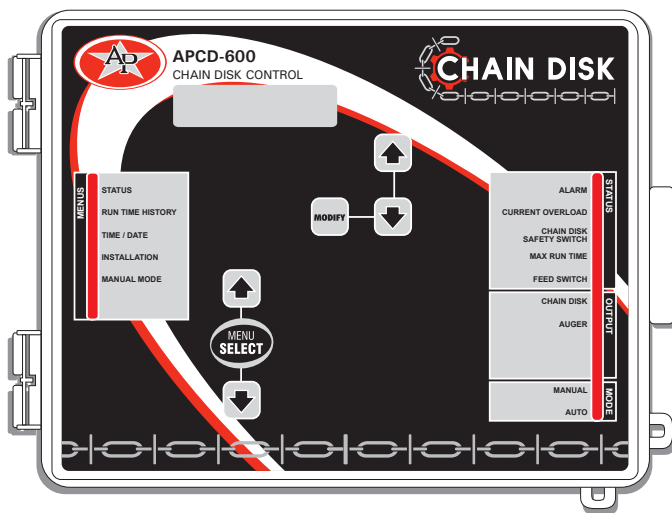


# APCD-600

## Chain Disk Controller

### User's manual



Manufacturer  
GSI ELECTRONICS  
5200, Armand-Frappier  
St-Hubert (Qc)  
Canada J3Z 1G5

**WARNINGS**

The warranty can be void if this product is used in a manner not specified by the manufacturer.

Every effort has been made to ensure that this manual is complete, accurate and up-to-date. The information contained in it is however subject to change without notice due to further developments.

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## 1. INTRODUCTION

### 1.1. Precautions



**WARNING:** Read and save these instructions!

Safety may be jeopardized if the equipment is used in a manner not specified by the manufacturer. Carefully read and keep the following instructions for future reference.

Although fuses at the input and outputs of the controller protect its circuits in case of an overload or over-voltage, we recommend installing an additional protection device on the controller's supply circuit.

The room temperature where the controller is located must always remain between 32°F and 104°F (0°C to 40°C). Indoor use only!

To avoid exposing the controller to harmful gases or excessive humidity, it is preferable to install it in a corridor.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not spray water on the controller! In order to clean the control, wipe it with a damp cloth.



**Before servicing or cleaning unit, switch power off at service panel and lock the switch disconnecting means to prevent power from being switched accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.**

### 1.2. Symbols of the Manual



**Warning.** Read the following text carefully; it contains important information which, if ignored, may cause the controller to operate improperly.



**High Voltage.** Hazard of electrical shock. Read the message and follow the instructions carefully.



**Pay attention.** The following text contains very useful information.



**Double insulation.**



**Both direct and alternating current (AC/DC).**



**Direct current (DC).**



**Alternating current (AC).**

**For Customer Use:** Enter below the serial number located on the side of the alarm system and keep this information for future reference.

Model: APCD-600

Serial number: \_\_\_\_\_

Date installed: \_\_\_\_\_

## 2. USER INTERFACE

### 2.1. Location of the Controls

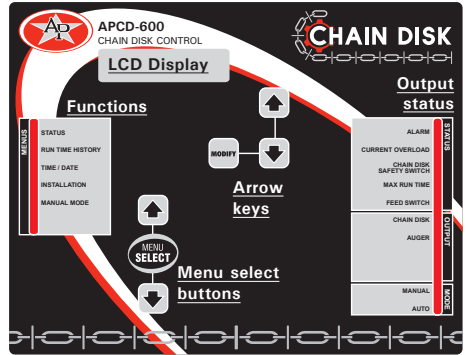
**LCD Display** — The LCD display on the left gives the current readings and parameters to be adjusted when you select a function. It automatically displays the STATUS menu after 4 minutes of inactivity.

**Arrow keys** — The arrow keys next to the LCD display are used to scroll down the parameters on screen. They are also used to change the value of the parameters inside editing pop-up menus.

