

Serial Communications Manual



Ramsey
Micro-Tech™ 3000
Model 3100/3200
Static Weight Indicator

Serial Comm-
3100/3200 Rev
Part No.: XXXXX

Thermo
ELECTRON CORPORATION

Ramsey
Micro-Tech™ 3000
Serial Communications
Model 3100/3200
Static Weight Indicator

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Revision History

Preliminary December 2003 Manual first released

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Chapter 1 Introduction

1.1 General

The Micro-Tech 3000 Integrator is a bus-based microprocessor instrument equipped with one COMM A (on Mother Board) that can be equipped (optionally) with a second serial communication boards. Each COMM A board has one serial channel that can be configured according to the following standards.

- RS423/RS232C For point to point asynchronous bidirectional communications, maximum 50 feet (15 m). Modem capability.
- RS485/RS422 For point to point or multidrop 4 wire bidirectional communications, maximum 4000 feet (1200 m).
- Current Loop For high immunity bidirectional asynchronous communications. Passive only.

All of the above are optically isolated.

COMM A board (Optionally) can be installed in any available mother board expansion slot. After installing the board and power has been restored, the instrument automatically detects the new board and adds the communication set-up scrolls to the Main Menu scrolls. The Micro-Tech refers to the COMM A on the Mother Board as COM 1, and the COMM A board (if installed) as COM 2.

If two COMM A are available; one can be set up for printing, the other one for transferring data to and from other intelligent devices such as computers and PLC's. The system cannot support two printers or two COMM lines.

Each COMM A contains a perpetual clock/calendar circuit with battery backup. The battery is located on the mother board and is the same battery used for system memory backup. The system automatically detects and uses the clock calendar circuit of the first board and ignores the second.

Time and date set-up screens become visible after the COMM board is installed.

The Micro-Tech 3000 Integrator COMM meets the year 2000 requirements.

1.2 Communication Protocols

When a COMM line is set up for communication (not for a printer), the system is able to send and receive data to and from another device connected to the COMM line. The COMM option comes with the following software communication protocols already built in:

- PC-Master A Thermo Ramsey proprietary protocol, multidrop.
- Modbus An AEG proprietary protocol, multidrop. The COMM option only contains a subset of the protocol as specified in this manual.
- Allen-Bradley A proprietary protocol, multidrop. The COMM option only contains a subset of the protocol in the PLC-5 version of it, as specified in this manual.

- 3964R A Siemens proprietary protocol, single point.

The hardware can be configured (through jumpers on the Mother Board and on the optionally COMM board if available) to one of the three standards as listed in the previous paragraph. However, only the RS485/RS422 standard allows multidrop communications, RS232C and Current Loop can only be used in point to point mode. This does not prevent the use of a protocol; it only prevents physically connecting the Micro-Tech 3000 to more than one device.

CAUTION

The communication protocols have been implemented and tested as described in this document or in other referenced documents. It is the intention of Thermo Ramsey to provide all the necessary information and help the user to connect the instrument to other compatible devices. However, because most of the protocols are specific to other manufacturers, Thermo Ramsey declines any responsibility for any malfunction that may occur when connecting the instrument to devices of other manufacturers, unless tested and approved by Thermo Ramsey.

1.2.1 Protocol Rules

The communication protocol allows a remote intelligent device to read and eventually write information from and to the Micro-Tech 3000. For convenience, the information is organized in a set of registers as listed in this document.

During the communication activity, the Micro-Tech 3000 always acts as Slave, meaning it responds to a request from a Master device on the line, but never attempts to send messages out.

The following rules apply:

- a. The Micro-Tech 3000 responds only if the message is completely received.
- b. The Micro-Tech 3000 reads the message and looks for the address, which is contained into an address byte in the query package. The message is then processed only if the address matches the one specified in the set-up data of the Micro-Tech 3000, otherwise it is ignored.
- c. When the system receives a message, the integrity of the message is checked. An answer-back message is prepared if the message is formally correct.
- d. When a message containing a variable to be written in memory is received, the system checks the correctness of the message and, if it is correct, immediately sends the answer-back message. This does not always mean the data is written in memory. The system first checks the register number (which must correspond to a valid address of a variable), then the minimum and maximum limits, and then the password. If data can be accepted, it is stored in memory and the success flag is set to 0 (no error). If not, it is set to 1. To know if the last variables sent have been stored, the Master checks (reads) the success flag contained in a read only register.

The following procedure applies:

- The Host sends data to the Micro-Tech 3000.
- The Host waits at least 100 ms.
- The Host reads the success flag. It should be 0.

Some data is read only, some is read write, and some is write only.

WARNING

In all cases, the maximum number of words the system can transfer is limited to 41 per time. Requests of registers in excess of 41 are considered errors and do not generate an answer.

1.3 Printer

When a COMM line is set up for printing, the system prints out data in different ways, depending on the set-up. Print menus become visible that allow the user to define when and in which format the data is printed.

1. Periodical printouts at predefined intervals, as well as at predefined times of day, or on command is possible.
2. The format of the printouts is selectable between a number of predefined formats, plus a fully programmable user defined format. In this particular case, the user is able to easily format the printout to fit into any pre-printed ticket or form, without the need of special software.

1.4 Thermo Electron Warranty

The seller agrees, represents, and warrants that the equipment delivered hereunder shall be free from defects in material and workmanship. Such warranty shall not apply to accessories, parts, or material purchased by the seller unless they are manufactured pursuant to seller's design, but shall apply to the workmanship incorporated in the installation of such items in the complete equipment. To the extent purchased parts or accessories are covered by the manufacturer's warranty, seller shall extend such warranty to buyer.

Seller's obligation under said warranty is conditioned upon the return of the defective equipment, transportation charges prepaid, to the seller's factory in Minneapolis, Minnesota, and the submission of reasonable proof to seller prior to return of the equipment that the defect is due to a matter embraced within seller's warranty hereunder. Any such defect in material and workmanship shall be presented to seller as soon as such alleged errors or defects are discovered by purchaser and seller is given opportunity to investigate and correct alleged errors or defects and in all cases, buyer must have notified seller thereof within one (1) year after delivery, or one (1) year after installation if the installation was accomplished by the seller.

Said warranty shall not apply if the equipment shall not have been operated and maintained in accordance with seller's written instructions applicable to such equipment, or if such equipment shall have been repaired or altered or modified without seller's approval; provided, however, that the foregoing limitation of warranty insofar as it relates to repairs, alterations, or modifications, shall not be applicable to routine preventive and corrective maintenance which normally occur in the operation of the equipment.

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Purchaser agrees to underwrite the cost of any labor required for replacement; including time, travel, and living expenses of *Thermo Electron Field Service* Engineer at closest factory base.

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Chapter 2 Installation

2.1 General

This chapter describes the installation procedure and hardware configuration for the communications (on Mother Board and on Comm A Board option). If the communication option was installed at the factory, it may not be necessary to continue with this chapter. Proceed to Chapter 3.0, Operation.

2.2 Comm A Board (Option) Installation

To install the COMM A board, proceed as follows:

1. Select the jumper positions on the COMM A board for the desired communication standard. Below is a table which summarizes the jumper positions for selection of the electrical interface. Refer to Figure 2-1 for jumper locations.

**TABLE 2-1
COMM A BOARD JUMPERS**

JUMPERS						
Mode	OP1	OP2	OP3	OP4	OP5	OP6
RS-232	"A"	"A"	"A"	"A"	"A"	"B"
RS-485	"B"	"A"	"B"	"B"	"MDP"	"TRM"
20 mA	"B"	"B"	"A"	"A"	"A"	"C"

[Default]

TABLE "MDP"
FOR RS-485 ONLY

OP5
"A" NORMAL
"B" MULTIDROP

TABLE "TRM"
FOR RS-485 ONLY

OP6
"A" TERMINATED
"B" NOT TERMINATED

2. Open the Micro-Tech wall mount enclosure and turn power off at the mains, or remove panel mount enclosure from the panel and remove top cover allowing access to the mother board.
3. Remove the field mating connector. Wire the connector per the supplied field wiring diagram or install field terminal board cable (wall mount only).
4. Remove the hex head mounting screw from the connector end of the COMM board.
5. Insert the COMM board in any available expansion slot on the mother board (see Figure 2-2).

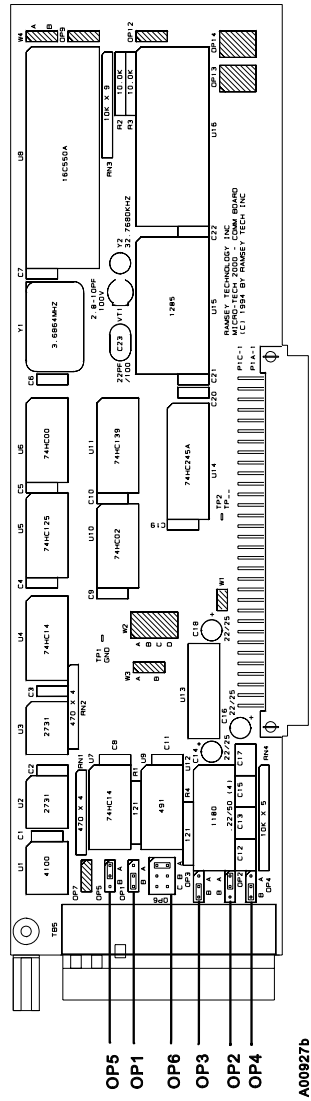
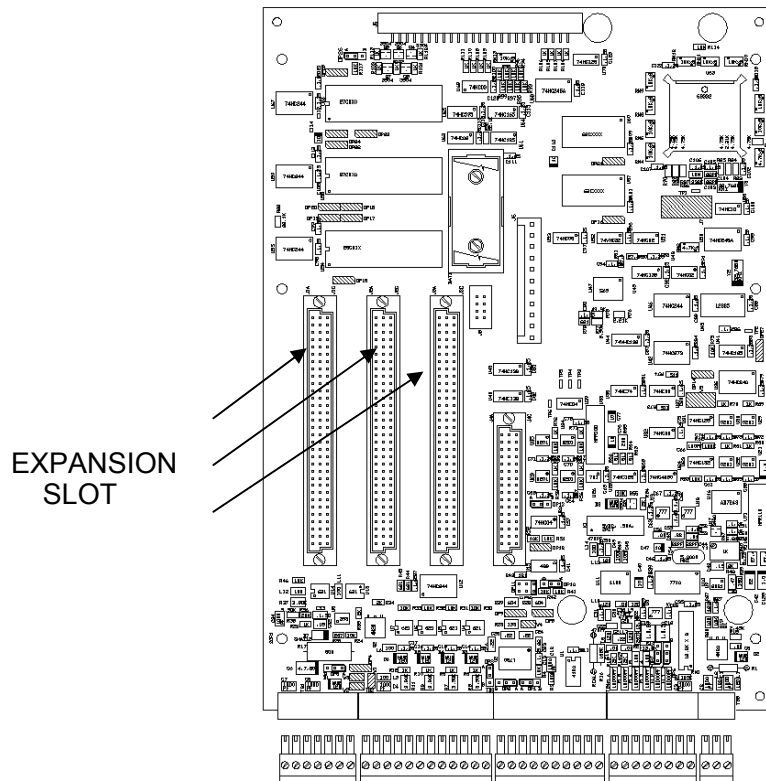


