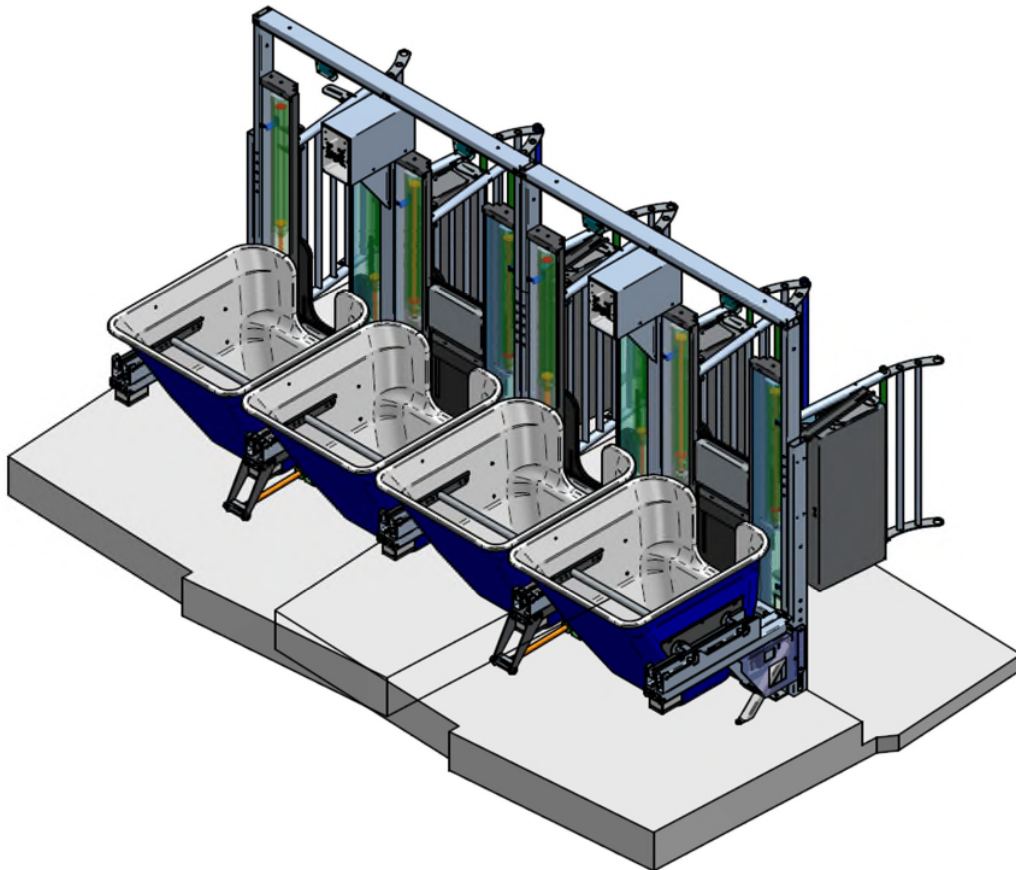


CRFI

System for Controlling and Recording Feed Intake
by BioControl AS



User manual

Version 4.5

August 2024

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SAFETY PRECAUTIONS!

Warning! All installations should be made by authorized or trained personnel only.

Warning! The power supplies and BlackBox must be mounted at maximum 2 meters above the ground in a dry area out of reach of the animals and any spray of fluids.

Warning! Moving air operated parts! Any service must only be performed when both the air pressure and power supply are disconnected.

IMPORTANT!

1. WHEN HANDLING THE MANGERS, TAKE CARE NOT TO GIVE «PUNCHES» TO THE LOAD CELLS. HARSH HANDLING CAN CAUSE THE LOAD CELLS TO DRIFT OUT OF CALIBRATION OR DESTROY THEM.

2. THE LOAD IN THE MANGERS IS REGISTERED CONTINUOUSLY. DO NOT TOUCH THE MANGERS WHEN THE SYSTEM IS OPERATING. AS A RESULT, INCORRECT DATA WILL BE DISPLAYED.

