Fusion

WATCH ID SYSTEM
CONCEPT TECHNICAL MANUAL

Based on the following software versions:
Sensomatic: 2.0
Activator:
Watch:
Receiver:
FIC: FIC@G2.1.3
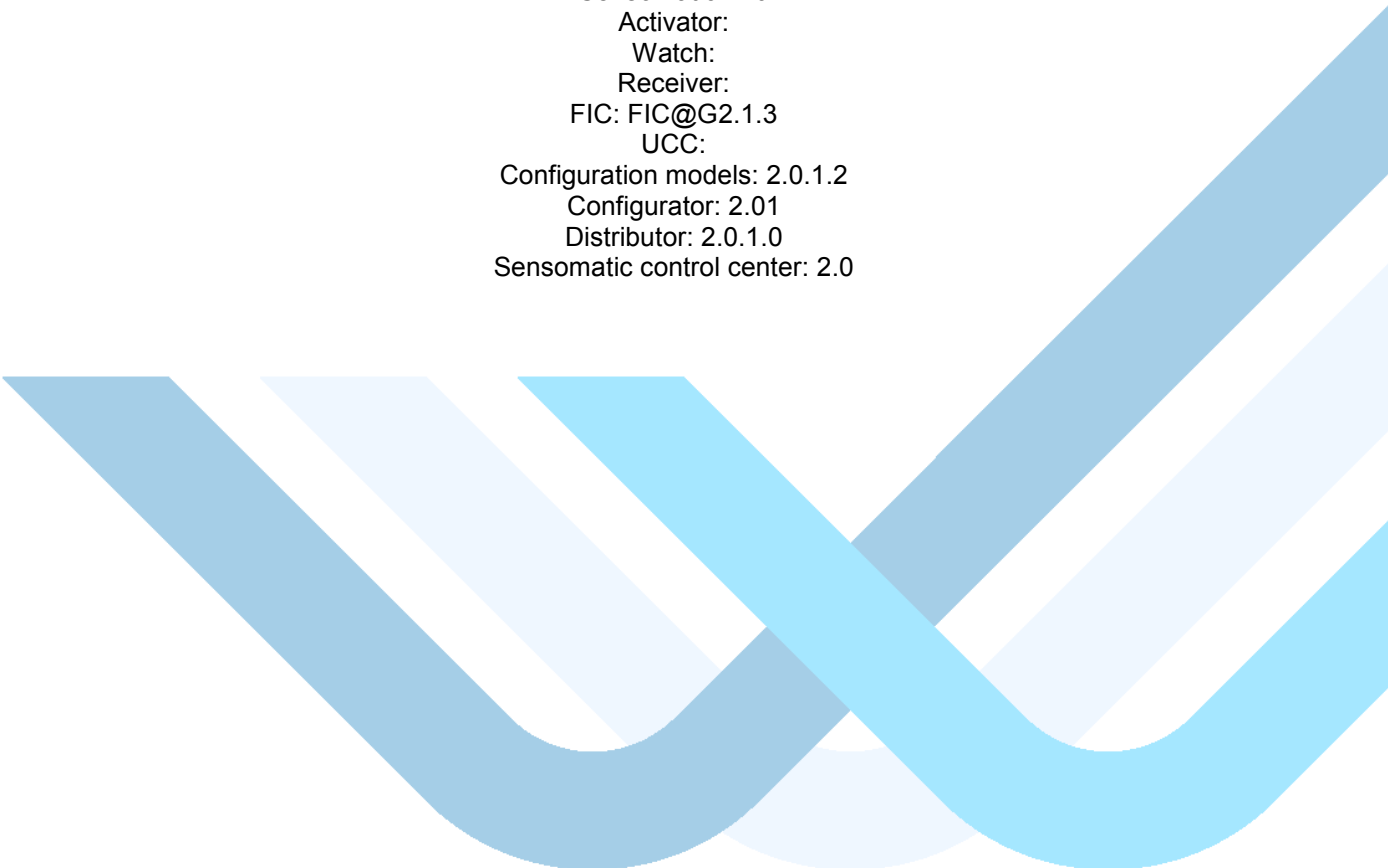UCC:
Configuration models: 2.0.1.2
Configurator: 2.01
Distributor: 2.0.1.0
Sensomatic control center: 2.0

READ THIS FIRST

✓ Before taking the CRYSTAL and Sensomatic system in operation, this manual and the appropriate operating instructions have to be read carefully. A proper handling of the equipment is the basis for correct functioning.

✓ The equipment must be used only for the application described.

✓ It is the responsibility of the farmer to check his animals and the performance of the equipment. If, for any reason, the CRYSTAL or Sensomatic system are not operational or individual animals refuse to use the system, it is the responsibility of the farmer to feed and milk the animals with alternative methods.

✓ Check that no pipes or anything similar are protruding in the barn or in the parlour on which the transponder neck bands or leg bands can get caught.

✓ Calibration of the milk meter and the feed dispensers is of most importance to obtain proper milking and feeding results. If calibration for some reasons is wrong, or wrong values have been programmed, the milking results and feed distribution can be bad until correct calibration has been done and proper values have been entered.

✓ Never remove cover(s) or parts of the system before the electrical power cable(s) is/are disconnected.

✓ Do not flush the electronic equipment with (high) pressure hoses.

✓ Installation of the equipment must be carried out by skilled and authorized technicians only.

✓ False or incorrect operation of the system may seriously affect the animals. It is therefore necessary to double check all input and output of the system.

✓ The manufacturers guarantee does not cover damage that has been caused by incorrect installation, incorrect usage, improper treatment, inadequate cleaning and servicing or wrong input. Neither does it cover further damage resulting from above.

✓ The system shall be powered from the low voltage source complying with safety extra low voltage (SELV) requirements of IEC60950-1 by voltage 24Vac limited up to 3A.

✓ Warning statement: Changes or modifications to this equipment not expressly approved by the party responsible for compliance (E.N.G.S Systems Ltd.) could void the user's authority to operate the equipment.

PREFACE

This manual provides a technical description of the Watch-ID system. It is therefore meant for the technical engineers who install and service these systems.
Readers of this manual are considered to have basic knowledge of the Crystal and FusionNet system.

Various warnings, notes etc. are used in this manual, having the following meaning:

FAILURE TO FOLLOW THE INSTRUCTIONS, CAN RESULT IN SEVERE INJURY TO ENGINEERS, USERS, BYSTANDERS OR LIVESTOCK.

INDICATES SPECIAL PRECAUTIONS THAT MUST BE TAKEN TO AVOID DAMAGE TO EQUIPMENT.

GIVES IMPORTANT INFORMATION TO PREVENT POSSIBLE PROBLEMS.

GIVES ADVICES OR SUGGESTIONS TO MAKE PROCEDURES EASIER OR CLEARER.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

CONTENTS

1. Introduction

The unique Sensomatic Watch ID system is a mobile identification concept and offers a reliable animal ID system that meets the accuracy of per stall ID systems at a low cost level. This Watch ID system uses a special "watch" like identification unit worn on the operators' wrists to detect both the 'address' of the milking stall and the Tiris-tag of the animal at the moment the cluster is attached for milking. In this way, data on that animal's milking can be obtained accurately and reliably. With the Watch ID system the infrastructure costs of multiple antennas and wiring, are eliminated.

The design of the Watch-id system is applicable to most parlour systems, even to parlours like:
-Shared parlours, where animals standing opposite to each other are milked by one Sensomatic unit through a swing-over system.
-Free-style parlours, where animals standing next to each other are milked by one Sensomatic unit.