**Output Status LEDs** — The table below gives the meaning of each output status pilot light :

**Function LED** — This pilot light shows what function is selected on the main menu.

**Menu Select Buttons** — These buttons are used to select a function from the main menu.



LED	MEANING
Alarm	Turns on when an alarm is detected. The Chain Disk System stops operating until the alarm is acknowledged.
Current Overload	Turns on when the amperage draw of the Chain Disk has exceeded the <i>Max Current</i> limit for the <i>Overload Delay</i> .  Fix the problem then acknowledge the alarm to restart the system.
Chain Disk safety switch	Turns on when the drive unit of the Chain Disk has reached its safety switch.
Max run time	Turns on when the Chain Disk run time exceeds the Max Run Time parameter value.
Feed switch	Turns on when the proximity sensor detects feed. Flashes during the <i>Feed Bypass Delay</i> .
Chain Disk	Turns on when the Chain Disk System is running.
Auger output	Turns on when the bin auger is running; Flashes during the <i>Auger Delay</i> .
Manual mode	Turns on when an output is manually controlled.
Automatic mode	Turns on when the automatic control mode is active.

## 2.2. Adjusting a Parameter

Use the arrow keys to select the parameter that needs to be adjusted. When it is selected, press MODIFY to display the pop-up window for adjusting the parameter. Now, use the arrow keys to modify the parameter's value and then press the MODIFY button again to validate the change.

## 3. MOUNTING INSTRUCTIONS

### 3.1. Mounting the Controller on the Wall

Remove the four screws in the front cover and lift the cover. Remove the black caps located on the three mounting holes. Mount the enclosure to the wall using three screws. Be sure the electrical knockouts are at the bottom of the enclosure in order to prevent water from entering the controller. Insert the screws into the mounting holes and tighten. Fasten the black caps onto the mounting holes.

### 3.2. Connections

To connect the controller, refer to the wiring diagram enclosed with this user's manual. Use the electrical knockouts provided at the bottom of the enclosure. Do not make additional holes in the enclosure, particularly on the side of the enclosure when using a computer communications module.



***All wiring must be done by an authorized electrician and must comply with applicable codes, laws and regulations. Be sure power is off before doing any wiring to avoid electrical shocks and equipment damage.***

- Do not install rigid conduit into electrical knockouts. Only nylon cable glands are permitted for cable or wire fastening.
- The controller has no power-on switch. An external switch or circuit breaker shall be included in the building installation to interrupt power to L and N electric power lines. It shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.
- The main supply circuit breaker for Chain Disk motor (L1/L2 POWER IN) shall be no larger than 20 A.
- Wire gage used for mains supply (L1/L2 POWER IN) and Chain Disk motor shall be at least 12 AWG.
- Separate circuit breaker shall be used for auger motor.
- The mains supply breaker for auger motor shall be 15 A.
- Wire gage used for Flex-Flo auger motor shall be at least 14 AWG.



***Safety may be jeopardized if the equipment is used in a manner not specified by the manufacturer.***

## 4. CONTROLLER'S OPERATION

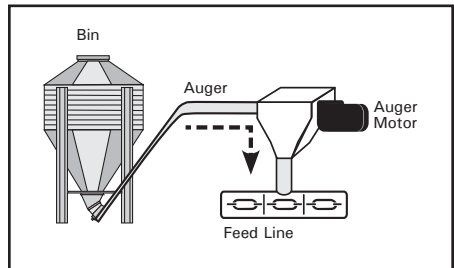
### 4.1. Controller's Description

The APCD-600 is an electronic device used to control a Chain Disk System in livestock buildings. The APCD-600 takes in charge the feed intake from the bin into the feed line and controls the feed distribution process using a proximity sensor.