Figure 2-1 COMM A Board

Figure 2-2 Micro-Tech 3000 Mother Board



6. Insert the hex head screw through the chassis and tighten.
7. Install the wired mating connector on the COMM board connector.
8. Reinstall panel mount enclosure in the panel.
9. Turn power back on. The following screen appears when power is applied and remains on for 10 seconds.

-SLOT # N CHANGED
Acquire new
configuration?
YES NO

The screen disappears after 10 seconds if the question is not answered, and the Micro-Tech 3000 assumes the answer is NO. "HW CONFIG. CHANGED" alarm is on and cannot be reset. The above screen appears each time power is cycled if the question is not answered.

Answer YES because this is a hardware configuration change.

10. This completes the installation procedure.
11. Set-up data for the newly installed COMM board must now be entered. Proceed to Chapter 3.0, Operation.

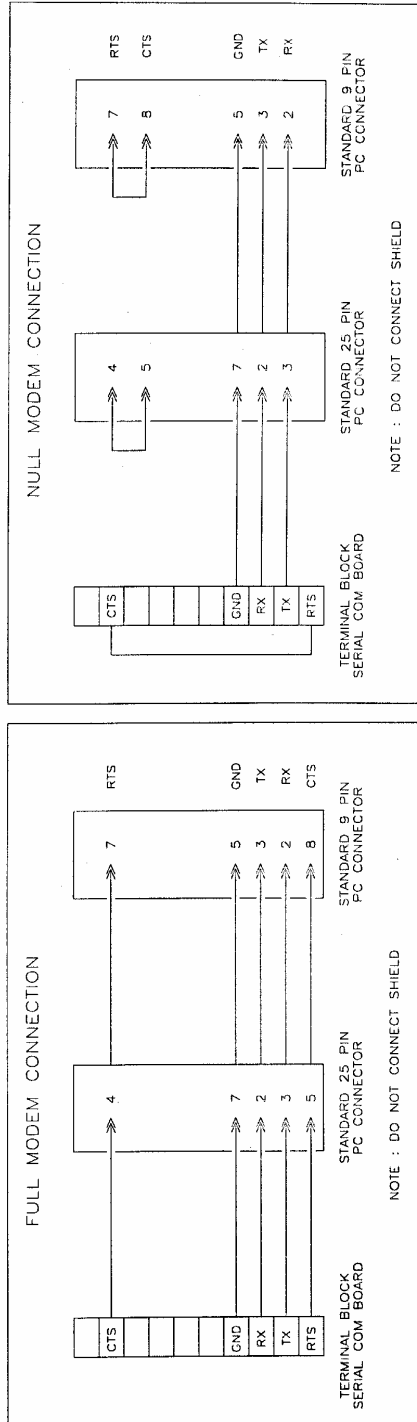


Figure 2-3 Serial Connection RS232

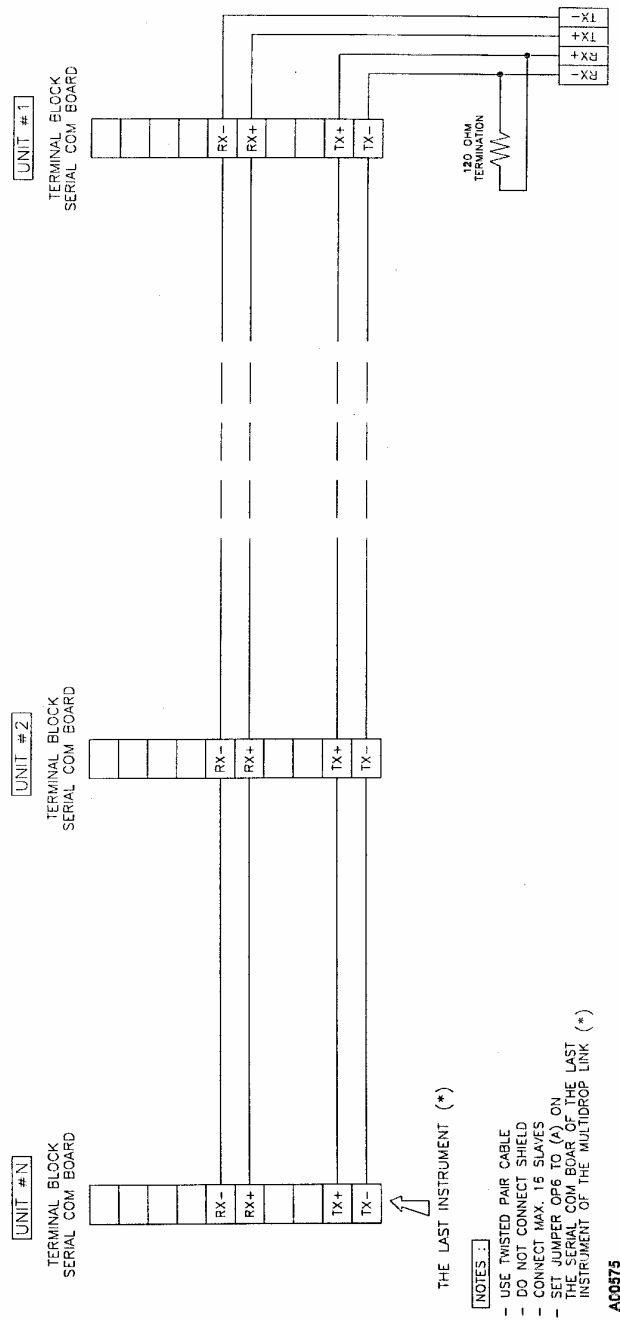


Figure 2-4 Serial Connection RS485

2.3 Communication Configuration (Mother Board) COMM1

This section describes the setup procedure and hardware configuration for the communications from the motherboard. Use the following steps to configure the communications:

Select the jumper positions for the desired communication standard. Refer to Table 2-5 for jumper locations.

Wire to the *Terminal Block 3* on the motherboard for the communication standard selected, *RS-485*, *RS-232c*, *20 mA* current loop.

Table 2-2: Mother Board COMM 1 Communications Wiring Configuration - TB3 – RS-485

Motherboard RS-485 Communications TB 3	
25	Shield
29	-RX
28	+Rx
24	Common
21	+TX
20	-TX

*Maximum cable length 4000 ft
Use Beldon 9830 or equivalent*

Table 2-3: Mother Board Wiring Configuration TB 3 – RS-232 Communications

Motherboard RS-232 Communications TB 3	
25	Shield
23	CTS
24	Common
22	RxD
21	TxD
20	RTS

*Maximum cable length 50 ft
Use Beldon 9538 or equivalent*

Table 2-4: Mother Board Wiring Configuration TB 3 – 20mA Serial Communications

Motherboard 20 mA Serial Communications TB 3	
25	Shield
26	+20 mA (out)
27	-20 mA (out)
28	+20 mA (in)
24	-20 mA (in)

*Maximum cable length 4000 ft
Use Beldon 9829 or equivalent*

Table 2-5: Mother Board Communication Jumper Settings

JUMPERS							
Mode	OP1	OP2	OP3	OP10	OP13	OP11	
RS-485	"A"	"A"	"A"	"A"	"A" Normal "B" Multi-drop	"A" Terminated "B" Not Terminated	Default
RS-232	"B"	"B"	"B"	"A"	"A" Normal	"B" Not Terminated "A" Terminated	Default
20 mA	"A"	"A"	"A"	"B"	"A"	"C"	

Chapter 3 Operation

3.1 General

The Micro-Tech 3000 Integrator is a bus-based menu driven machine that allows the operator easy access to all communication and printer set-up scrolls. Main Menu 3's Diagnostic Scroll contains the clock/calendar set-up screens. Main Menu 2's Display Scroll contains the clock/calendar configuration screens, and Main Menu 5 contains the communications and printer set-up scrolls.

The PRINT key enables the Micro-Tech 3000 to print the data selected in the Printer Scroll. Periodical printing and alarms print when directed by the system if enabled.

3.2 Print Formats

The printer can be set up to print totals, batch reports, instrument set-up data, and audit trails upon request. Batch reports and audit trails require optional hardware. In addition, totals can be printed at four predetermined intervals and enabled alarms at the time they occur.

3.2.1 Totals

There are three formats for printing totals; two of them are predefined, one is user programmable. Selection between the different formats is done via menus, as described in the next paragraphs.