3. DO NOT OVERFILL THE MANGERS, IT WILL CAUSE THE FEED TO FALL THROUGH THE NECK OPENING.

4. IF CLEANING WITH JET WATER, DO NOT AIM THE JET DIRECTLY ON LOAD CELLS, ANTENNAS AND OTHER ELECTRONIC PARTS.



READ CAREFULLY BEFORE USE!

Before using the CRFI system you must carefully read the instructions provided in this manual and any other instructions delivered by the supplier with the machine. Proper maintenance, use and care for the system is important for error-free operation.

- If the system for some reason is not working, or if animals willingly do not use the machine, customer and user of the system is responsible for feeding the animals alternatively.
- Customer and user maintain the responsibility for monitoring the animals and the equipment.
- BioControl will not take responsibility for damages to the system or animals due to wrong use, or missing service or maintenance of the machine.
- Do not use the CRFI system for any other purpose than described in this user manual.
- Do not use a pressure washer to clean electrical components, air operated parts or load cells.

Proper calibration of the system is necessary to display correct results. If calibrated amount for some reason is wrong, the feeding will be wrong until a correct calibration of the system is performed.

It is the customers' and users' responsibility to mount an adequate lightning rod for the building to protect the CRFI system from lightning strikes. We also recommend obtaining an insurance against any damages caused from lightning strikes, as this is not covered by the BioControl warranty.

The warranty covers all errors to the system with the following exceptions:

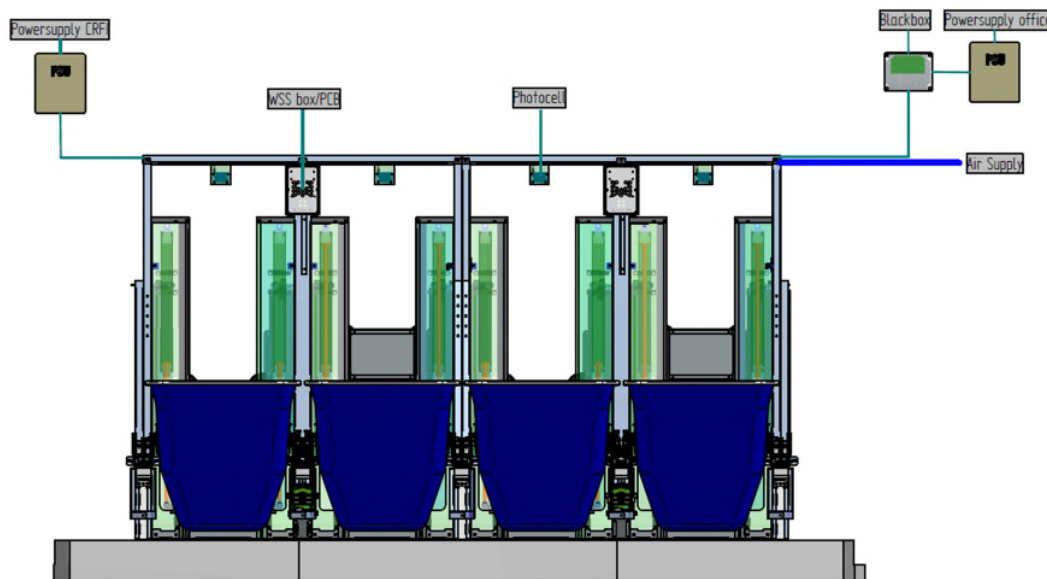
- Damages originated from electrical overvoltage or discharges including lightnings from thunder-storms.
- Damages originated from excessive impacts or loads imposed to the system
- Damages originated from un-described or unintended operation of the system.

1. General

1.1 General description

BioControl's CRFI system for Controlling and Recording Feed Intake gives individual cows access to specified mangers that are placed on weighing cells. Cows are identified by means of neck transponders or ear tags, and the purpose of the system is to record their feed intake.

The system consists of feed stations with a feed manger weighed by electronic load cells, a pneumatic closing device which controls the cow's access to the feed in the manger, an ID-transponder reader, optical sensor, an electronic control unit which controls two gates, and lids for the mangers.