2. Principle of operation

The Watch is in wireless communication with the Activator, the Tiris based leg tag and the Receiver using three different frequency domains, in the next drawing visualized by green, red and blue.
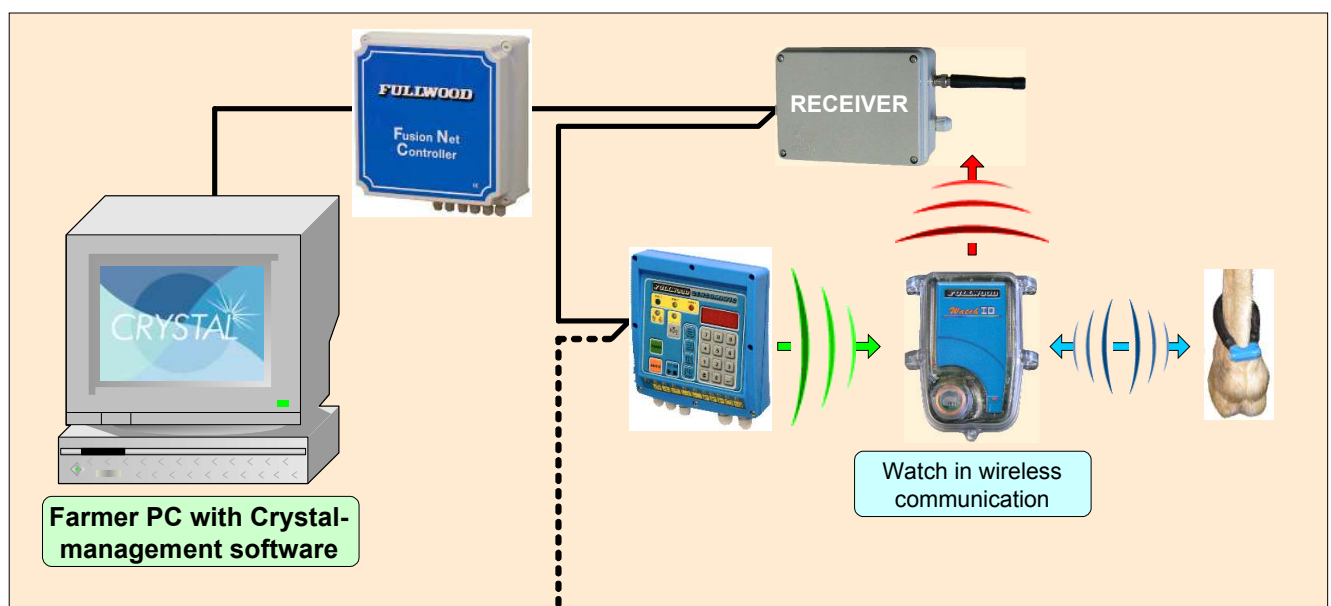

Fig. 2.1 Watch-ID system, schematic.

When a new milking is started by pressing the "HAND" or "AUTO" button on a Sensomatic, the Activator in that same Sensomatic enclosure transmits a signal to the Watch. The Watch will start scanning for a tag (transponder). When the milking cluster is then being attached to the udder, the Watch on the milker's arm will identify that tag, and thus that animal. The Watch will broadcast the gathered information to a special Receiver. This Receiver transfers the information to the display of the Sensomatic on that stall and the results of the milking will be linked to that animal in Crystal.

Information feedback: Both Watch and Sensomatic provide feedback to the milker about the progress of the identification process. The Sensomatic starts bleeping as soon as the ID- sequence is started by pressing either the HAND or AUTO- button, and stops bleeping when it receives the retrieved animal code. The Watch provides feedback by flashing several red LED's when scanning for a tag and lighting up two green LED's as soon as a tag is found and read.

3.   Hardware description

A typical Watch-id system is built from the following components:

- Sensomatic: One unit per one or more milking positions

- Activator board and Activator antenna: One for every Sensomatic, inside the Sensomatic enclosure.

- Watch and Charger: One Charger for every Watch. There is no real limitation to the number of Watches. Practically its number will be equal to the number of milkers. There may be multiple Watches/milkers working within the same parlour. To avoid cross identification milkers should avoid activating their Watch at the same time when attaching the milk cluster of two adjacent positions.

- Leg transponder: One for each animal.

- Central Receiver: In most cases one single Receiver can be used, but this depends on local circumstances and system dimensions.

- Fusion Net Controller: In most cases one single controller can be used (max 99 Sensomatics on one controller), but this depends on local circumstances and system dimensions.

Fig. 3.1 Activator + antenna installed in the Sensomatic enclosure

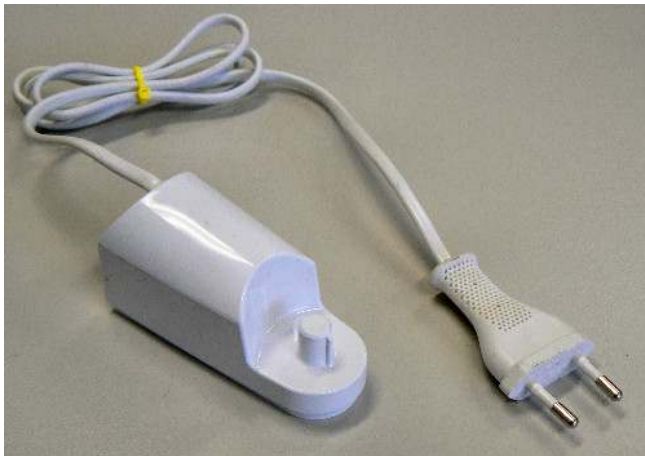*Fig. 3.2 The Watch*

Fig. 3.3 The Watch on the milker's arm

Fig. 3.4 Charger for the Watch

Fig. 3.5 Watch on Charger

Fig. 3.6 Receiver for the Watch

Fig. 3.7 Leg transponder

To be worn on each animal's hind leg.

Farmer PC with CRYSTAL-management software

RECEIVER

Watch in wireless communication
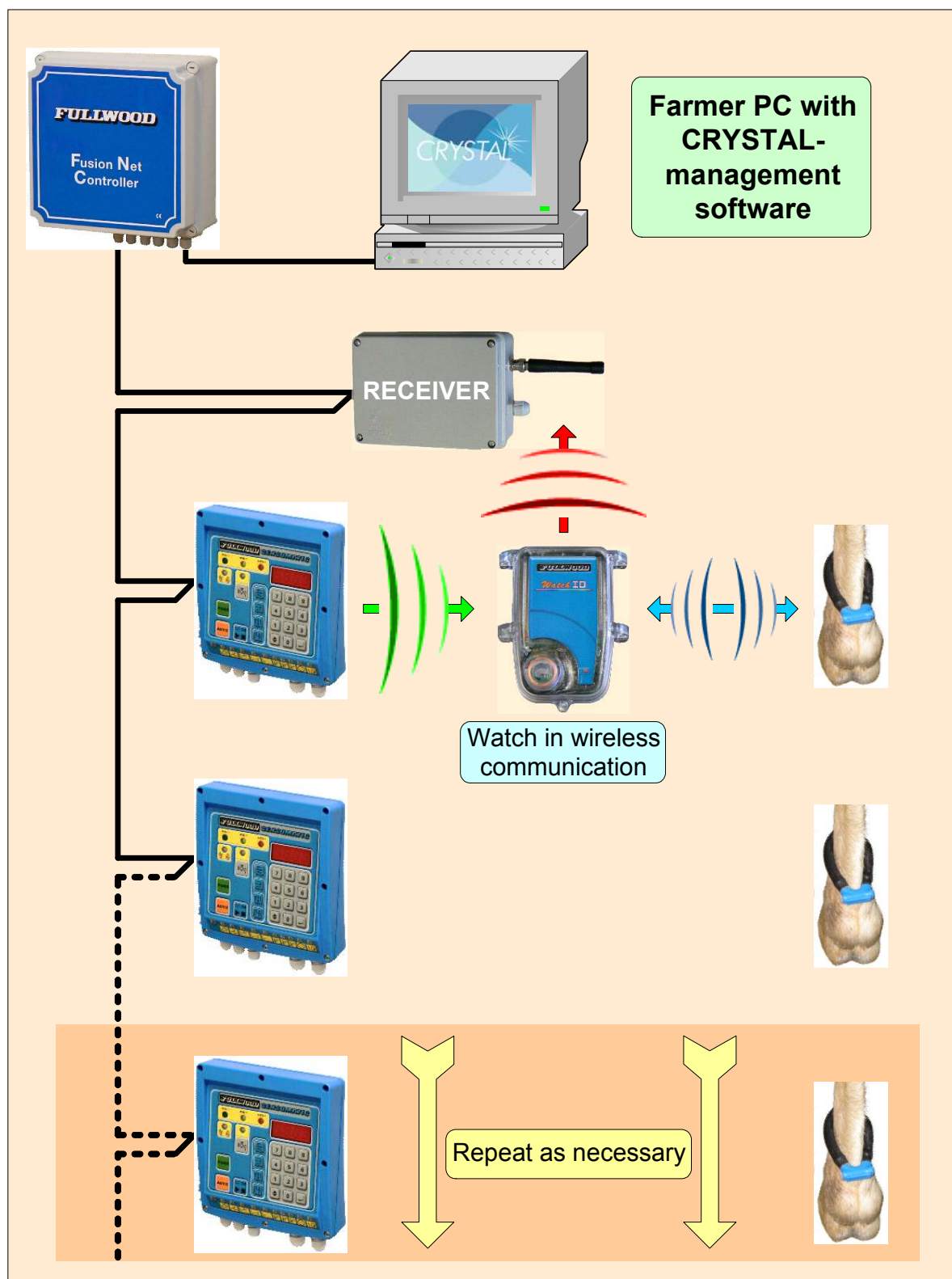
Repeat as necessary

Fig. 3.8 The Watch-ID system, schematic.