The first predefined format is named **DEFAULT1**, and prints data in the following way:

TOTALS REPORT

DATE: 09-10-2002

TIME: 8:12a

MASTER TOTAL: 0.00 Tons

RESET TOTAL: 0.00 Tons

If more than one scale is defined:

TOTALS REPORT

DATE: 09-10-2002

TIME: 8:12a

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SCALE 1

MASTER TOTAL: 0.00 Tons

RESET TOTAL: 0.00 Tons

SCALE 2

MASTER TOTAL: 0.00 Tons

RESET TOTAL: 0.00 Tons

SCALE 3

MASTER TOTAL: 0.00 Tons If more than two scales

RESET TOTAL: 0.00 Tons

SCALE 4

MASTER TOTAL: 0.00 Tons If four scales

RESET TOTAL: 0.00 Tons

The second method, called **USER DEFINED**, is to define your own format using the printer set up screens as described in Section 3.3.4.

The USER DEFINED format includes three programmable strings. The position of each datum on the paper can be assigned by row and column, making it easy to fulfill any custom requirement.

3.2.2 Batch

If the optional Load Out board is installed, the load out data can be printed in the following format:

BATCH REPORT

DATE: 09-10-2002

TIME: 8:12a

BATCH NR: 0

SET PT: 0.00 Tons

TOTAL : 0.00 Tons

3.2.3 Alarms

The system can optionally print out each alarm (if the alarm has been turned on in the Alarms Menu) in the following format:

09-10-2002 8:14a

Clock Fail

where "Clock Fail" is only an example of a possible alarm condition. Date and time corresponds to when the alarm has occurred the first time.

3.2.4 Set-Up

The entire system set-up data can be printed by the unit for the customer's record. Format and sequence of data can vary depending on the hardware and software configurations.

3.2.5 Audit Trails

When Audit Trails is installed, the recorded data can be printed out in the following format:

```
TRAIL RECORD NR  1
DATE 09-10-2002 TIME 11:59p
VARIABLE scale cap
NEW 400.00
OLD 500.00
TRAIL RECORD NR  2
DATE 09-10-2002 TIME 11:31p
VARIABLE span
NEW 250000
OLD 300000
TRAIL RECORD NR  3
DATE 09-10-2002 TIME 11:59p
VARIABLE div (e)
NEW 0.05
OLD 0.1
```

Each record contains a description of the variable which has been altered, the old and the new values of the variable, and an index number.

3.3 COMMUNICATION SET-UP

This section explains the communication and printer set-up. See Section 3.4 for communication protocols detailed description.

3.3.1 Clock/Calendar Set-Up

When an optional COMM "A" board is installed, date and time become available and must be set. The battery, located on the mother board, provides backup for the perpetual calendar/clock. Time and date needs to be set only once.

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When an optional COMM "A" board is installed, date and time become available and must be set. The battery, located on the mother board, provides backup for the perpetual calendar/clock. Time and date needs to be set only once.

1. Press the MENU key until Main Menu 3 appears. Press the soft key under the DIAGNOSTICS scroll and scroll down until -DIAGNOST SCROLL 7- appears.

The following scroll is provided to set up the date, and enter the day, month and year in sequence.

```
-DIAGNOSTIC SCROLL 7-  
Date:   MM-DD-YYYY  
DAY:    DD  
ENTER
```

Password: SERVICE

Default: 00-00-0000
Min: 01-01-0000
Max: 12-31-2096

Time is entered in a similar way. The **AM/PM** key is used when time is in the English mode (see Display Scroll 7 below).

```
-DIAGNOSTIC SCROLL 8-  
Time:           HH:MM  
HOURS:  HH  
ENTER           AM/PM
```

Password: SERVICE

24 hour am/pm
Default:00:00 01:00
Min: 00:00 01:00
Max: 23:59 12:59

2. Press the MENU key until Main Menu 2 appears. Press soft key under DISPLAY scroll and scroll down until -DISPLAY SCROLL 7- appears.
The operator can define the format for displaying and printing time and date. Select the 24 hours or 12 hours format:

```
- DISPLAY SCROLL 7 -  
Time  
>am/pm h<  
CHOICE ENTER
```

Password: SERVICE

If USA or English: Default: am/pm
If other language: Default: 24 h
Selections: am/pm, 24 h

Then date can be set to show month or day first, in three possible configurations:

```

- DISPLAY SCROLL 8 -
      Date
> MM-DD-YYYY <
CHOICE  ENTER
    
```

Password: SERVICE

If USA: Default: MM-DD-YYYY

If other language: Default: DD-MM-YYYY

Selections: DD-MM-YYYY, MM-DD-YYYY, YYYY-MM-DD

3. When a COMM is available, date and time can be displayed line three (3) in the RUN screen if selected using DISPLAY SCROLL 9.

```

- DISPLAY SCROLL 9 -
Run display line 3
> No Display <
CHOICE  ENTER
    
```

Password: OPERATOR

Default: NO DISPLAY

Selections: NO DISPLAY, LOAD, SPEED, DATE/TIME

3.3.2 COMM A and Print Scroll Set-Up

Main Menu 5 is dedicated to the serial line. COMM A is used to set up the serial line of the COMM A, regardless if the serial line is connected to a computer or a PLC or for printing. The PRINT scroll is used for setting up the printer, and it only appears if the COMM A is set for printer.

```

- MAIN MENU 5 -
Press MENU for more

COMM A  PRINT
    
```

1. Line Setting and Protocol Definition

Two COMM line can be installed and programmed, typically one for the printer and one for the supervisor.

The following screens define the communication parameters for the first and the second channel.

```

- COMM. A SCROLL 1 -
      Baud rate port #1
> 2400 <
CHOICE  ENTER
    
```

Password: Service

Default: 9600

Selections: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200

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- COMM. A SCROLL 2 -
Set parity port #1
> No parity <
CHOICE ENTER

Password: Service

Default: NO PARITY
Selections: EVEN PARITY, ODD PARITY, NO PARITY

- COMM. A SCROLL 3 -
Stop bits port #1
> 1 <
CHOICE ENTER

Password: Service

Default: 1
Selections: 1,2

- COMM. A SCROLL 4 -
Wordlength port #1
> 8 <
CHOICE ENTER

Password: Service

Default: 8
Selections: 7,8

The next screen defines the port use. Some commonly used protocols are implemented in the system. Possible selections are:

- PC-MASTER Ramsey proprietary protocol: Multidrop, Master Slave.
- SIEMENS 3964R A proprietary protocol of Siemens. Point to point, Multi Master.
- ALLEN-BRADLEY A proprietary protocol of Allen-Bradley.
DF1 Multidrop, Master Slave.
- MODBUS A proprietary protocol of AEG. Multidrop, Master Slave.
- PRINTER Not a protocol, selects printer output.

- COMM. A SCROLL 5 -
Protocol port #1
> MODBUS <
CHOICE ENTER

Password: Service

Default: PRINTER
Selections: PC-MASTER, SIEMENS 3964R, ALLEN-BRADLEY DF1, MODBUS, PRINTER

If the option COMM A board is installed, the following screen appears. These screens operate exactly as the ones dedicated to the COMM A on the Mother Board.

- COMM. A SCROLL 6 -
Baud rate port #2
> 2400 <
CHOICE ENTER

Password: Service

Default: 9600
Selections: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200

- COMM. A SCROLL 7 -
Set parity port #2
> No parity <
CHOICE ENTER

Password: Service

Default: NO PARITY
Selections: EVEN PARITY, ODD PARITY, NO PARITY

- COMM. A SCROLL 8 -
Stop bits port #2
> 1 <
CHOICE ENTER

Password: Service

Default: 1
Selections: 1,2

- COMM. A SCROLL 9 -
Wordlength port #2
> 8 <
CHOICE ENTER

Password: Service

Default: 8
Selections: 7,8

- COMM. A SCROLL 10 -
Protocol port #2
> PRINTER <
CHOICE ENTER

Password: Service

Default: PRINTER
Selections: PC-MASTER, SIEMENS 3964R, ALLEN-BRADLEY DF1, MODBUS, PRINTER

3.3.3 Multidrop Operator Set-Up

NOTE: This section only applies to multidrop operation. If you are using the COMM for connecting a printer, skip this section and refer to Section 3.3.4. The Clear To Send (CTS) line of the port can be used for hardware handshake. Select Enabled if you want to connect the CTS input of the system to a control signal generated by the other device.

WARNING

**THE CTS INPUT CAN ONLY BE USED WHEN JUMPERS ARE SET FOR RS232.
ATTEMPTING TO ENABLE THE CTS SOFTWARE CONTROL IN RS485 MODE
WILL RESULT IN LOCK-UP OF THE LINE.**

```
- COMM. A SCROLL 11 -  
Clear to Send #1  
> Disabled <  
CHOICE ENTER
```

Password: Service

Default: DISABLED
Selections: ACTIVE, DISABLED

The following screens define the ADDRESS of the device in the multidrop line, and the access permission from the remote supervisor. If NONE is selected, the supervisor has full access to the device. If LIMITED is selected, the supervisor can only access those variables that are accessible with the OPERATOR password. If PROTECTED is selected, the unit is read only to the supervisor.

```
- COMM. A SCROLL 12 -  
Address port #1  
> 1 <  
ENTER
```

Password: Service

Default: 1
Min: 1
Max: 255

```
- COMM. A SCROLL 13 -  
Access prot port #1  
> None <  
CHOICE ENTER
```

Password: Service

Default: NONE
Selection: NONE, LIMITED, PROTECTED

Similarly for COMM 2, if installed:

3.3.4 Printer Set-Up

NOTE: This section only applies to printer. If you are using the COMM for connecting a computer, PLC or other device using a protocol, skip this section and refer to Section 3.3.3.

The Micro-Tech 3000 has a fully programmable printer format. The following section explains how to program the Print scroll according to the specific needs.