1.2 Function

When the system is in recording mode and gates are set to AUTO, the default position of any gate giving access to the manger is closed. When a cow approaches the gate, the cow's ID-number will be registered by the antenna. The ID-number is transmitted to BlackBox and PC for verification. This will answer by sending data to the gate telling if the cow has access to feed.

If the cow has access, the gate will open and the weight in the manger will be registered. When the cow is eating, the weight in the manger will be registered simultaneously. If the cow eats the maximum accessible amount, the gate will close.

When the cow puts her head in the gate to eat, the gate controller will lose the contact to the cow's transponder. A photocell indicates if the cow is still in the gate or if it has retracted her head.

Every visit in any of the roughage feed stations are registered with information of among others: cow number, time of the visit, gate number, how much feed is consumed, and the duration of the visit.

1.3 Specifications

Supported tag standards	FDX, HDX, DeLaval B-transponders
Approvals/Tests	IEC 62368-1:2018 EN 301 489-01:V2.2.3 EN 301 489-03:V2.2.0 EN IEC 61000-6-2:2019 EN IEC 61000-6-4:2019 FCC CFR 47 Subpart 15B ETSI EN 300 330 V2.1.1 (2017-02) FCC Part 15.209 Industry Canada RSS-210; Issue 11 ISED Canada RSS-102, Issue 6 ISED Canada SPR-002, Issue 2
RFID Frequency band	134,2 kHz
Interface	USB
Power supply 1 (for blacbox)	See 1.1.3
Power supply 2 (for frames)	See 1.1.3
Operating temperature:	-10°C / +40°C
Long term storage temperature:	0°C / +40°C
IP Rating	IP65
Maximum force to close gates	2355 N at 6 bar
Resolution of recorded weight	1 gram
Maximum combined error of load cells	0.01 %
Maximum load per manger	250 kg
Air pressure	6 bar

Produced by:
BioControl AS
Gautestadveien 75
1894 Rakkestad
Norway

Modification Statement:

Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Compliance Statement:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Class B Radio Frequency Interference Statement :

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

Industry Canada Interference Statement

ICES-003: CAN ICES-3(B)/NMB-3(B)

This device complies with Industry Canada License-exempt RSS standard(s).