### 4.2. Auger's Operation


At the start-up of each feeding cycle, right after the *Auger Delay* has elapsed, the bin auger starts bringing feed into the Chain Disk Systems and stops when the Chain Disk System is full. There are two ways the controller can detect that a Chain Disk System is full:

1. The proximity sensor detects feed for 5 seconds without interruption;
2. The drive unit has been running for the *Max Run Time* parameter value (only if no proximity sensor is used).



#### Chain Disk Overload Protection:

The controller monitors the amperage draw of the Chain Disk drive units to prevent overloading the system. If the amperage exceeds the limit (*Max Current Consumption*), the controller will temporarily shut down the bin auger while the Chain Disk System keeps running in order to discharge the feed. As the feed load decreases the amperage draw also decreases; the bin auger restarts when the current consumption gets lower than the *Max Current Consumption - Window Size*.

 Refer to section 5.4 to set bin auger parameters.

## 4.3. Operation of the Chain Disk System

The Chain Disk system can work two different ways, depending on the location of the proximity sensor (proximity sensor in drop tube or in the Chain Disk System after the last drop tube).

### • Operating mode 1: Proximity sensor in the last drop

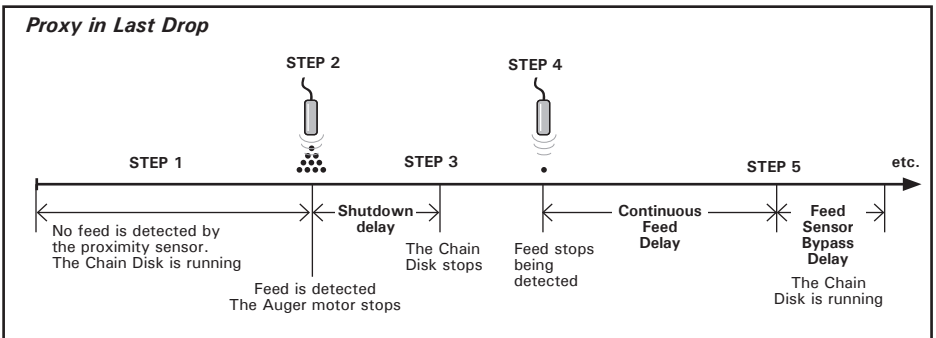
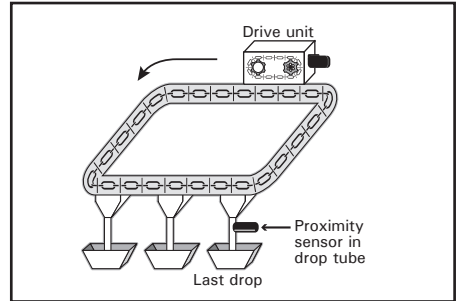
**Step 1.** The proximity sensor does not detect the presence of feed: the Chain Disk motor runs continuously.

**Step 2.** The proximity sensor detects the presence of feed for 5 consecutive seconds: the auger motor stops and the controller launches the *Shutdown Delay*.

**Step 3.** The *Shutdown Delay* has elapsed: the Chain Disk motor stops and the controller waits for the animals to eat the feed.

**Step 4.** The proximity sensor stops detecting feed: the controller launches the "*Continuous Feed Delay*".

**Step 5.** The *Continuous Feed Delay* has elapsed: the Chain Disk motor runs during the *Feed Sensor Bypass Delay*, go back to step 1.



## • Operating mode 2 — Proximity sensor on the Chain Disk System Line after the Last Drop

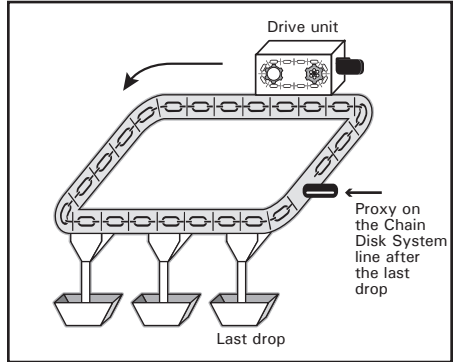
**Step 1.** The proximity sensor does not detect the presence of feed: the Chain Disk motor runs continuously.