The system can be configured to operate without any handshake (NONE), or using the Clear To Send signal (CTS) or the XON-XOFF sequence. Refer to the instruction manual of the printer to define which selection is required. The selection NONE is only supplied for testing purposes, but is not recommended for normal use. If NONE is selected, the system is not able to recognize if the printer is on line or not, or if the paper is empty.

The most commonly used protocol is the CTS, which is a signal generated by the printer to indicate whether it is ready to receive data or not.

WARNING

THE CTS INPUT CAN ONLY BE USED WHEN JUMPERS ARE SET FOR RS232. ATTEMPTING TO ENABLE THE CTS SOFTWARE CONTROL IN RS485 MODE WILL RESULT IN LOCK-UP OF THE LINE.

- PRINTER SCROLL 1 -
Handshaking
> None <
CHOICE ENTER

Password: Service

Default: NONE
Selection: NONE, CTS, XON-XOFF

Different printers use different end of line patterns. Select the one you need according to the printer.

- PRINTER SCROLL 2 -
End of line
> CR <
CHOICE ENTER

Password: Service

Default: CR
Selection: CR, LF, CR+LF

Some simple printers cannot accept characters while they are printing. In some cases the handshake is not well controlled by the printer, so a delay at end of line is helpful.

- PRINTER SCROLL 3 -
Delay end of line
0 sec
ENTER

Password: Service

Default: 0 sec
Min: 0 sec
Max: 5 sec

A Form Feed character can be sent to the printer after each report to force the printer to eject the paper.

- PRINTER SCROLL 4 -
Form Feed
> NO <
CHOICE ENTER

Password: Service

Default: NO
Selections: NO, YES

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If you want to generate periodical printing, enter the number of minutes, hours or days in the following screen. By entering 0, the periodical printing is prevented. Use the INTV key to switch from minutes to hours and to days.

```
- PRINTER SCROLL 5 -  
Print interval  
 0 min  
ENTER INTV
```

Password: Service

Default: 0
Min: 0 min, 0 hour, 0 days
Max: 59 min, 23 hour, 365 days

The system can print at specific times during the day. Enter the time you want to obtain the printing. Use the NEXT keys to scroll between the print times. Up to four discrete times may be entered. The ON/OFF key enables or disables the displayed print time.

```
- PRINTER SCROLL 6 -  
Print time # 1  
time HH:MM  
ENTER ON/OFF NEXT
```

Password: Operator

Default: OFF
Min: 00:00
Max: 23:59

3.3.5 Define Printing Format

By selecting YES in the following screen, the system is instructed to print one line each time a new alarm condition occurs. The alarm is printed as follows:

```
xx-xx-xxxx yy:yyz  
kkkkkkkkkkkkkkkkkkkk
```

where:

xx-xx-xxxx	Day, Month, Year, printed according to the local format as defined in Main Menu 2 - Display.
yy:yyz	Hour, Minutes, am/pm printed according to the local format as defined in Main Menu 2 - Display
kkkkkkkkkkkkkkkkkkkk	Alarm message, same message appearing on the screen.

For example:

```
09-10-2002 8:14a  
High rate
```

```

- PRINTER SCROLL 7 -
Print alarms
> No <
CHOICE ENTER
    
```

Default: NO
 Selections: NO, YES

If YES is selected, the system prints all alarms that have been set to alarm in the Alarm scroll. There are three ways for defining the printing format. The first two are predefined formats, which are as follows:

1. DEFAULT 1
 TOTALS REPORT

DATE: 09-10-2002
 TIME: 8:12a

MASTER TOTAL: 0.00 Tons
 RESET TOTAL: 0.00 Tons
 OPERATOR TOTAL: 0.00 Tons
 RATE: 0.00 Tph

2. Define Own Format

The last method is to define your own format using the printer setup screens listed below.

Select DEFAULT if you want the predefined format. Select USER DEFINED if you want to set up your own format.

```

- PRINTER SCROLL 8 -
Totals Report format
> Default <
CHOICE ENTER
    
```

Password: Service

Default: DEFAULT1
 Selections: DEFAULT1, USER DEFINED

If your selection is USER DEFINED, the following screens are displayed.

Define first the number of strings that you want to add in your report. You may enter a number from 0 to 3. Strings can be used to add the Customer name as well as other information that you want to include in the print format.

```

- PRINTER SCROLL 9A -
Number of strings
> 3 <
ENTER
    
```

Password: Operator

Default: 1
 Min: 0
 Max: 3

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If you specified a number of strings larger than zero, you can now enter the strings. Use the alphanumeric keypad, pressing the numeric key corresponding to the letter that you want to type. Each time you press a new key, the cursor moves to the right one place. If you need to use the same key twice (example: for double letters), move the cursor right using the arrow keys (left and right soft keys).

- PRINTER SCROLL 9A - Contents strings #1 <u>XXXXXXXXXXXXXXXXXXXX</u> < ENTER >	
---	--

Password: Operator

Default: XXXXXXXXXXXXXXXXXXXX

Once you have defined the string, you have to specify where the string is to be placed on the printed report. The coordinate is given in the following way:

```

0000000000111111111122222222223...
0123456789012345678901234567890...
+-----> Y
00|This line printed first
01|This line printed second           ^
02|                                   | DIRECTION OF
03|                                   | PAPER
04|
05|
06|
.v
.X
    
```

Use the X-pos and Y-pos keys to enter the X and Y coordinates. Confirm with **ENTER**. By specifying 0,0, the string is not printed.

- PRINTER SCROLL 9B - Position string #1 X = 0 , Y = 0 ENTER X-pos Y-pos	
--	--

Password: Operator

	X	Y
Default:	1	1
Min:	0	1
Max:	24	80

If you specified more strings, enter the relevant data using the same procedure.

```

- PRINTER SCROLL 10 -
Strings #2
< YES >
CHOICE      ENTER
    
```

Password: Operator

Default: NO
 Selections: YES,NO

If you selected YES, the next two scrolls are displayed.

```

- PRINTER SCROLL 10A -
Contents string #2
XXXXXXXXXXXXXXXXXXXXX
< ENTER >
    
```

Password: Operator

Default: XXXXXXXXXXXXXXXXXXXXX

```

- PRINTER SCROLL 10B -
Strings #2 pos.
X =      Y =
ENTER    X/Y pos
    
```

Password: Operator

	X	Y
Default:	2	1
Min:	0	1
Max:	24	80

There is a third string. If only one scale is defined, it is a third heading string exactly as the previous two. If more scales are defined, it may be used to define a scale identifier. String definition is different for each scale and it is use as scale heading.

```

- PRINTER SCROLL 11-
String #3
< yes >
CHOICE      ENTER
    
```

Password: Operator

Default: NO
 Selections: YES,NO

If you selected YES, the next two scrolls are displayed.

SCALE# key allows the user to select the scale.

```

- PRINTER SCROLL 11A -
Contents string #2

SCALE
    
```

Password: Operator

Default:

If only 1 scale is defined or if more scales are defined, the ENTER and ARROWS keys compare in the fourth line of display when the numeric or alphanumeric key is pressed.

- PRINTER SCROLL 11B -
String #3 pos.
X = , Y =
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	4	1
Min:	0	1
Max:	24	80

A series of variables can be added in the report. Variables are : MASTER TOTAL, RESET TOTAL, DATE, TIME, NET WEIGHT, GROSS WEIGHT, TARE WEIGHT and PEAK WEIGHT.

The position must be defined for each variable. If you do not intend to add a variable in the report, you should set its X position to 0.

- PRINTER SCROLL 12 -
Date position
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	5,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 13-
Time position
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	5,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 14 -
Reset total pos.
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	7,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 15 -
Master total pos.
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	6,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 16 -
Net weight pos.
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	0,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 17 -
Gross weight pos.
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	0,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 18 -
Tare weight pos.
X = 0 , Y = 0
ENTER X-pos Y-pos

Password: Operator

	X	Y
Default:	0,	1
Min:	0,	1
Max:	24,	80

- PRINTER SCROLL 19-
Peak weight pos.
X = __, Y =
ENTER X|Y-Pos

Password: OPERATOR

	X	Y
Default:	0,	1
Min:	0,	1
Max:	24,	80

3.3.6 The Print Key

This section only applies to the Printer. If you are using the COMM for connecting a computer or a PLC and you are using a protocol, skip this section and refer to Section 3.3.2.

The Micro-Tech 3000 can print out several kinds of data, depending on the system set-up. When the printer has been installed and properly set up, the user can print means of the PRINT key as described below. by

When the PRINT key is pressed, the following screen is displayed:

- PRINTER SCROLL - COM #1 <u>no data</u> Start print <u>TOTALS</u> PRINT RETURN COM	Password: Not Required
--	------------------------

The second line gives the status of the printer:

NO DATA Indicates the printer is idle, no data is being sent to the printer.
IS RUNNING Indicates the system is sending data to the printer.

The third line indicates what kind of data is printed if the PRINT soft key is pressed.

The UP and DOWN keys select between:

- a. TOTALS Print totals (all scales if more scales defined)
 - TOTALS S1 Print totals scale 1 (only if enabled)
 - TOTALS S2 Print totals scale 2 (only if enabled)
 - TOTALS S3 Print totals scale 3 (only if enabled)
 - TOTALS S4 Print totals scale 4 (only if enabled)
 - SETUP Print the set up data of the instrument
 - TRAILS If audit trails option is active, print audit trails data
- b. BATCH Only if load out option is active, print load out information.
- c. SETUP Print the set-up data of the instrument.
- d. TRAILS If audit trails option is active, print audit trails data. (See Main Menu 6 in the Micro-Tech 3000 manual.)

Print starts after the PRINT soft key is pressed.