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

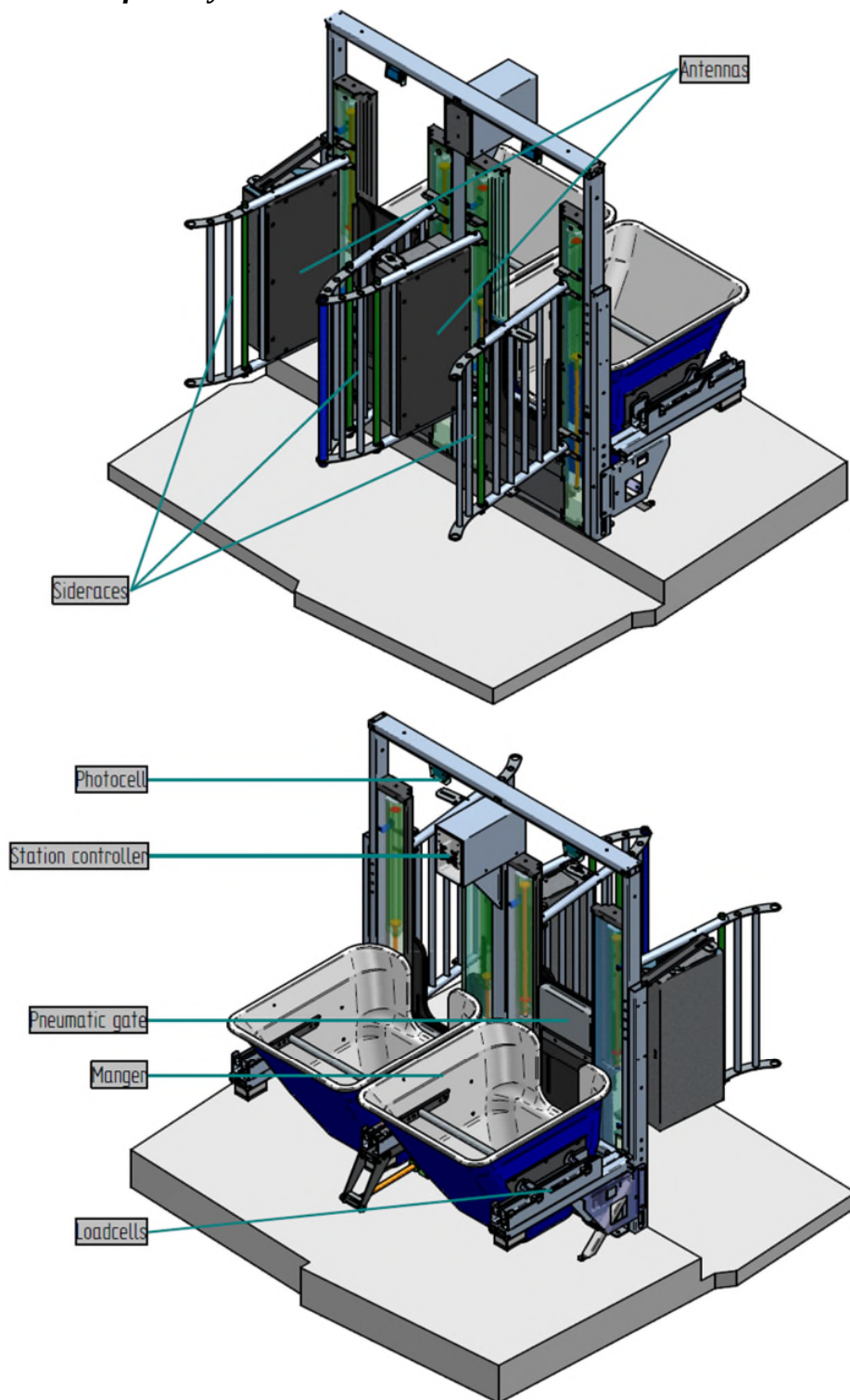
- (1) l'appareil ne doit pas produire de brouillage;
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed on permanent structures to provide a separation distance of at least 20 cm from any persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Pour se conformer aux limites d'exposition RF FCC/IC pour la population générale/exposition non contrôlée, la ou les antennes utilisées pour cet émetteur doivent être installées sur des structures permanentes pour fournir une distance de séparation d'au moins 20 cm de toute personne et ne doivent pas être co-situé ou fonctionnant en conjonction avec toute autre antenne ou émetteur.



1.3 Parts of the System



1.3.1 System modules and power supplies:

The system is comprised of the following modules.

1. Station Controller (WSS)

On each frame there is a station controller unit with display to display among others weight and animal ID.

Article Number of module: 107695

Article/Module name: CRFI WSS Module

The module consists of electronic board:

Art. 107092	PCB-WSS3000-1.07 Cpl 24V
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2. Load Cells with DLC PCB

The mangers are weighed by load cells. A box is installed on the arm with PCB for loadcell.

Article number for module: 107697

Article/Module name: CRFI DLC Module

The module consists of electronic board:

Art. 107632	PCB-DLC0.03
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3. Antenna

The antenna is an RFID reader for ISO 11784/11785 transponders.

Article number for module: 107698

Article/Module name: CRFI Antenna Module

The module consists of electronic board:

Art. 107630	PCB-StationController0.08 CRFI
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4. Blackbox Processor

A main processor is connected to all frames (WSS PCB) to control the system. Installed in the office next to PC. With USB cable for connection to PC.

Article number for module: 107699

Article/Module name: CRFI Blackbox Module

The module consists of electronic board:

Art. 106824	PCB-BlackBox0.03 cpl
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5. Fuse Box

A fuse box with 2A fuse is installed behind the WSS box. The box is between system power supply and WSS Box.

Article number for module: 107775



Article/Module name: CRFI Fuse box

6. Power supply for Blackbox and communication

A power supply is installed to power Blackbox and communication line. Installed next to BlackBox in the office

Article number for module: 107701

Article/Module name: CRFI Blackbox Power Supply

Specifications:

100-240VAC

50/60Hz

0,7A

7. Power supply for frames in barn

One or more power supplies are installed to power the frames (WSS PCB) in the barn.