This drawing presents a schematic overview of how the Watch ID system is integrated in the milking system.
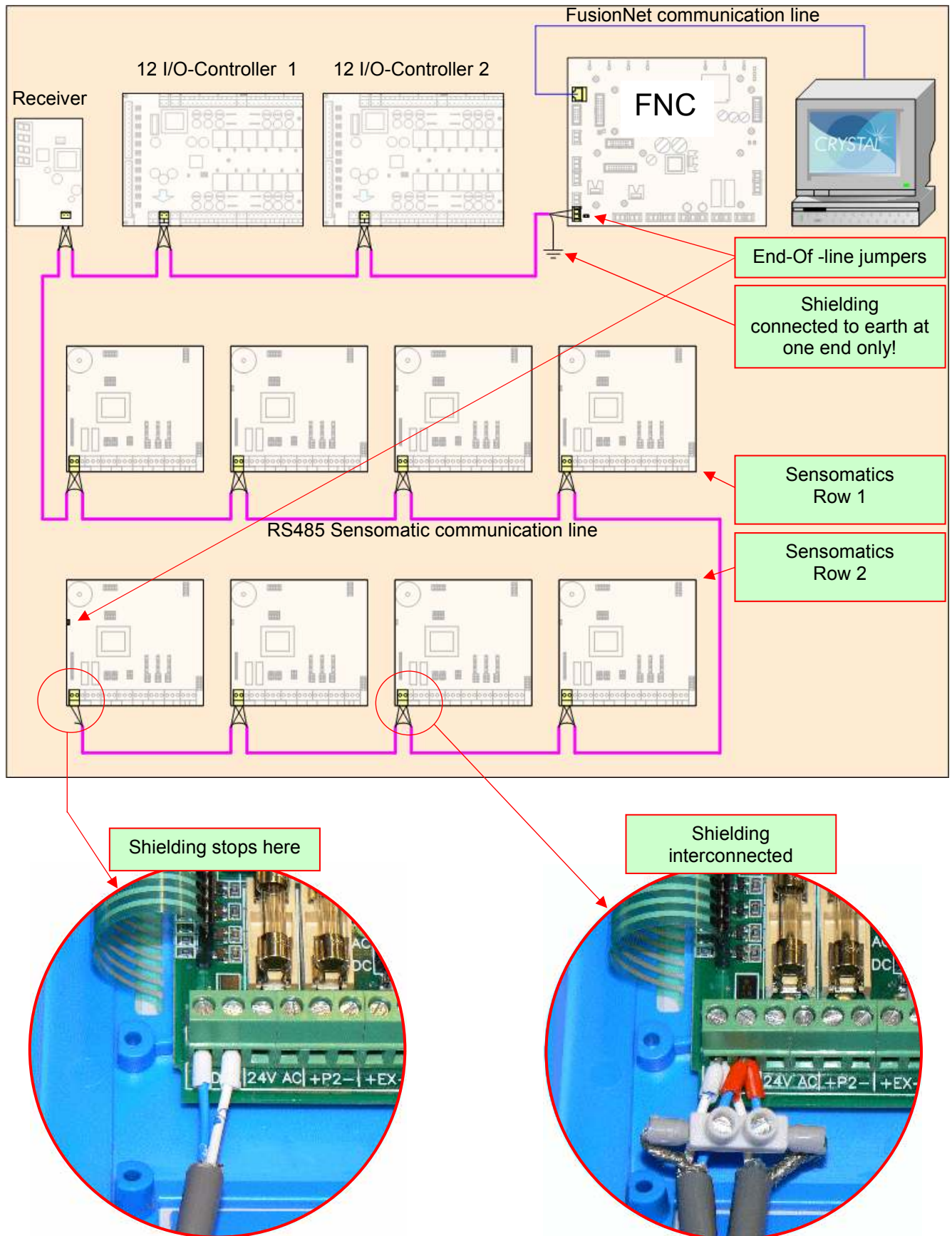
Fig. 3.9 Example of a Sensomatic network coupled to FusionNet and a PC with Crystal herd management software.

4. Hardware installation

This chapter describes the installation of the Watch ID components.

- - 4.1 The Activator
- - 4.2 The Receiver
- - 4.3 The Watch
- - 4.4 The Transponder

Fig. 3.9 presents an example of a Sensomatic network coupled to FusionNet and a PC with Crystal herd management software. See the Technical Manual of the Sensomatic for further directions how to wire the RS485 network to the Fusion Network Controller.

4.1 The Activator

- General:

The Activator circuit board and its antenna are both situated inside the Sensomatic enclosure as shown in the picture below.
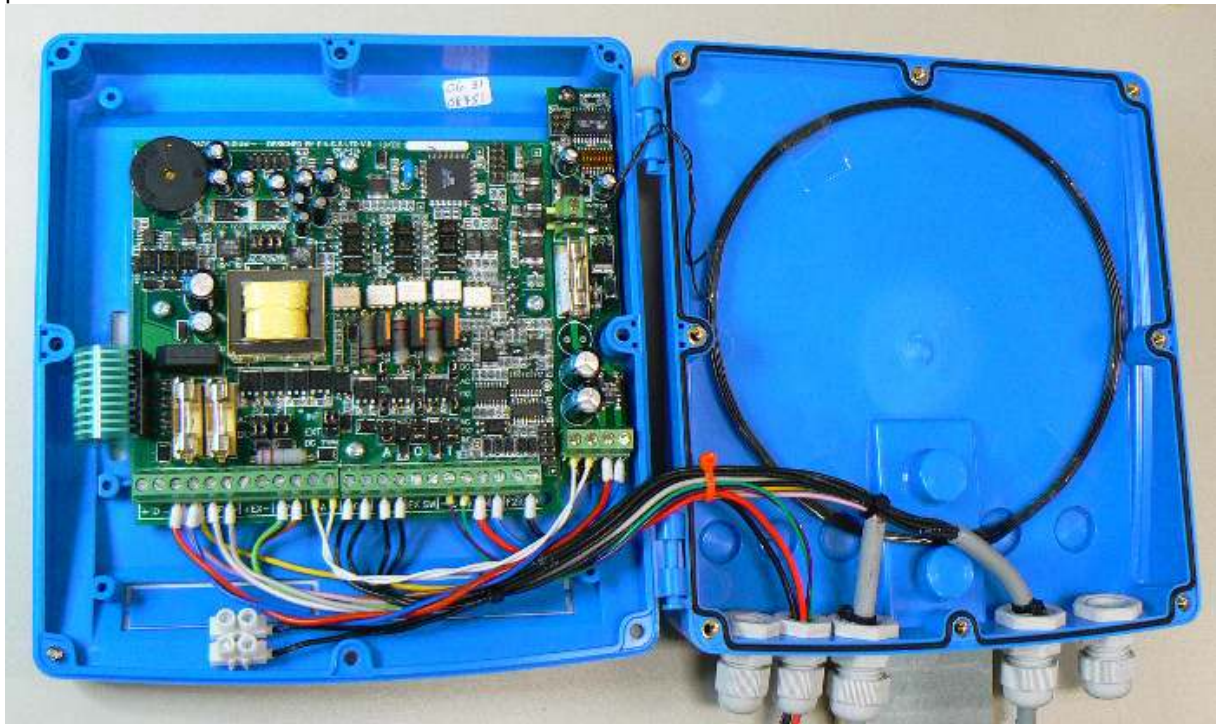

Fig. 4.1 The Sensomatic with built-in Activator and antenna.