The COM key allows the operator to select the printer if more than one is installed. Here are some examples of data that can be printed :

Print TOTALS, default:

If one scale is defined:

TOTALS REPORT

DATE: 09-10-2002

TIME: 8:12a

MASTER TOTAL: 0.00 Tons

RESET TOTAL: 0.00 Tons

If more scales are defined:

TOTALS REPORT

DATE: 09-10-2002

TIME: 8:12a

SCALE 1

MASTER TOTAL: 0.00 Tons

RESET TOTAL:0.00 Tons

SCALE 2

MASTER TOTAL: 0.00 Tons

RESET TOTAL:0.00 Tons

SCALE 3

MASTER TOTAL: 0.00 Tons

RESET TOTAL: 0.00 Tons

If more than two scales

SCALE 4

MASTER TOTAL: 0.00 Tons

RESET TOTAL: 0.00 Tons

If four scales

Print ALARM:

09-10-2002 8:14a

Clock fail

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Print AUDIT TRAILS: (Optional)

When print AUDIT TRAILS command is given, the number of records to print is required. This allows the operator to print a portion of the recorded trails.

```
TRAIL RECORD NR 3
DATE 09-10-2002 TIME 11:59p
VARIABLE scale cap
NEW 400.00
OLD 500.00
```

```
TRAIL RECORD NR 2
DATE 09-10-2002 TIME 11:31p
VARIABLE span
NEW 250000
OLD 300000
```

```
TRAIL RECORD NR 1
DATE 09-10-2002 TIME 11:59p
VARIABLE div (e)
NEW 0.05
OLD 0.1
```

3.3.7 Additional Diagnostic

If a Communication board is detected, the following screen is shown. The "Port 2" soft key is only shown if two boards are detected.

- TEST SCROLL 8 -	
Test communication A	
PORT1	PORT2

Password: Service

By pressing the PORT 1 or the PORT 2 soft key the test is initiated. A test pattern is sent out on the TX output and read on the RX input. If the test fails, the message TEST FAILED is shown, otherwise the message TEST PASSED is displayed.

NOTE: This test requires a hardware jumper to be installed between the (RX) and (TX) terminals of the communication board.

3.4 Communication Protocols

The communication protocol allows a remote intelligent device to read and eventually write the contents of the registers as listed in this section.

During the communication activity, the Micro-Tech 3000 always acts as Slave, meaning that it will respond to a request from a Master device on the line, but never attempts to send messages out.

The instrument responds only if the message is completely received. The instrument reads the message and looks for the address, which is contained in an address byte in the query package. The message is then processed only if the address contained in the message matches the address specified in the set-up data of the instrument. When the system receives a message, the integrity of it is checked, and an answer message is prepared if yes.

The Master must respect a 100 ms interval time between two messages. If a message is sent before 100 ms have passed since the previous one, it is lost. (The data is received by an interrupt routine, while it is processed in a task which is executed each 100 ms.)

If the Master sends variables to be written in memory, the system checks the correctness of the message, and immediately sends an answer message if it is correct. This does not necessarily mean that the data is written in memory. The system first checks the address, which must correspond to a valid address of a variable, then the minimum and maximum limits are checked, and then the password. If data can be accepted, the success flag is set to 0 (no error), if not, it is set to 1. The Master needs to check the success flag (contained into a read only register), to know if the last variables sent have been stored or not.

The procedure is as follows:

- Send the data to the Micro-Tech 3000
- Wait 100 ms
- Read the success flag, should be 0.

Some data is read only, some is read write, some is write only.

NOTE: The maximum number of words the system can transfer is 41 per time. Requests of registers in excess of 41 are treated as errors and do not generate an answer.

3.4.1 Register Definition

The following registers can be accessed through a serial line link using one of the available communication protocols. The table lists the registers specifying per each:

- register	A conventional name		
- type	Can be:	RO	The register can be read but cannot be written.
		RW	The register can be read or written. Write is allowed if the instrument is in the specified protection level at the moment the write message is received.
		RO	The register can only be written. Write is subject to protection control.

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- low limit The minimum acceptable value for the variable. Lower values are considered as errors.
- high limit The maximum acceptable value for the variable. Higher values are considered as errors.
- refresh time The time between two updates of the variable in the instrument's memory.
- protection The minimum protection level which must be in place to allow access to the variable:

 none always available
 limited available if limited or service
 service available if service only
- format Can be: char An ASCII string
 integer 16 bits IEEE integer
 float 32 bits IEEE float

WARNING

THE ACTUAL ADDRESS OF EACH REGISTER IS DEFINED DIFFERENTLY FOR EACH PROTOCOL AS EXPLAINED IN THE FOLLOWING SECTIONS.

1. Type, Limits and Format of Register

register	type	low limit	high limit	refresh time [ms]	protection	format
success_flag	RO	-	-	-	none	integer
display	RO	-	-	100	-	char
leds	RO	-	-	100	-	integer
status	RO	-	-	100	-	integer
alarms	RO	-	-	100	-	integer
i_o	RO	-	-	100	-	integer
commands	RW	0	32767	100	none	integer
Net_weight	RO	-	-	100	-	float
Gross_weight	RO	-	-	-	-	float
Peak	RO	-	-	100	-	float
master_total	RO	-	-	100	-	float
reset_total	RW	0 (1)	0 (1)	100	none	float
Scale_cap	RO	1	-	-	service	float
Threshold_1	RW	0	105.0%	-	limited	float
Threshold_2	RW	0	105.0%	-	limited	float
Threshold_3	RW	0	105.0%	-	limited	float
Threshold_4	RW	0	105.0%	-	limited	float

(1) Can only be zeroed.

2. Description of Register

In the following section an explanation is given per each variable of the above table.

a. success_flag

Set to 0 after a message has been received and properly processed. If a message is correctly received but cannot be processed because password protection or size error, this flag is set to 1. The user may read this register after a write message to ensure the data have been accepted.

b. display

It contains the messages actually shown on the display of the instrument in form of an ASCII string. For example, the screen:

```

- MENU MAIN 1 -
PRESS MENU FOR MORE
ZERO SPAN MAT'L
CAL CAL CAL
```

Will be stored in registers in the following way:

display(1)	2DH	20H	Characters 1 and 2 from left of first row
display(2)	4DH	45H	
display(3)	4EH	55H	
display(4)	20H	4DH	
display(5)	41H	49H	
display(6)	4EH	20H	
.....			
display(10)	....	....	Characters 19 and 20 from left of first row
displa (11)	....	....	Characters 1 and 2 from left second row
.....			
display(20)	....	....	Characters 19 and 20 from left of second row
display(21)	....	....	Characters 1 and 2 from left of third row
.....			
display(30)	....	....	Characters 19 and 20 from left of third row
display(31)	....	....	Characters 1 and 2 from left of fourth row
.....			
display(38)	4CH	20H	
display(39)	20H	20H	
display(40)	20H	20H	Characters 19 and 20 from left of fourth row

c. leds

Leds(1)	<u>bit</u>	<u>description</u>	
	15	not used	
	.		
	.		
	<u>bit</u>	<u>description</u>	
	05	not used	
	04	led 5	(1 = on, 0 = off)
	03	led 4	
	02	led 3	
	01	led 2	
	00	led 1	

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d. status

Status(1)	<u>bit</u>	<u>description</u>
	15	cumulative shutdown (a shutdown alarm is pending)
	14	cumulative alarms (an alarm is pending)
	13	calibration running
	12	weight stable
	11	center of zero
	10	tare acquired
	09	not used
	08	ready
	07	threshold 1
	06	threshold 2
	05	threshold 3
	04	threshold 4
	03	not used
	02	not used
	01	not used
	00	success flag

Status(2)	not used
-----------	----------

e. alarms

In the alarms register, each bit represents the status of an alarm. If the alarm is active, the relevant bit contains '1', otherwise it contains '0'.

alarms(1)	<u>bit</u>	<u>description</u>
	15	CLOCK FAIL
	14	CELL FAIL
	13-10	Not used
	09	RAM FAIL
	08	ROM FAIL
	07	THRESHOLD 1
	06-03	Not used
	02	THRESHOLD 2
	01-00	Not used

alarms(2)	<u>bit</u>	<u>description</u>
	15-14	Not used
	13	THRESHOLD 3
	12-09	Not used
	08	THRESHOLD 4
	07-04	Not used
	03	WARM START
	02	COLD START
	01	PWD DURING CAL
	00	CALTIME ELAPSED

alarms(3)	bit	description
	15-12	Not used
	11	EXTERN ALAM 1
	10	EXTERN ALAM 2
	09	EXTERN ALAM 3
	08	AZT OVER LIMIT
	07-04	Not used
	03	HW CNF CHANGE SLOT 1
	02	HW CNF CHANGE SLOT 2
	01	HW CNF CHANGE SLOT 3
	00	
alarms(4)	bit	description
	15	
	14	
	13	BCD OVERFLOW
	12	MATHEMATIC ERROR
	11	PRINTER ERROR
	10	COMMUNICATION ERROR
	09	RIO COMM ERROR
	08	PROFIBUS COMM ERROR
alarms(5)	bit	description
	15-00	Not used

f. i_o

The instrument has physical inputs and outputs to which logical input and output functions are associated. As far as communication is concerned, only the status of physical inputs and outputs are transferred.

i_o(1)	bit	description
	15-04	not used
	03	in 3 – mother board
	02	in 2 – mother board
	01	in 1 – mother board
	00	in 0 – mother board

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<u>i_o(2)</u>	<u>bit</u>	<u>description</u>
	15	in 3 board 4in/16out # 1
	14	in 2 board 4in/16out # 1
	13	in 1 board 4in/16out # 1
	12	in 0 board 4in/16out # 1
	11	in 3 board 4in/16out # 2
	10	in 2 board 4in/16out # 2
	09	in 1 board 4in/16out # 2
	08	in 0 board 4in/16out # 2
	07	in 3 board 4in/16out # 3
	06	in 2 board 4in/16out # 3
	05	in 1 board 4in/16out # 3
	04	in 0 board 4in/16out # 3
	03	in 3 board 4in/16out # 4
	02	in 2 board 4in/16out # 4
	01	in 1 board 4in/16out # 4
	00	in 0 board 4in/16out # 4