Article number for module: 107700

Article/Module name: CRFI System Power Supply

Specifications:

100-240VAC

50/60 Hz

8A

2. Installation

All installations must be performed by trained personnel and according to manufacturer specifications.

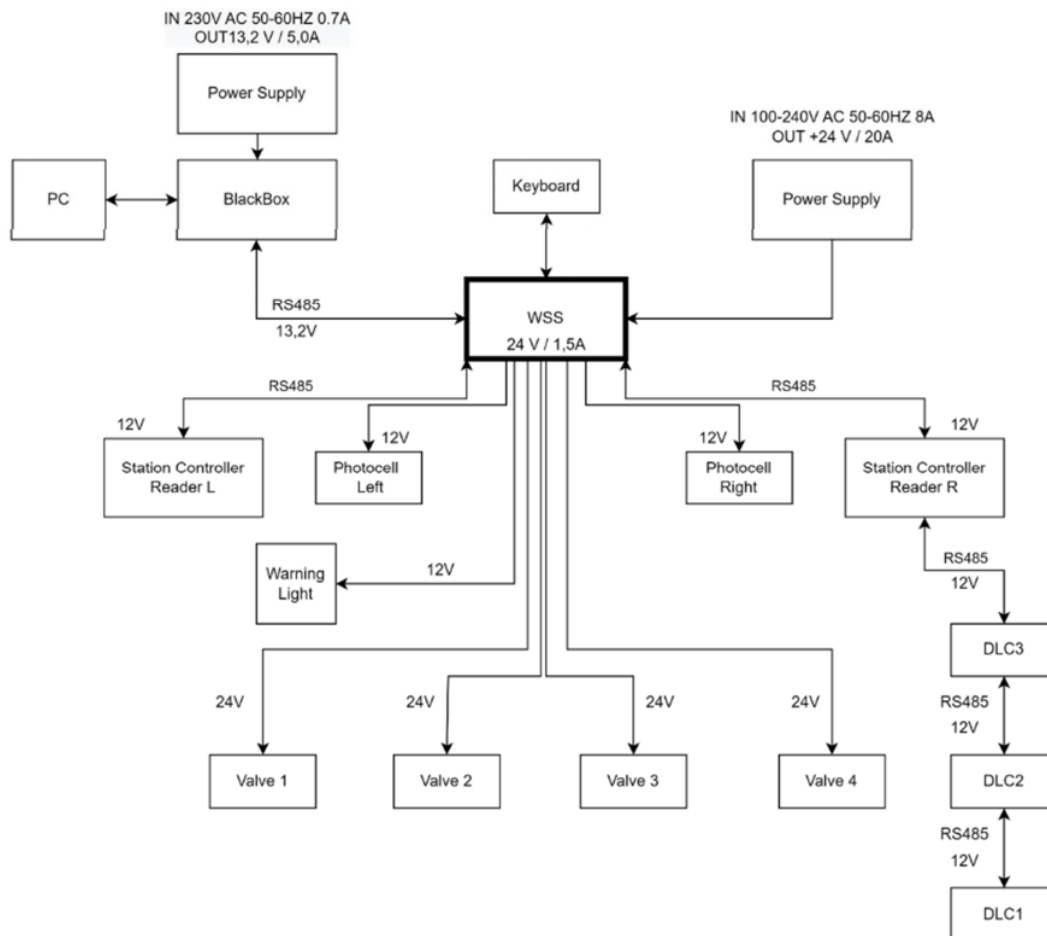
2.1 Mechanics

All frames must be securely bolted to the surface.

2.1 Cabling

All units must be connected according to specifications.

Connection Schematics



2.1 Power

The input voltage for the system is 100-240 V AC.

The customer is responsible for a stable voltage supply and protection against overvoltage.

The system power supply must be mounted at least 1,5 meters above the ground in a dry area out of reach of the animals and any spray of fluids.

Blackbox and powersupply for Blackbox must be mounted securely on the wall in the office near the PC.

2.2 Compressor

The system should be supplied with dry (filtrated) air at pressure of 6 bars.