The Sensomatics with built-in Activator are wired as usual to the RS-485-connector of the Fusion Net Controller (FNC). See the Sensomatic Technical Manual for further Sensomatic installation details.

- Remote-start button & external Activator-antenna:

In case a remote start button is used, an external Activator-antenna must be used, positioned close to the remote start button.

- Installing the Activator afterwards:

In case the Activator and its antenna did not come pre-installed, install it in the Sensomatic's housing as shown in Fig. 4.1 and Fig. 4.2.

- Activator address setting:

There is a dipswitch-block on the circuit board of the Activator where an address must be set (see drawing below). This should be set to the same address as that of the Sensomatic in which enclosure it is installed.

This can be done by changing these dipswitch settings. This dipswitch-block counts in a binary way, where the left-hand jumper (8) sets the most significant bit and the right-hand jumper (1) the least significant bit.

Note that the "**ON**"-position is **UP** and not down *as printed on the dipswitch itself*. The numbers 1 - 8 *printed on the dipswitch itself* are right though.

Disconnect the power to the Activator and Sensomatic before changing the address and jumpers.

- Sensomatic output setting:

The Sensomatic's digital output "A" must be:
- Hardware-configured for active 24VAC operation (see drawing below), and
- Software-configured for "Normally Opened" (see chapter 7, Fig. 7.1 "Post Setup").
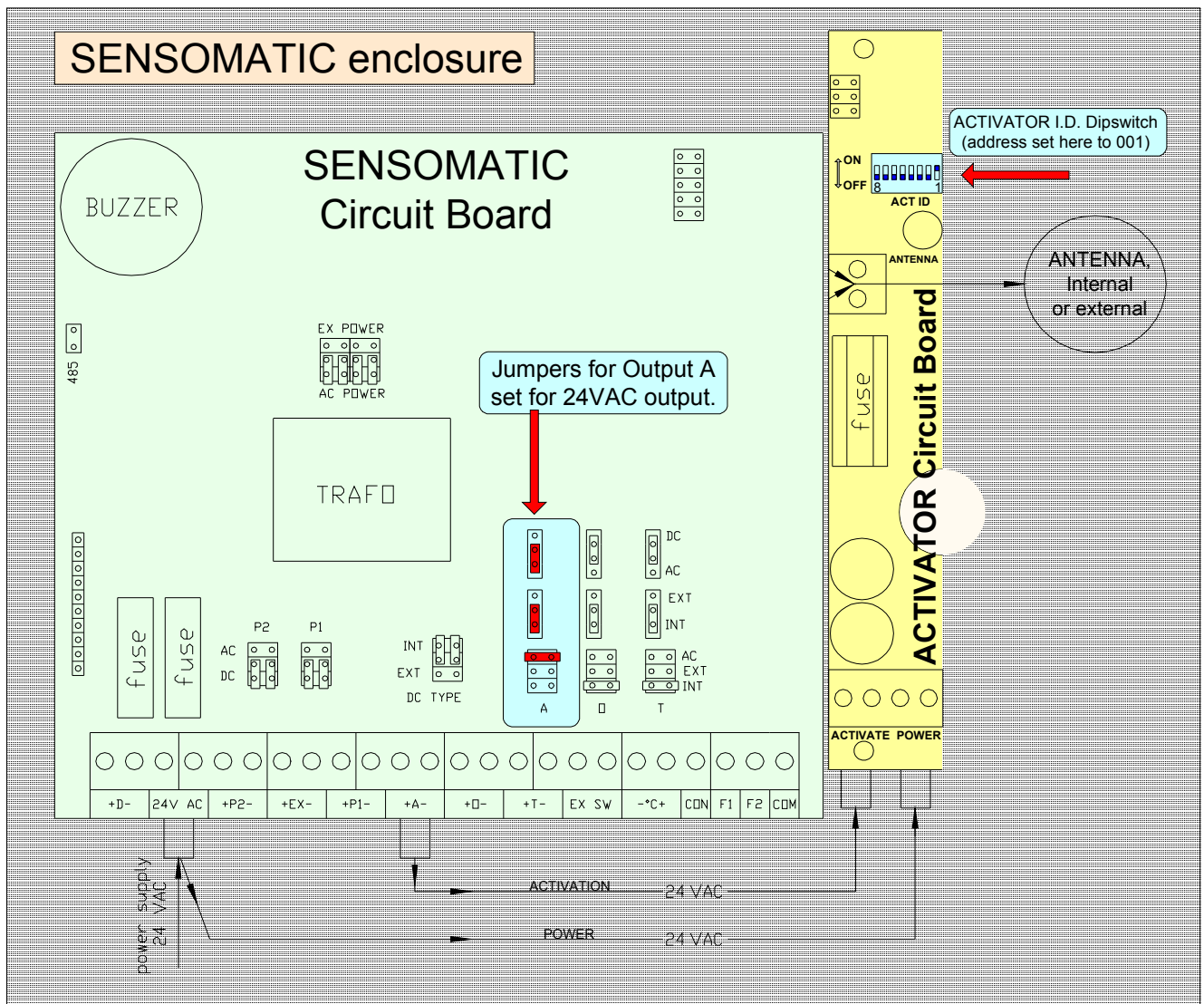

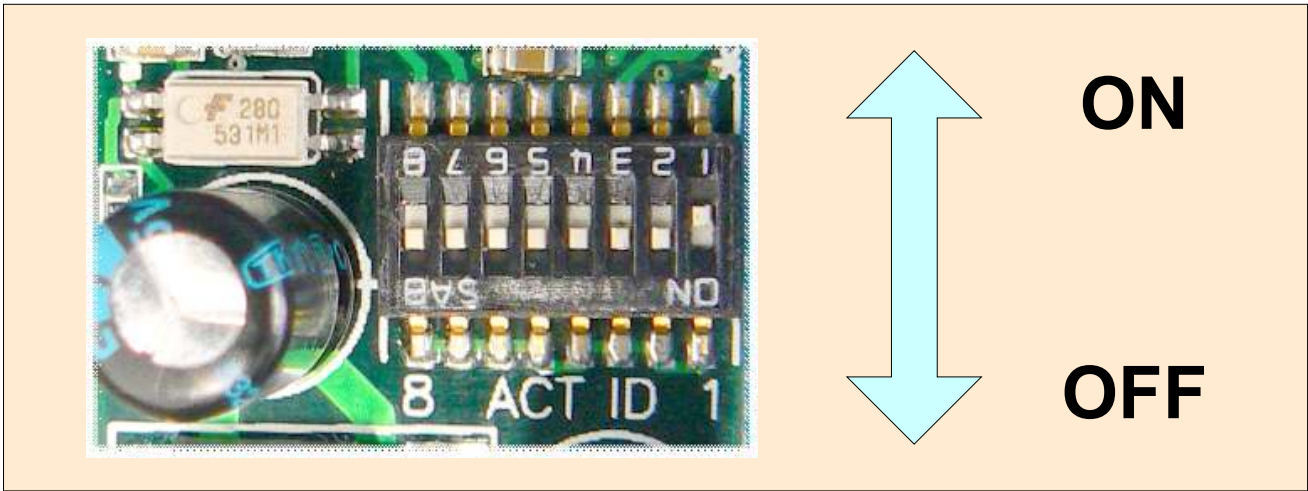*Fig. 4.2 Activator & Sensomatic: wiring, jumpers and dipswitches*

Fig. 4.3 Dipswitch on Activator circuit board, orientation reference.

The "**ON**"-position is **UP** and not down as printed *on the dipswitch itself*.
The numbers 1 till 8 are printed right though.

Dipswitch position	Corresponding Address
	001
	002
	003
	004
	005
	006
	007
	008

Address settings-
1 - 8 shown here,
1 - 100 possible.

Set to the same address
as the Sensomatic
in which enclosure it is.

Fig. 4.4 Address setting examples for the Activator.

