take place:

IR	Copy integer data from SB to PLC
IC	Copy integer data from PLC to SB
FR	Copy floating point data from SB to PLC
FC	Copy floating point data from PLC to SB

[DATASLAVE] Section

Path

The complete path string for the internal slave message processor. Default is DS.1.0.0.0.0.

[ADAPTER] Section

SWInterrupt

The software interrupt used for the SA85 communications adapter. Deafult is 5C. See [2], page 9. If a Netbios compatible network is operational, 5D may be a better choice. Note that the PC configuration file CONFIG.SYS has to be altered accordingly. See Modify PC configuration, page 5.

REFERENCES

[1] Modicon Modbus Plus Network, Planning and Installation Guide.
Modicon Publication 890 USE 100 00, October 1994

[2] Modicon IBM Host Based Devices User's guide
Modicon Publication GM-HBDS-001 Rev G, January 1995

[3] Modicon 984 Programmable Controller Systems Manual
Modicon Publication GM-0984-SYS Rev. B, May 1991