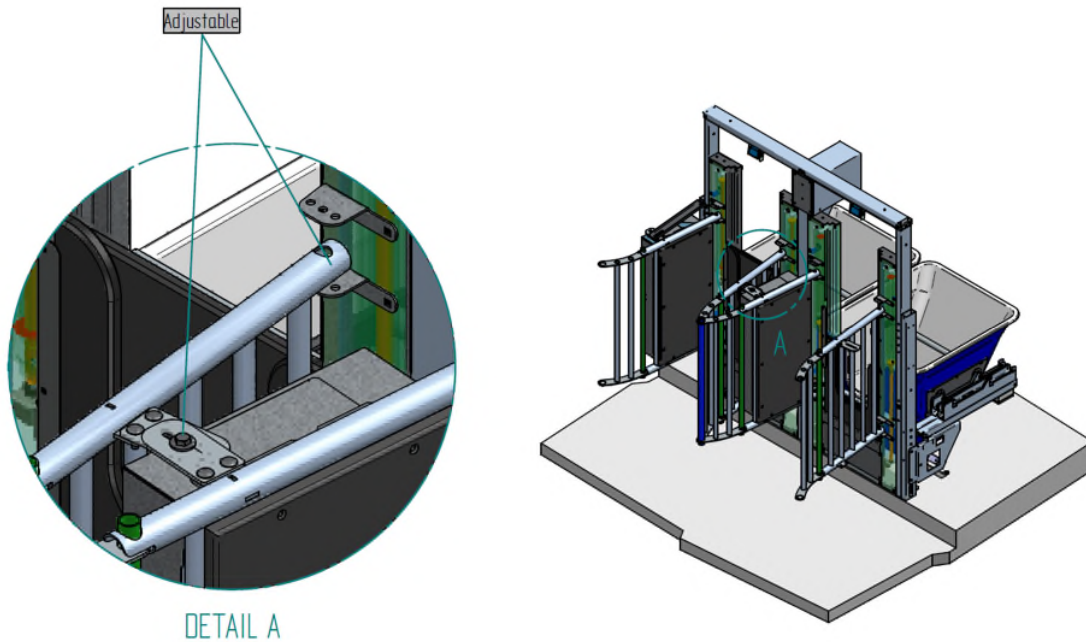
A regular change of oil and filters in the compressor should be performed according to the manufacturer recommendations.

3. Preparation and Maintenance of System

3.1 Preparation of System

3.1.2 Adjusting Sidewalls

The sidewalls on the CRFI system are adjustable. The sidewalls should be adjusted so that only one cow fits in the side races.



For set-up of feed rations and mangers, please see separate user manual for BioControl CRFI PC Program.

3.2 Maintenance of the System

3.2.1 Maintenance Routines

Daily Maintenance

Once per day, the mangers should be emptied, feed remains should be removed from the supports, and the display should be controlled to show 0.0 Kg. Wet feed will normally give some remains that can cause the tara weight to show a small value. A big deviation in weight should lead to a calibration. The floor under the mangers should be cleaned.

Weekly Maintenance

Once a week all parts of the frame should be cleaned with compressed air. Mangers can be removed from frame if necessary. Check especially cleanliness of the positions around the manger supports, load cells, gate, photocell and under mangers. All mangers should be controlled to check calibration. Place test load in manger and assure that weight increases correctly. If deviations are found, calibrate mangers.

All mangers should be calibrated minimum every 6 months.



OBS! Do not clean with jet water on load cells, antennas, pneumatics or any electronic parts.

3.2.2 Tara and Calibration of the System

The scales should be controlled and calibrated regularly. Start by controlling the weight every day, then every week, and then make longer intervals if no deviation is found. To calibrate, use the following procedure by using the Station Controller:

1. Empty the manger completely, and remove remains from the manger supports and under and around the manger.
2. Press «UP» on the Station Controller to close the gate for the manger you want to calibrate
3. Keep holding «UP» and then press the «TARA» key without releasing «UP». After a few seconds, the display will show 0.0 Kg. If the result is not satisfactory, redo the tare.
4. Put the calibration load in the centre of the manger. 20 kg is the default calibration load value, if required another calibration value it may be programmed in the PC Software. Avoid using a value less than 20 kg.
5. Press and keep holding «UP» and then Press the «CAL» key without releasing «UP». After a few seconds the display will show 20.0 Kg. If the result is not satisfactory, redo the calibration.
6. Take out the load and the display shall return to 0.0 Kg. If it does not return to zero, the steps 3 to 5 can be repeated.