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Date	: November 2006

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4.2   The Receiver:

- Installation:

The Receiver has its own enclosure, and installation is quite simple. It only needs a 24VAC power supply and the RS485 Sensomatic network communication connection. The 24VAC power can be derived from the same source as for the Sensomatics. Proper data transmission between the Watch and the Receiver can take place across distances up to 80 meter, under ideal circumstances and a fair line of sight between Watch and Receiver. Install the Receiver preferably in the same room where the Watch will be used. There should be no metal close to the antenna (pipes, reinforcement, and sheeting). This is to provide for optimal receiving conditions from every point where the Watch will be used. The antenna direction is not critical. Mount the box of the Receiver in such a way that none of the glands point up and the cables leaving the glands bend down, so water is lead away from the glands

Fig. 4.5 The Receiver.

Power input 24VAC

End of line-jumper

Communication connection

Jumpers for address
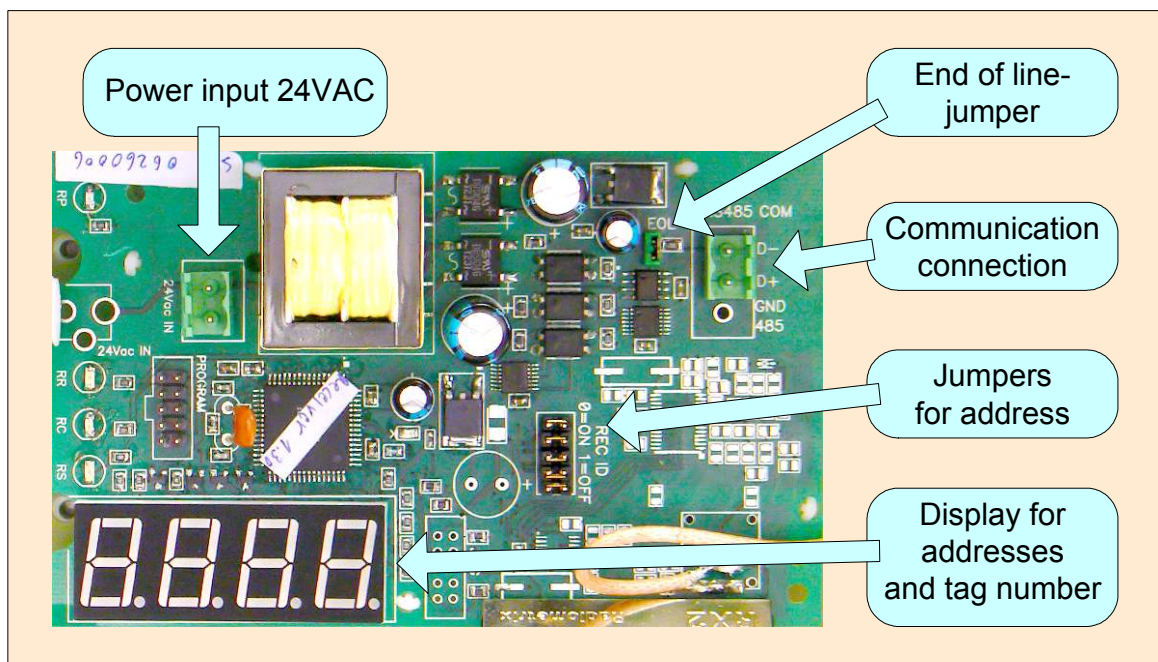
Display for addresses and tag number

Fig. 4.6 The circuit board of the Receiver.

- Communication:

The communication connection should be wired to the same RS-485 Sensomatic communication network as for the Sensomatics. See the Sensomatic manual for directions how to wire the RS485 network to the Fusion Network Controller.

Use a special RS485 communication cable. The specifications for the cable are:
- • Two AWG24 wires (<0.08 Ohm/m)
- • Twisted pair, minimum of 20 layer twists/m
- • Characteristic impedance of 120 Ohm at 1 MHz
- • Nominal capacitance between wire and shield < 60 pF/m)
- • Braided shield covering > 90% of the surface
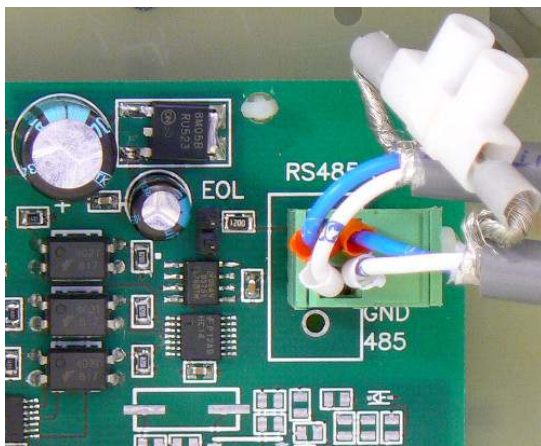- • PE or PVC isolation

Fig. 4.7

In the case of the communication line passing trough the Receiver: do *not* use the End-Of-Line jumper. See Fig. 4.7.

Fig. 4.8

When used at the end of the communication line: the End-Of-Line jumper pins must be shorted. See Fig. 4.8.

- Receiver display readings:

When powered-up, the display on the Receiver's circuit board will show the selected address for one minute. Thereafter it will display the Activator's address as soon as the Watch is activated by the Activator, followed by the animal's tag-number, read and transmitted by the Watch.

- Receiver address setting:

The Receiver address may be set between 150 and 181. Node address 150 is used by default.
The address can be altered by changing the jumper settings. These five jumpers count in a binary way, where the left-hand jumper sets the least significant bit and the right-hand jumper the most significant bit.
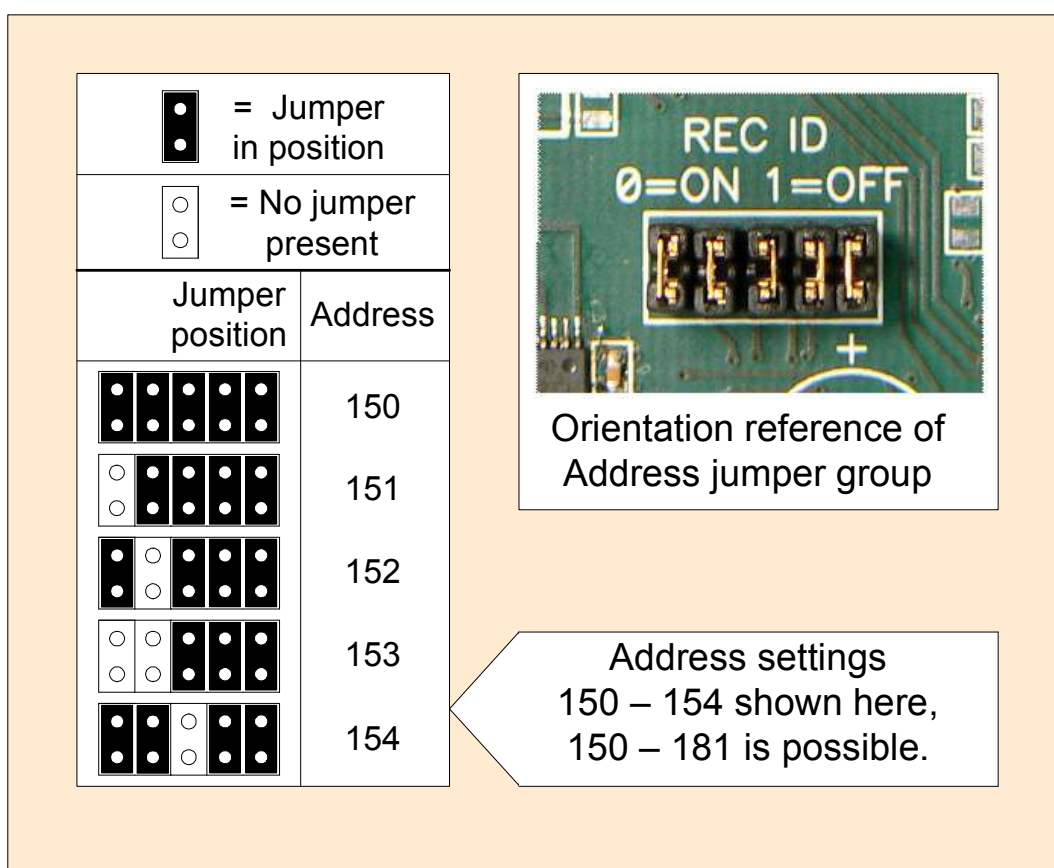Changing the address should be done with the power to the Receiver disconnected.