<u>i_o(3)</u>	<u>bit</u>	<u>description</u>
	15	in 15 board 16in/4out # 1
	14	in 14 board 16in/4out # 1
	13	in 13 board 16in/4out # 1
	12	in 12 board 16in/4out # 1
	11	in 11 board 16in/4out # 1
	10	in 10 board 16in/4out # 1
	09	in 09 board 16in/4out # 1
	08	in 08 board 16in/4out # 1
	07	in 07 board 16in/4out # 1
	06	in 06 board 16in/4out # 1
	05	in 05 board 16in/4out # 1
	04	in 04 board 16in/4out # 1
	03	in 03 board 16in/4out # 1
	02	in 02 board 16in/4out # 1
	01	in 01 board 16in/4out # 1
	00	in 00 board 16in/4out # 1

<u>i_o(4)</u>	<u>bit</u>	<u>description</u>
	15	in 15 board 16in/4out # 2
	14	in 14 board 16in/4out # 2
	13	in 13 board 16in/4out # 2
	12	in 12 board 16in/4out # 2
	11	in 11 board 16in/4out # 2
	10	in 10 board 16in/4out # 2
	09	in 09 board 16in/4out # 2
	08	in 08 board 16in/4out # 2
	07	in 07 board 16in/4out # 2
	06	in 06 board 16in/4out # 2
	05	in 05 board 16in/4out # 2
	04	in 04 board 16in/4out # 2
	03	in 03 board 16in/4out # 2
	02	in 02 board 16in/4out # 2
	01	in 01 board 16in/4out # 2
	00	in 00 board 16in/4out # 2

<u>i_o(5)</u>	<u>bit</u>	<u>description</u>
	15	in 15 board 16in/4out # 3
	14	in 14 board 16in/4out # 3
	13	in 13 board 16in/4out # 3
	12	in 12 board 16in/4out # 3
	11	in 11 board 16in/4out # 3
	10	in 10 board 16in/4out # 3
	09	in 09 board 16in/4out # 3
	08	in 08 board 16in/4out # 3
	07	in 07 board 16in/4out # 3
	06	in 06 board 16in/4out # 3
	05	in 05 board 16in/4out # 3
	04	in 04 board 16in/4out # 3
	03	in 03 board 16in/4out # 3
	02	in 02 board 16in/4out # 3
	01	in 01 board 16in/4out # 3
	00	in 00 board 16in/4out # 3

<u>i_o(6)</u>	<u>bit</u>	<u>description</u>
	15	in 15 board 16in/4out # 4
	14	in 14 board 16in/4out # 4
	13	in 13 board 16in/4out # 4
	12	in 12 board 16in/4out # 4
	11	in 11 board 16in/4out # 4
	10	in 10 board 16in/4out # 4
	09	in 09 board 16in/4out # 4
	08	in 08 board 16in/4out # 4
	07	in 07 board 16in/4out # 4
	06	in 06 board 16in/4out # 4
	05	in 05 board 16in/4out # 4
	04	in 04 board 16in/4out # 4
	03	in 03 board 16in/4out # 4
	02	in 02 board 16in/4out # 4
	01	in 01 board 16in/4out # 4
	00	in 00 board 16in/4out # 4

<u>i_o(7)</u>	<u>bit</u>	<u>description</u>
	15-04	not used – mother board
	03	out 3 – mother board
	02	out 2 – mother board
	01	out 1 – mother board
	00	out 0 – mother board

<u>i_o(8)</u>	<u>bit</u>	<u>description</u>
	15	out 3 board 16in/4out # 1
	14	out 2 board 16in/4out # 1
	13	out 1 board 16in/4out # 1
	12	out 0 board 16in/4out # 1
	11	out 3 board 16in/4out # 2
	10	out 2 board 16in/4out # 2
	09	out 1 board 16in/4out # 2
	08	out 0 board 16in/4out # 2
	07	out 3 board 16in/4out # 3
	06	out 2 board 16in/4out # 3

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05	out 1	board 16in/4out # 3
04	out 0	board 16in/4out # 3
03	out 3	board 16in/4out # 4
02	out 2	board 16in/4out # 4
01	out 1	board 16in/4out # 4
00	out 0	board 16in/4out # 4

<u>i_o(9)</u>	<u>bit</u>	<u>description</u>
	15	out 15 board 4in/16out # 1
	14	out 14 board 4in/16out # 1
	13	out 13 board 4in/16out # 1
	12	out 12 board 4in/16out # 1
	11	out 11 board 4in/16out # 1
	10	out 10 board 4in/16out # 1
	09	out 09 board 4in/16out # 1
	08	out 08 board 4in/16out # 1
	07	out 07 board 4in/16out # 1
	06	out 06 board 4in/16out # 1
	05	out 05 board 4in/16out # 1
	04	out 04 board 4in/16out # 1
	03	out 03 board 4in/16out # 1
	02	out 02 board 4in/16out # 1
	01	out 01 board 4in/16out # 1
	00	out 00 board 4in/16out # 1

<u>i_o(10)</u>	<u>bit</u>	<u>description</u>
	15	out 15 board 4in/16out # 2
	14	out 14 board 4in/16out # 2
	13	out 13 board 4in/16out # 2
	12	out 12 board 4in/16out # 2
	11	out 11 board 4in/16out # 2
	10	out 10 board 4in/16out # 2
	09	out 09 board 4in/16out # 2
	08	out 08 board 4in/16out # 2
	07	out 07 board 4in/16out # 2
	06	out 06 board 4in/16out # 2
	05	out 05 board 4in/16out # 2
	04	out 04 board 4in/16out # 2
	03	out 03 board 4in/16out # 2
	02	out 02 board 4in/16out # 2
	01	out 01 board 4in/16out # 2
	00	out 00 board 4in/16out # 2

<u>i_o(11)</u>	<u>bit</u>	<u>description</u>
	15	out 15 board 4in/16out # 3
	14	out 14 board 4in/16out # 3
	13	out 13 board 4in/16out # 3
	12	out 12 board 4in/16out # 3
	11	out 11 board 4in/16out # 3
	10	out 10 board 4in/16out # 3
	09	out 09 board 4in/16out # 3
	08	out 08 board 4in/16out # 3
	07	out 07 board 4in/16out # 3
	06	out 06 board 4in/16out # 3

05	out 05	board 4in/16out # 3
04	out 04	board 4in/16out # 3
03	out 03	board 4in/16out # 3
02	out 02	board 4in/16out # 3
01	out 01	board 4in/16out # 3
00	out 00	board 4in/16out # 3

<u>i_o(12)</u>	<u>bit</u>	<u>description</u>
	15	out 15 board 4in/16out # 4
	14	out 14 board 4in/16out # 4
	13	out 13 board 4in/16out # 4
	12	out 12 board 4in/16out # 4
	11	out 11 board 4in/16out # 4
	10	out 10 board 4in/16out # 4
	09	out 09 board 4in/16out # 4
	08	out 08 board 4in/16out # 4
	07	out 07 board 4in/16out # 4
	06	out 06 board 4in/16out # 4
	05	out 05 board 4in/16out # 4
	04	out 04 board 4in/16out # 4
	03	out 03 board 4in/16out # 4
	02	out 02 board 4in/16out # 4
	01	out 01 board 4in/16out # 4
	00	out 00 board 4in/16out # 4

g. commands

Each bit of the commands register is specified as follows :

Bit	Description	Action
15-06	Not used	
05	Clear Peak	
04	Clear Reset Total	
03	Update Totals	
02	Reset Tare	
01	Set Tare	
00	Reset Alarms	Reset any pending alarm

In order to give a command, the Host must set the relevant bit to 1 and write (send) the register to the instrument. The action will be performed if the write message is accepted.

NOTE: The registers from h. to n. only apply if the optional Load Out option is installed.

h. Net_Weight

The instantaneous net weight in engineering units.

i. Gross_Weight

The instantaneous gross weight in engineering units.

- j. Peak
The instantaneous value of peak.
- k. Master_total
The current value of the master totalizer.
- l. Reset_total
The current value of the reset totalizer. Reset total can be zeroed by writing zero to this register or by the command register.
- m. Scale_cap
The scale capacity of the scale. Entered by the operator at first start up, should never be altered.
- n. Threshold_1
The set point for the alarm of threshold 1. Entered or downloaded by the operator.
- o. Threshold_2
The set point for the alarm of threshold 1. Entered or downloaded by the operator.
- p. Threshold_3
The set point for the alarm of threshold 1. Entered or downloaded by the operator.
- q. Threshold_4
The set point for the alarm of threshold 1. Entered or downloaded by the operator.

3.5 PC-Master Protocol

The PC-Master protocol is fully described in the following manual (available from Thermo Ramsey on request) :

PC-MASTER COMMUNICATION PROTOCOL

The following messages are used to communicate with MT3100 type of instruments:

- Message #97 : Send a Key to the MT3000
- Message #98 : Send a variables to the MT3000
- Message #99 : Get variables from the MT3000

3.5.1 Description

1. Message #97 : SEND A KEY TO THE 3100

With this command, the code of one or more keys can be sent to the instrument. When the keys are received by the instrument, they are processed as the normal keyboard entries.

QUERY MESSAGE

Begin of frame	STX	02
	DLE	10H
Address	xxx	xxx
Code	97	61H
Stamp	xxx	xxx

Data	KEY	1byte
Error check	xxx	xxx
End of frame	ETX	03

RESPONSE MESSAGE

No response is provided.