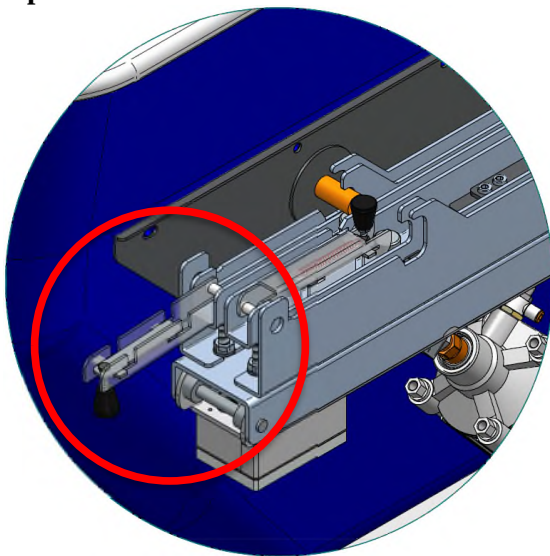
3.2.3 Removing Mangers

To perform a complete cleaning of the system the mangers can be removed. The mangers should also be removed when they are not in use to remove pressure on the load cells.

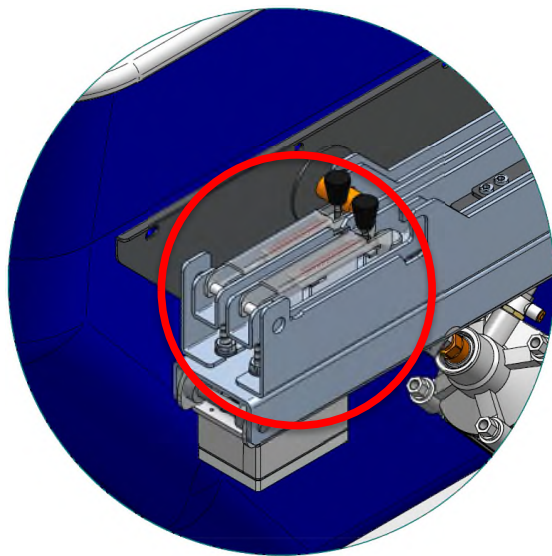
To remove the mangers, unlock them from the arm, and lift the manger up and towards you.

Lock for mangers

Open Position:



Closed Position:



OBS! Two people should work together to remove the mangers from the arms. Be careful to not give any punches or excessive loads to the load cells. Wear gloves to avoid cuts on hands.

3.3 Service of the System



Service should only be performed by trained service personnel!

3.3.1 Fuses

There are two types of fuses in the CRFI System. See information below about type of fuses for replacement.

Fuse used in Fuse box: T2A H250V

Fuse used in Blackbox: T5A H250V

4. Operation

4.1 Station controller

The electronic control unit that controls two gates has a display and 16 keys. The display shows the weight in the manger on both sides of the control unit. The unit can be turned on and off by the «ON» and «OFF» keys. When the unit is off, the gate will always be in closed position. The front of the roughage station controller is equipped with a plastic foil where the keyboard is integrated. The station controller is water and dust proof as long as the protection foil is undamaged. The keyboard has to be operated using fingers only, using sharp objects like screwdrivers, ballpoint pens and fingernails might break the protection foil.

The keyboard consists of 16 keys: **ON** and **OFF** for the power, and two of each of the following keys, one for each gate (left and right):

Tare Tare scale
Cal Calibrate scale
Up Close gate
Auto Feeding mode
Down Open gate
LID Open/Close LID
TILT TILT Manger

Next to each of the keys Up, Auto and Down there is a light emitting diode (LED) indicating the chosen state of the gate.

When the **Auto** feeding mode is selected with the station controller, the gate will first close. Then the gate will open and close due to commands from the BlackBox.