Fig. 4.9 Address setting examples for the Receiver.

- Number of Receivers:

In most cases one single Receiver can be used, but this depends on local circumstances and system dimensions.

4.3 The Watch

- The Watch should be worn on the same arm that is used to press the start buttons on the Sensomatic or the remote start button. This is to ensure that it is close enough to the Activator antenna to receive the Activator's signal. The Watch can be activated from up to 35 cm distance of the Sensomatic, depending on shape and position of the antenna and environmental circumstances.
- In case a remote start button is used, an external Activator-antenna must be used, positioned close to the remote button.
- The Watch has a rechargeable battery inside. When not in use it should always be connected to the Charger. When the battery is empty it will take about 24 hours to recharge it completely. Connected the Charger to a suitable 230VAC socket. A fully charged Watch is able to do at least 1750 identifications with a 10 second identification duration time, within 24 hours after the charge.
- The Watch is using a Tiris RF module for tag identification. This module is designed to support wireless synchronization. That means that the Watch-id system can be used in systems where other Fusion automation products (like for instances feeding stations) also use Tiris ID. The wireless synchronization capability even allows for simultaneous use of multiple Watches within one system.

Fig. 4.10 The Watch close to the Activator when pressing a button.

Fig. 4.11 Watch on charge.

4.4 The Transponder

The Transponder comes in three parts: two plastic tubes and the actual transponder in a blue plastic housing. The tubes are 12.5 cm and 10 cm long. The shorter and smaller diameter tube should be shoved inside the longer and larger diameter tube before fitting the whole onto the animal's hind leg. See Fig. 4.12; Fig. 4.13 and Fig. 4.14. The two plastic tubes must be fitted into each other, because if only one tube is used, it tends to kink and eventually break. In case the ambient temperature is below 25°C, warming the plastic tube of the transponder to ± 30°C (in hot water) will greatly ease fitting the tube onto the blue transponder part.

Fig. 4.12   *Fig. 4.13*   *Fig. 4.14*

The Transponder should be on the animal's hind leg. All transponders must be attached to the same leg, being the leg closest to the arm of the operator on which the Watch is carried. The Tiris identification typically requires distances of 10cm or less to identify a tag.

Fig. 4.15 Transponder & leg.

5. Configuration of the Watch ID System components

- **Sensomatic**
  The digital output "A" must be configured for active 24VAC operation. This must be done on the Sensomatic's circuit board. See fig. 4.2.

- **Activator**
  On the Activator's circuit board there is a dipswitch where an address must be set. This address should be the same as the number/address of the Sensomatic in which enclosure this Activator is positioned. See Fig. 4.2, 4.3 and 4.4. The normal Sensomatic address range runs from 1 - 99.

- **Watch**
  The Watch does not require any specific settings to be made.

- **Receiver**
  The Receiver address may be set between 150 and 181. Node address 150 is used as default. This can be done on the Receiver's circuit board. See fig. 4.5 & 4.6.

6. Crystal Configurator settings

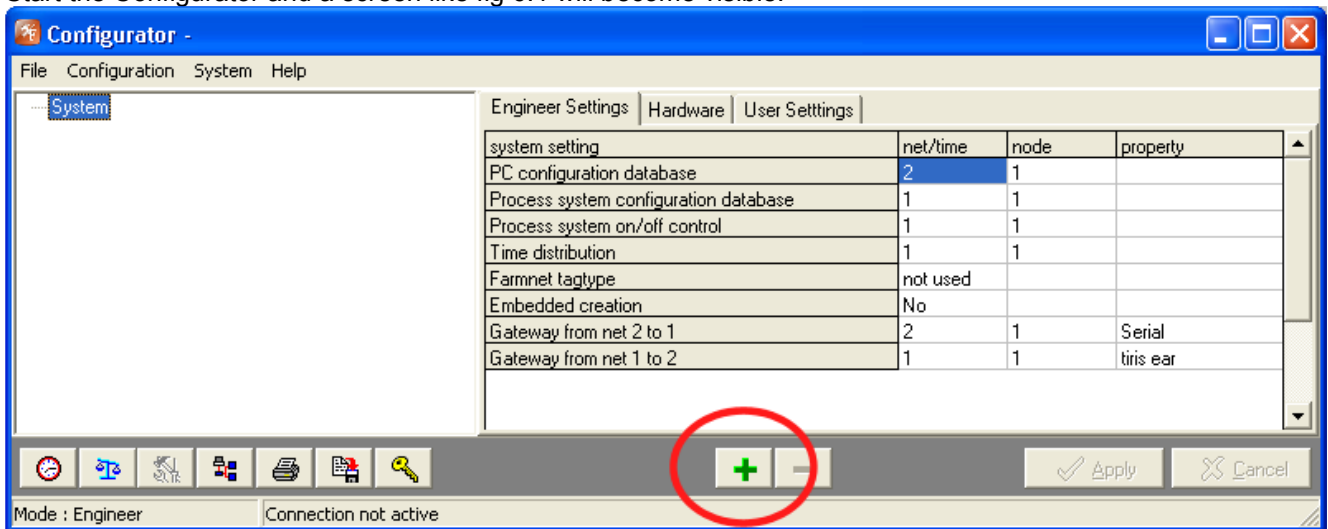Start the Configurator and a screen like fig 6.1 will become visible.

Fig. 6.1 the first screen of the Configurator.

To add a parlour working with the Watch-ID-system click ➕, which will open the following screen:
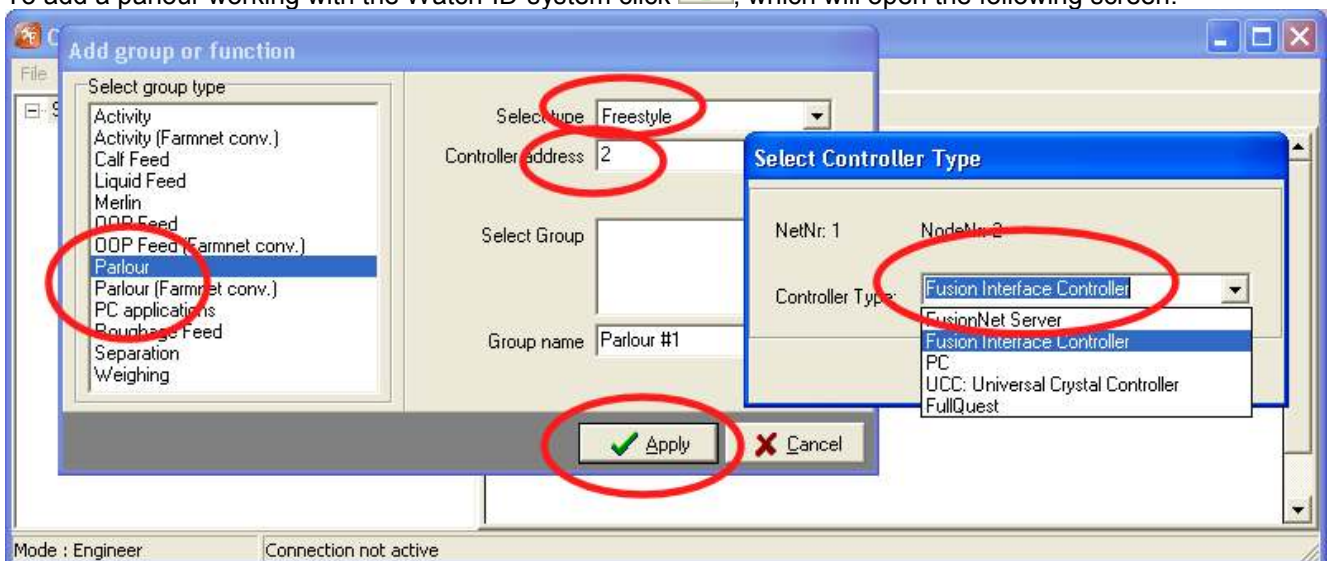

Fig. 6.2

Select **"Parlour"** as group-type and select **"Freestyle"** as parlour-type. Set the right controller address, click ✔ Apply, and select the controller type in the screen that appears, click ✔ Ok which opens Fig. 6.3.