TABLE OF THE KEYS

KEY	HEX CODE	KEY	HEX CODE
UP ARROW	48H	EIGHT	38H
DOWN ARROW	50H	NINE	39H
DECIMAL POINT	2EH	MENU	4DH
CLEAR	53H	RUN	52H
ZERO	30H	F1	3FH
ONE	31H	F2	40H
TWO	32H	F3	41H
THREE	33H	AUTO/MAN	3BH
FOUR	34H	LOC/REM	3CH
FIVE	35H	START	3DH
SIX	36H	STOP	3EH
SEVEN	37H		

Example 1:

The Host sends the "MENU"key to 3100 (Address of Slave 1) :

<u>HOST (PLC)</u>		<u>SLAVE (3100)</u>
02H	→	
10H		
01H		
61H		
01H		
4DH		
B0H		
03H	→	

- Message #98 : SEND A VARIABLE TO THE 3100

With this command, the master sends registers to the slave unit.

QUERY MESSAGE

Begin of frame	STX	02
	DLE	10H
Address	xxx	xxx
Code	98	62H
Stamp	xxx	xxx
Data	Address	1WORD
	WordCount	1WORD
	DATA	WordCount WORDS

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Error check xxxxxx
 End of frame ETX 03

RESPONSE MESSAGE

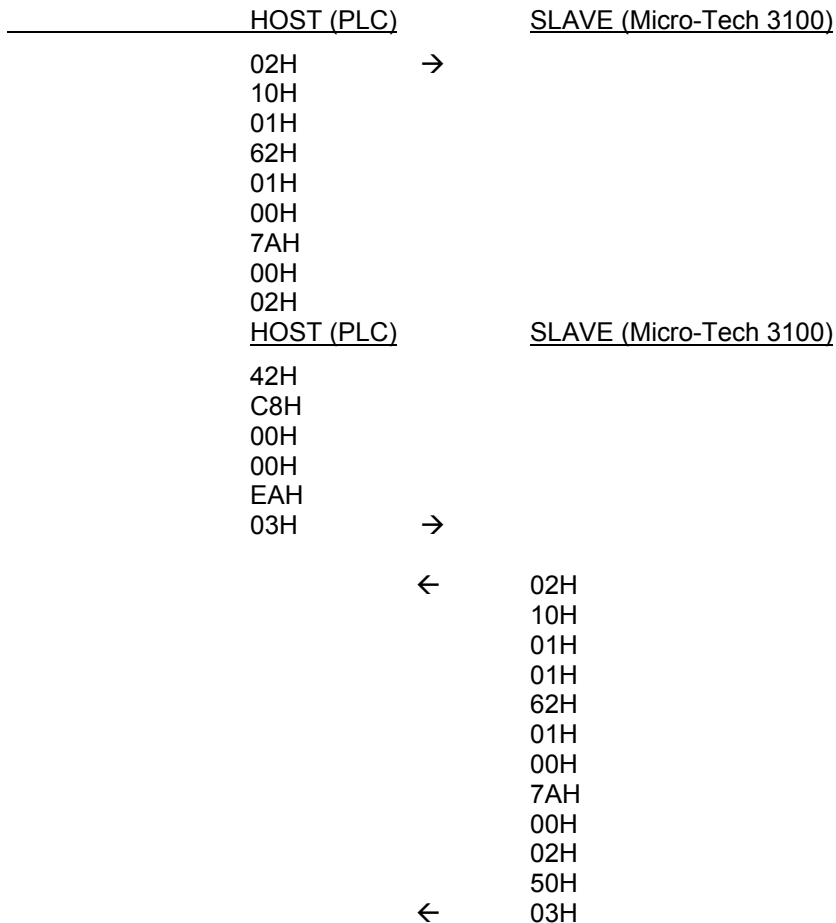
Begin of frame STX 02
 DLE 10H
 Address xxx xxx
 Code 98 62H
 Stamp xxx xxx
 Data Address 1WORD
 WordCount 1WORD
 DATA WordCount WORDS
 Error check xxx xxx
 End of frame ETX 03

Example 1 :

The Host wants to write the HIGH WEIGHT SET (address 7A hex):

High weight set : 100.0%

Address of Slave : 1



3. Message #99 : READ REGISTER FROM THE 3000

With this command, the master asks the slave unit for registers.

QUERY MESSAGE

Begin of frame	STX	02
	DLE	10H
Address	xxx	xxx
Code	99	63H
Stamp	xxx	xxx
Data	Address	1WORD
	WordCount	1WORD
Error check	xxx	xxx
End of frame	ETX	03

RESPONSE MESSAGE

Begin of frame	STX	02
	DLE	10H
Address	xxx	xxx
Code	99	63H
Stamp	xxx	xxx
Data	Address	1WORD
	WordCount	1WORD
	DATA	n. WORDS
Error check	xxx	xxx
End of frame	ETX	03

Example 1 :

The Host wants to write the HIGH WEIGHT SET (address 7A hex):

High weight set: 100.0 %

Address of Slave: 1

HOST (PLC)

SLAVE (Micro-Tech 3100)

02H 10H 01H 63H 01H 00H

7AH 00H 02H 01H 03H ----->

<-----

02H 10H 01H 63H 01H 00H

7AH 00H 02H 42H C8H 00H

00H EBH 03H

3.6 Siemens 3964R

3.6.1 Description

The protocol has been implemented as described in – “Funzioni di accoppiamento con CP 525/2 Manuale – Simatic S5” – Siemens.

Two communication modes are provided :

FETCH The HOST asks the slave unit for register

SEND The HOST sends registers to the slave

The choice between requesting or sending data is made using a specific code inside the message.

3.6.2 Write Register

<u>HOST (PLC)</u>			<u>SLAVE (Micro-Tech 3100)</u>
STX	(02H)	-->	
		<--	DLE (10H)
HEDING TEL HI	(00H)	-->	
HEDING TEL LO	(00H)		
COMAND HI	(41H)		
COMAND LO	(44H)		
DESTINATION DB	(00H)		
DESTINATION DW	(XXH)		
NUMBER BYTES HI	(00H)		
NUMBER BYTES LO	(XXH)		
no CF	(FFH)		
all CPUs	(FFH)		
DATA MSB			
....			
DATA LSB			
DLE	(10H)		
ETX	(03H)		
BCC	(XXH)		
		<--	DLE (10H)
			STX (02H)
DLE	(10H)	-->	
		<--	HEDING TEL HI (00H)
			HEDING TEL LO (00H)

NOT USED (00H)
 NUMBER ERROR (00H)
 DLE (10H)
 ETX (03H)
 BCC (XXH)

DLE (10H) -->

Example:

The Host wants to write the HIGH LOW RATE (address 78 hex) at 100.0%:

<u>HOST (PLC)</u>		<u>SLAVE (Micro-Tech 3100)</u>
02H	----->	
		<----- 10H
00H 00H 41H 44H 00H 78H		
00H 02H FFH FFH 42H C8H		
00H 00H 10H 03H E5H	----->	
		<----- 10H 02H
10H	----->	
		<----- 00H 00H 00H 00H 10H 03H 13H
10H	----->	

3.6.3 Read Register

<u>HOST (PLC)</u>		<u>SLAVE (Micro-Tech 3100)</u>
STX	-->	
		<-- DLE (10H)
HEDING TEL HI (00H)	-->	
HEDING TEL LO (00H)		
COMAND HI (45H)		
COMAND LO (44H)		
DESTINATION DB (00H)		
DESTINATION DW (XXH)		
NUMBER BYTES HI (00H)		
NUMBER BYTES LO (XXH)		
no CF (FFH)		

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all CPUs	(FFH)		
DLE	(10H)		
ETX	(03H)		
BCC	(XXH)		
		<--	DLE (10H)
			STX (02H)
DLE	(10H)	-->	
		<--	HEDING TEL HI (00H)
			HEDING TEL LO (00H)
			NOT USED (00H)
			NUMBER ERROR (XXH)
			DATA LSB
			MAX 127BYTES
			DATA MSB
			DLE (10H)
			ETX (03H)
			BCC (XXH)
DLE	(10H)	-->	

Example:

The Host wants to receive the LOW RATE SET (address 78 hex).

HIGH WEIGHT SET: 100.0%

<u>HOST (PLC)</u>		<u>SLAVE (Micro-Tech 2100)</u>
02H	----->	
		<----- 10H
00H 00H 45H 44H 00H 78H		
00H 02H FFH FFH 10H 03H		
6BH	----->	
		<----- 10H
		<----- 02H
10H	----->	
		<----- 00H 00H 00H 00H 42H C8H
		00H 00H 10H 03H 99H

10H ----->

3.7 MODBUS

This protocol has been implemented as described in: - "Gould Modicon Modbus Protocol" - Reference Guide - November 1993 - Rev. A (Gould Inc. Programmable Control Division)

NOTE: Only a subset of the protocol has been implemented, as described in this chapter.

3.7.1 Read Register

QUERY

Address	xxx
function	03H
add. hi	xxx
add. lo	xxx
n.data hi	xxx
n.data lo	xxx
n. data hi	xxx
n. data lo	xxx
crc 16 lo	xxx
crc 16 hi	xxx

RESPONSE MESSAGE

Address	xxx	
function	03H	(83H in case of error)
Byte cnt	xxx	
Data MSB	xxx	
.....	xxx	
Data LSB	xxx	
crc16 lo	xxx	
crc16 hi	xxx	

Example:

The Host wants to write the LOW WEIGHT SET (address 125 dec) to 20.0%:

Address of Micro-Tech 3100: 1

HOST (PLC) _____ SLAVE (Micro-Tech 3100)


```

ADDRESS OF DATA (FOURTH BYTE)
SIZE OF DATA IN ELEMENTS (LOW)
SIZE OF DATA IN ELEMENTS (HIGH)
DLE          (10H)
ETX          (03H)
BCC
→
←   DLE  (10H)
←   ACK  (06H)

```

- The HOST (PLC) asks for data from the Slave (3000) :
This message is sent from the Host to the Slave to request a certain number of data:

```

HOST (PLC)                SLAVE (3000)
DLE          (10H)        →
ENQ          (05H)
ADDRESS SLAVE
BCC
→
←   DLE          (10H)
    STX          (02H)
    ADDRESS HOST
    ADDRESS SLAVE
    4FH          (COMMAND)
    STS          (00H)
    TMS          (xxH)
    TMS          (xxH)
    TYME DATA PARAMETER
    DATA LSB MSB
    .....
    DATA LSB MSB
    DLE          (10H)
    ETX          (03H)
    BCC
←
DLE          (10H)        →
ACK          (06H)        →

```

Example:

The Host wants to receive the HIGH WEIGHT SET (address F8:13):
High load set: 100.0%
Address of Slave: 02
Address of Host: 01

```

HOST (PLC)                SLAVE (Micro-Tech 3100)
10H 01H 02H 10H 02H 02H
01H 0FH 00H 00H 00H 78H
00H 00H 01H 00H 07H 00H
08H 0AH 01H 00H 10H 03H
69H                        ----->
<----- 10H 06H

```

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```
10H 05H 01H FFH          ----->
                                     <----- 10H 02H 01H 02H 4FH 00H
                                               00H 00H 99H 09H 06H 94H
                                               08H 00H 00H C8H 42H 10H
                                               03H A2H
10H 06H                  ----->
```

3.8.3 Write Register

Send data

This message is used from the Host to download registers into the Micro-Tech 2100.