When the **Down** button is pressed on the station controller animals will be given free access to the feed in the manger. The transponder will be transmitted to the BlackBox and if it is registered in the database, logs are recorded depending on the version of the software.

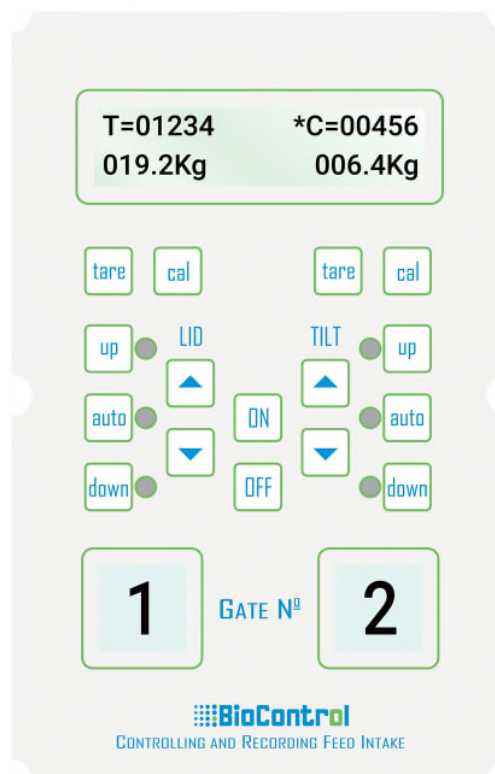
NOTE: Please keep in mind that logs created in DOWN mode may not reflect correct feed intakes. DOWN mode should be used when animals are learning the system or in emergency cases.

Holding **LID** arrow UP for minimum 3 seconds will lift the lids above mangers, holding **LID** arrow DOWN for minimum 3 seconds will lower the lids.

Holding **TILT** arrow DOWN for minimum 3 seconds will start the manger tilt process, during which **LID** will be lifted and manger will be tilted. Holding **TILT** arrow UP will bring back mangers to their original position, but **LID** will remain lifted.

By pressing **OFF**, the power supply of the roughage station controller is shut off. If the key **ON** is pressed, the power is switched on. The position that the gates had when the power was switched off will be restored (up, auto or down).

The display of the front of the station controller has two lines, each of them are able to show 16 characters. During normal use, this picture can for example be shown:



T=01234	*C=00456
019.2Kg	006.4Kg

On the left side, the transponder number 1234 is recently detected. The number is on its way to the BlackBox. The station controller is waiting to get a cow number and a feed ration for the transponder in return. This may take a couple of seconds. The manger contains 19.2 kg of feed.

On the right side cow number 456 is displayed, which returned from the BlackBox. The asterisk shows that the cow is breaking the beam of the photocell. The load of the feed in the manger is 6.4 kg.

4.2 Filling or Emptying the Mangers

Before the manger is filled or emptied, close the gate by pressing «UP» on the Station Controller.



OBS! Move away from the mangers when any air operated parts are moving. Moving parts can result in serious injury.

4.3 Transponder Reader

The equipped transponder reader can read full and half duplex ISO transponders or DeLaval B-transponders depending on system's configuration.

Tuning of the antenna can be performed via the station controller of the frame:

- 1) Click both gates to UP position
- 2) Hold down right side CAL and press right side TARE repeatedly until you see tuning menu
- 3) Click TARA on left side to start tuning
- 4) Antenna will be tuning

All animals can only wear one RFID tag.

4.4 Access Gates and Photocell

The access gates to the mangers are operated by compressed air and opening or closing gives the cow access to the manger.



Closed Access Gate



Open Access Gate

The default position of the access gates in AUTO mode is closed. When the cow approaches the manger and moves past the Transponder Reader, the system will check whether the cow should be given access to the manger. If the cow should have access to the manger, the access gate will open to allow the cow to eat. When the cow has finished eating its ration, the access gate will pull up and close, and therefore force the cow to leave the manger and no longer have access to the feed in the manger.

Opening and closing of the access gates can be manually controlled by the Station Controller.

4.5 Blackbox and PC Program

Please see separate user manual for PC Program.