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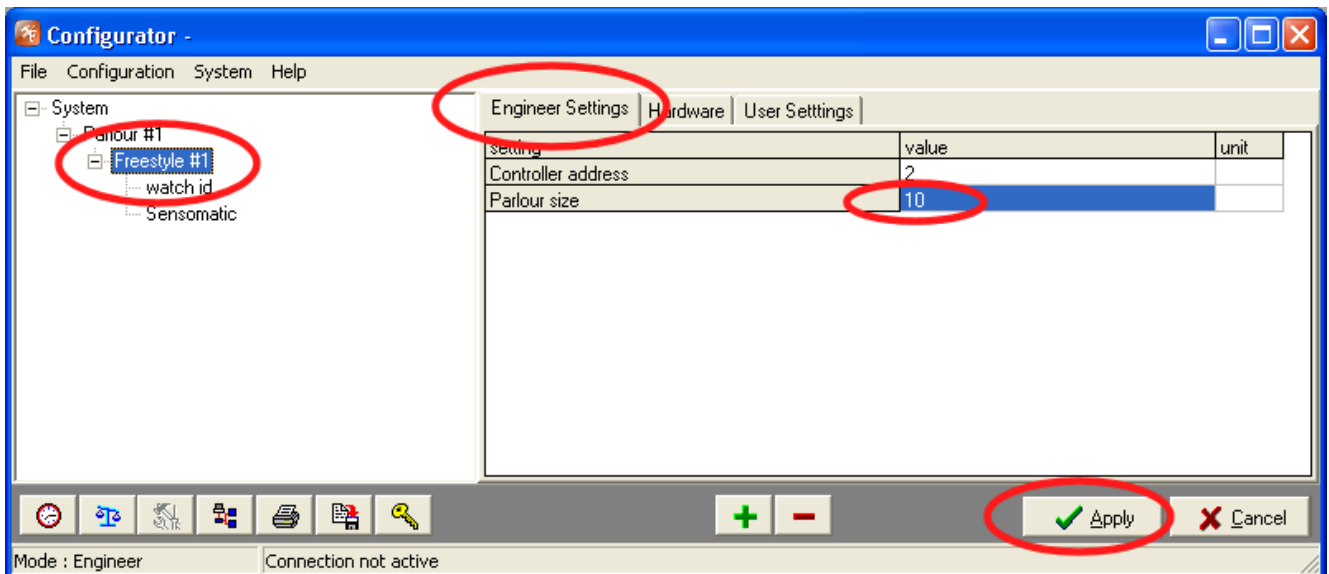Concept Technical Manual

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Fig. 6.3

Select **"Freestyle"**, go to the tab page 'Engineer settings' and set the parlour size. The default value is 12. In the example here "10" is filled in as parlour size. Click ✔ Apply. Select watch id on the left, and this opens Fig. 6.4.
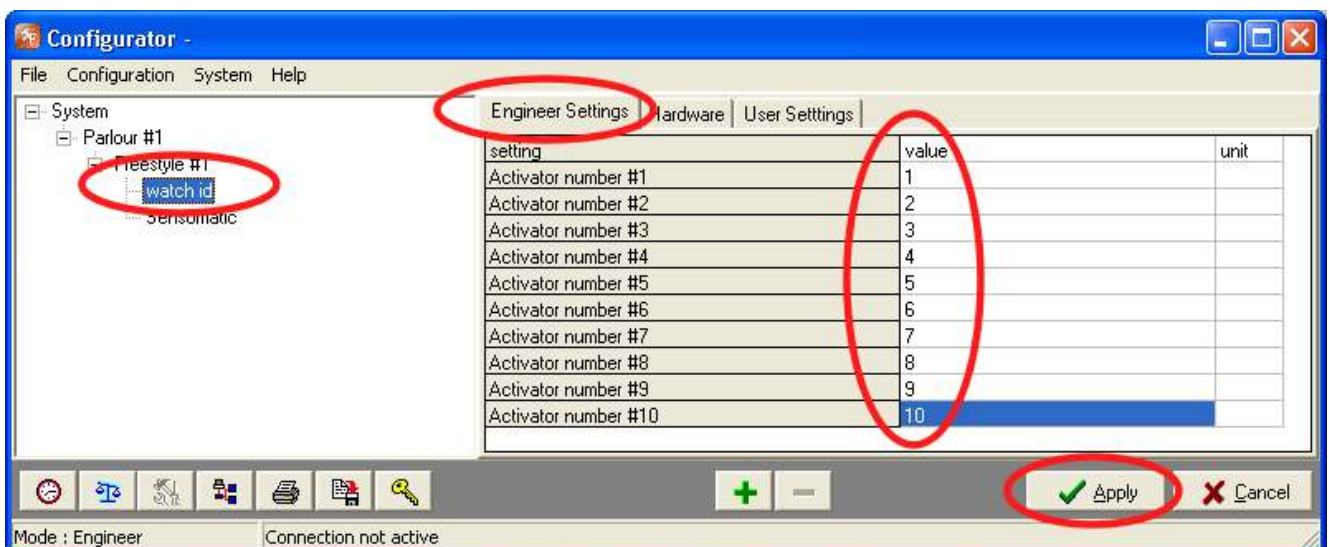

Fig. 6.4

Go to the tab page Engineer Settings' and at **"value"** fill in the addresses of each Activator. These are the addresses set on the dipswitch of each Activator, and should be the same as the addresses of the Sensomatics in which enclosure the Activators are situated.

💡 **TIP: Use the Shift – '' Copy downwards key'** ▼ **to enter the values counting up in one go.**

Click ✔ Apply and select the tab page 'Hardware' which opens Fig. 6.5.
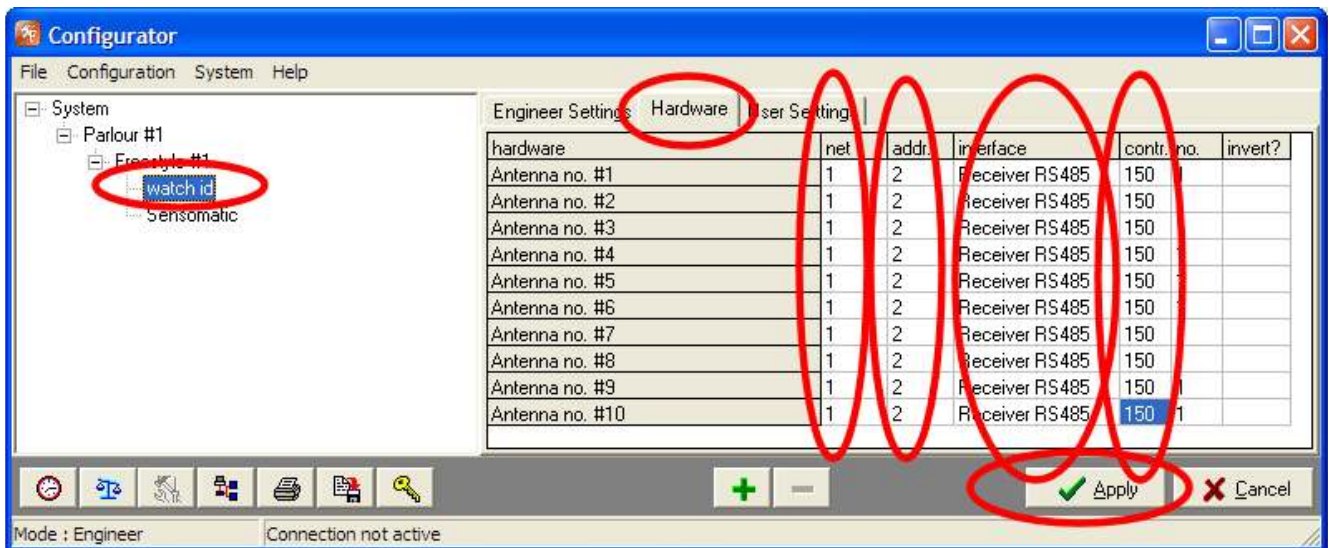
Fig. 6.5

Here the installed Receiver should be configured. Even though one Receiver is used, there are as much antennas listed as the Parlour size. Fill in the same values for every antenna.