```
HOST (PLC)          SLAVE (Micro-Tech 3100)
DLE (10H)  -->
SOH (01H)
ADDRESS OF SLAVE
DLE (10H)
STX (02H)
ADDRESS SLAVE
ADDRESS HOST
COMMAND (OF H)
STS (00H)
TMS (xxH)
TMS (xxH)
FNC (67 H)

PACKET OFFSET (LOW)
PACKET OFFSET (HIGH)
TOTAL TRANS (LOW)
TOTAL TRANS (HIGH)
ADDRESS OF DATA (FIRST BYTE)
ADDRESS OF DATA (SECOND BYTE)
ADDRESS OF DATA (THIRD BYTE)
ADDRESS OF DATA (FOURTH BYTE )
TYPE DATA PARAMETER
DATA LSB MSB
...
DATA LSB MSB
DLE (10H)
```

```

ETX (03H)
BCC                                -->
                                   <--
                                   DLE   (10H)
                                   ACK   (06H)
    
```

Ask if data ok:

```

HOST (PLC)                                SLAVE (Micro-Tech 3100)
DLE (10H)                                -->
ENQ (05H)
ADDRESS SLAVE
BCC                                        -->
                                        <--
                                        DLE (10H)
                                        STX (02H)
                                        ADDRESS HOST
                                        ADDRESS SLAVE
                                        4FH (COMMAND)
                                        STS (00H)
                                        TMS (xxH)
                                        TMS (xxH)
                                        DLE (10H)
                                        ETX (03H)
                                        BCC
DLE (10H)                                -->
ACK (06H)
    
```

If the message is incorrectly received, the Micro-Tech 2100 will not respond. The character 10H is doubled (sent two times), but is computed only once in the BCC.

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Example:

The Host wants to write the HIGH WEIGHT SET (address F8:13) to 100.0%:

Address of Slave: 02

Address of Host: 01

HOST (PLC)

SLAVE (Micro-Tech 3100)

10H 01H 02H 10H 02H 02H

01H 0FH 00H 00H 00H 67H

00H 00H 01H 00H 07H 00H

08H 0AH 99H 09H 06H 94H

08H 00H 00H C8H 42H 10H

03H 1DH ----->

<----- 10H 06H

10H 05H 02H FEH ----->

<----- 10H 02H 01H 02H 4FH 00H

00H 00H 10H 03H AEH

10H 06H ----->

3.9 Register Mapping

register	Modbus	PC Master Siemens	Allen Bradley	note
success_flag	33	20H	N7:0	0 successful, 1 failed
display(1)	34	21H	N7:1	
display(2)	35	22H	N7:2	
display(3)	36	23H	N7:3	
display(4)	37	24H	N7:4	
display(5)	38	25H	N7:5	
display(6)	39	26H	N7:6	
display(7)	40	27H	N7:7	
display(8)	41	28H	N7:8	
display(9)	42	29H	N7:9	
display(10)	43	2AH	N7:10	
display(11)	44	2BH	N7:11	
display(12)	45	2CH	N7:12	
display(13)	46	2DH	N7:13	
display(14)	47	2EH	N7:14	
display(15)	48	2FH	N7:15	
display(16)	49	30H	N7:16	
display(17)	50	31H	N7:17	
display(18)	51	32H	N7:18	
display(19)	52	33H	N7:19	
display(20)	53	34H	N7:20	
display(21)	54	35H	N7:21	
display(22)	55	36H	N7:22	
display(23)	56	37H	N7:23	
display(24)	57	38H	N7:24	
display(25)	58	39H	N7:25	
display(26)	59	3AH	N7:26	
display(27)	60	3BH	N7:27	
display(28)	61	3CH	N7:28	
display(29)	62	3DH	N7:29	
display(30)	63	3EH	N7:30	
display(31)	64	3FH	N7:31	

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display(32)	65	40H	N7:32	
display(33)	66	41H	N7:33	
display(34)	67	42H	N7:34	
display(35)	68	43H	N7:35	
display(36)	69	44H	N7:36	
display(37)	70	45H	N7:37	
display(38)	71	46H	N7:38	
display(39)	72	47H	N7:39	
display(40)	73	48H	N7:40	
leds	74	49H	N7:41	
status(1)	75	4AH	N7:42	
status(2)	76	4BH	N7:43	
alarm_status(1)	77	4CH	N7:44	
alarm_status(2)	78	4DH	N7:45	
alarm_status(3)	79	4EH	N7:46	
alarm_status(4)	80	4FH	N7:47	
alarm_status(5)	81	50H	N7:48	
i_o(1)	82	51H	N7:49	
i_o(2)	83	52H	N7:50	
i_o(3)	84	53H	N7:51	
i_o(4)	85	54H	N7:52	
i_o(5)	86	55H	N7:53	
i_o(6)	87	56H	N7:54	
i_o(7)	88	57H	N7:55	
i_o(8)	89	58H	N7:56	
i_o(9)	90	59H	N7:57	
i_o(10)	91	5AH	N7:58	
i_o(11)	92	5BH	N7:59	
i_o(12)	93	5CH	N7:60	
commands	94	5DH	N7:61	
Net_weight (1)	95	5EH	F8:0	
Net_weight (2)	96	5FH		
Gross_weight (1)	97	60H	F8:1	
Gross_weight (2)	98	61H		
Peak (1)	99	62H	F8:2	
Peak (2)	100	63H		

Master_total (1)	101	64H	F8:3	
Master_total (2)	102	65H		
Reset_total (1)	103	66H	F8:4	
Reset_total (2)	104	67H		
scale_cap (1)	105	68H	F8:5	
scale_cap (2)	106	69H		
Threshold_1 (1)	107	6AH	F8:6	
Threshold_1 (2)	108	6BH		
Threshold_2 (1)	109	6CH	F8:7	
Threshold_2 (2)	110	6DH		
Threshold_3 (1)	111	6EH	F8:8	
Threshold_3 (2)	112	6FH		
Threshold_4 (1)	113	70H	F8:9	
Threshold_4 (2)	114	71H		

3.10 Freerun Protocols

When the freerun protocol is selected, the instrument starts to send a fixed length data string at a frequency of 10 per second. There are two formats: LONG and SHORT.

LONG Format:

SS N1 ... N8 T1 ... T8 S1 S2 S3 CR

SHORT Format:

SS N1 ... N8 S1 S2 S3 CR

Where:

SS is the scale number in ASCII format:

30h for scale #1

31h for scale #2

32h for scale #3

33h for scale #4

If only one scale has been defined, this value will be fixed at 30h. In multi scale systems, the scale number will increase at each transmission and it will go back to 30h after the last active scale data has been sent.

N1-N8 is the net weight. It is in 8 digit ASCII format, N1 is the MSD and N8 the LSD. The string does not contain sign and decimal point and the digits before the first significant digit are zero (30h).

The passed value will be the filtered net weight if the stable weight indicator on the instrument front panel is turned on, the unfiltered value if it is off.

T1-T8 is the tare weight. It is in 8 digit ASCII format, T1 is the MSD and T8 the LSD. The string does not contain sign and decimal point and the digits before the first significant digit are zero (30h).

S1 Status byte #1 - Display status.

Bit #0 - Unit measure: 0 English, 1 Metric

Bit #1 - Net weight sign: 0 positive, 1 negative

Bit #2 - Unit size: 0 small (kg, lb), 1 large (t, TONS, LTONS)

Bit #3 - always 0

Bit #4 - always 0

Bit #5 - always 1

Bit #6 - always 0

Bit #7 - always 0

S2 Status byte #2 - Data status.

Bit #0 - Motion: 0 no motion (stable weight), 1 motion.

Bit #1 - Alarm: 0 no alarm, 1 alarm

Bit #2 - Print valid: 0 yes, 1 no

Bit #3 - always 0

Bit #4 - always 0

Bit #5 - always 1

Bit #6 - always 0

Bit #7 - always 0

S3 Status byte #3 - Decimal position.

Bit #0 - one decimal.

Bit #1 - two decimals.

Bit #2 - three decimals.

(If all zero, no decimals)

Bit #3 - always 0

Bit #4 - always 0

Bit #5 - always 1

Bit #6 - always 0

Bit #7 - always 0

CR String terminator, carriage return 0Dh.

It is possible to use the CTS signal to slow down the transmission rate. The instrument checks the CTS before it starts a new transmission; if CTS is active, data will not be sent.

If CTS becomes active during a transmission, it will be completed in any case.

For this purpose, it is necessary to define ACTIVE in the CTS selection during setup.

Chapter 4 Maintenance

4.1 General

Refer to the Micro-Tech 3100 Integrator manual for maintenance information.

Chapter 5 Parts

5.1 General

Refer to the Micro-Tech 3100 Integrator manual for parts information.