In case there is more than one network in the system: select under **"addr."** the address of the interface the Receiver is wired to, and under **"net"**: the network this interface is wired to.

Under **"interface"** select **"Receiver RS485"**.

Under **"contr."** the address of the Receiver itself must be filled in. This is the address set on the circuit board of the Receiver. Possible addresses: 150-181. See also Fig. 3.6.

TIP: Use the '' Copy downwards key' **to enter the values in one column in one go.**

Click **Apply** and go to **Sensomatic**, select the tab "Hardware" which opens Fig. 6.6.
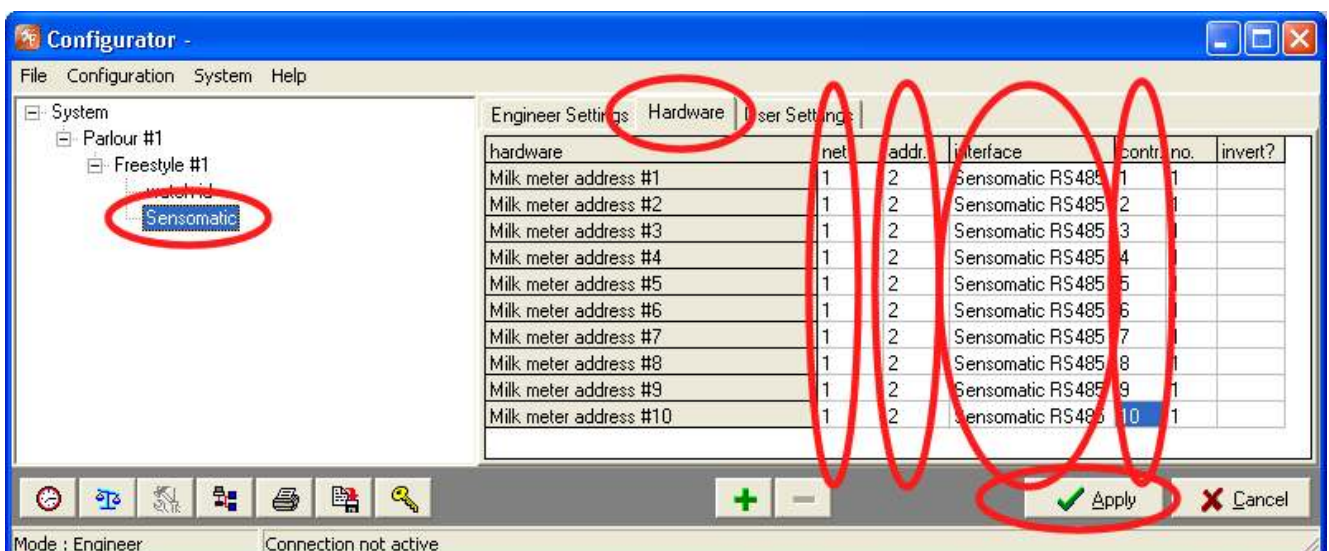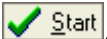

Fig. 6.6

Here the Sensomatics that have the Activators installed must be configured.

In case there is more than one network available: select under **"addr."** the correct address of the interface the Sensomatics are wired to, and under **"net"** the network this interface is wired to.

Under **"interface"** chose **"Sensomatic RS485"**.
Under **"contr."** the addresses of the Sensomatics must be filled in. This column should be filled in the same as was done at watch id, tab "Hardware settings", **"value"**. See fig. 6.4. Possible addresses are: 1-99.

Click ✔ Apply to save these settings.
The last step is to load the new configuration in the FusionNet: click **"System"**, followed by **"Connect"** and ✔ Start.
This may take a few minutes.

7. Sensomatic Control Center settings

1. From the post Setup select the option "post #" and click "Open record".

2. On the **"General Setting"** chart select **"Start before ID"**. This is because the identification process is initiated by starting the Sensomatic itself.

3. On the **"Flow control"** chart select **"Arm flow" as N/O"**.

4. Select "All stalls" on the left top corner.

5. Press "Send" and wait until the display will show the verification message. It may take 2-3 minutes (depends on the number of stalls).
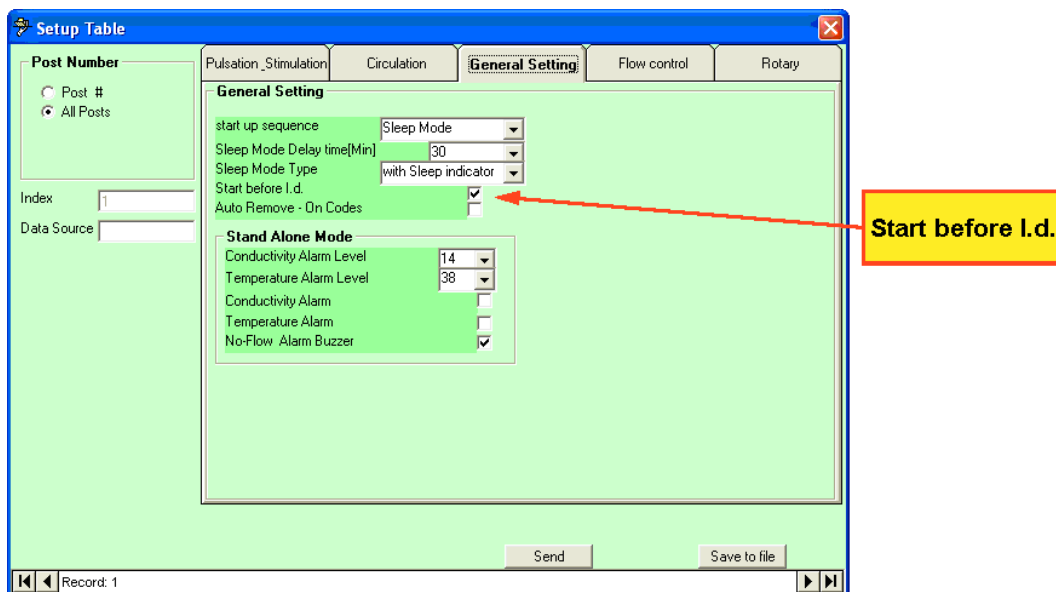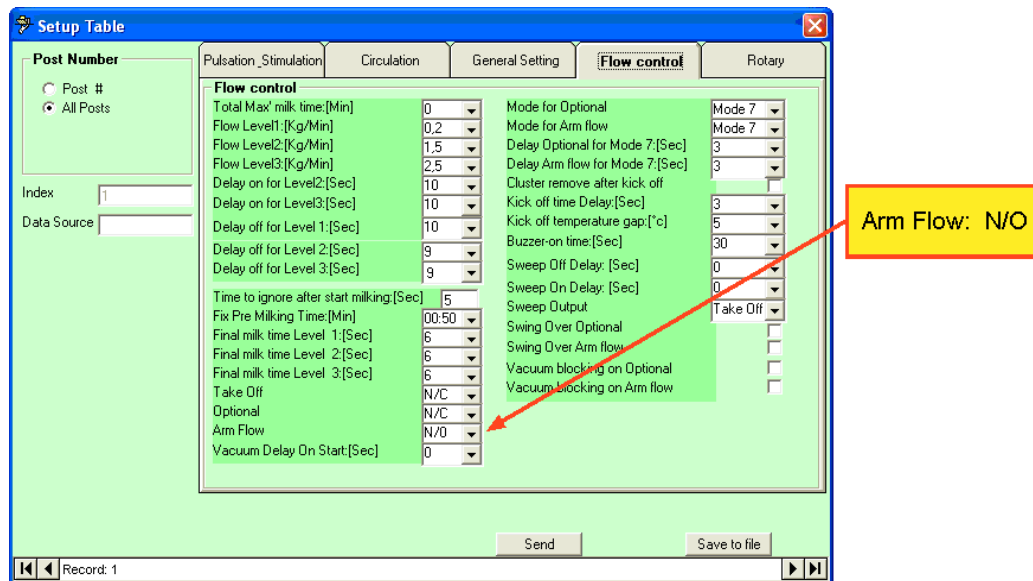

Fig. 7.1

Fig. 7.2

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