**Step 2.** The proximity sensor detects the presence of feed for 5 consecutive seconds: the auger motor stops and the controller launches the *Shutdown Delay*.

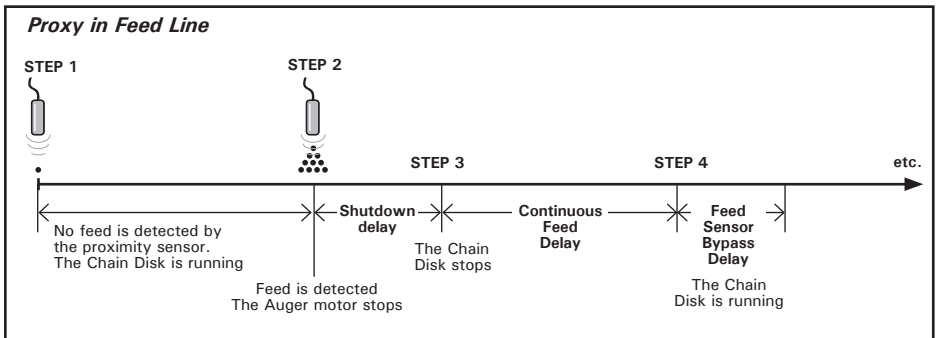
**Step 3.** The Shutdown Delay has elapsed: the Chain Disk motor stops and the Continuous Feed Delay is launched (the *Continuous Feed Delay* is the amount of time required for the animals to eat the feed).

**Step 4.** The *Continuous Feed Delay* has elapsed: the Chain Disk motor runs during the *Feed Bypass Delay*.

- **Step 4a)** If feed is detected at the end of the *Feed Sensor Bypass Delay*, go back to step 3.
- **Step 4b)** If no feed is detected by the proximity sensor at the end of the *Feed Sensor Bypass Delay*, go back to step 1.



**! The feed distribution process STOPS when an alarm is active!**



## 5. PARAMETER SETTINGS

### 5.1. Controller Status

This menu indicates the controller's status. The following pieces of information can be displayed:

- The Chain Disk System is in manual mode;
- A countdown before the Chain Disk System stops (shut down delay);
- The current that is consumed by the motor of the Chain Disk System.

The alarm acknowledgment must also be performed from this menu (refer to section 5.6 for further information about the alarms). The controller automatically returns to this menu after 4 minutes of inactivity.

1. Use the menu select buttons to select the STATUS main menu.
2. Use the arrow keys to scroll the display.

### 5.2. Run Time History

The APCD-600 keeps a daily history of the Chain Disk System run times. The run times are kept in memory 6 days.

1. Use the menu select buttons to select the RUN TIME HISTORY menu. This menu allows you to see the Current Cycle, mode, and run time if the chain disk system is feeding,

Current Cycle (MANUAL) 0:35
--------------------------------

or the Last Cycle, mode, and last run time if the chain disk system is not currently feeding.

Last Cycle (AUTO) 0:35
---------------------------

2. Use the down-arrow key to scroll the display. The Chain Disk System run times of the past 6 days are displayed.

Run Time History
Today 1:20

### 5.3. Time & Date

Use the menu select buttons to select the TIME / DATE menu. The actual time and date are displayed.

12:00:00PM
01/01/200X

Press MODIFY. The hours flash on the display. Use the arrow keys to set the hours to the proper value.

Press MODIFY once again. The minutes flash on the display. Use the arrow keys to set the minutes to the proper value.

Press MODIFY once again. The seconds flash on the display. Use the arrow keys to set the seconds to the proper value.

Press MODIFY. The day flashes on the display. Use the arrow keys to set the day to the proper value.


Press MODIFY once again. The month flashes on the display. Use the arrow keys to set the month to the proper value.

Press MODIFY once again. The year flashes on the display. Use the arrow keys to set the year to the proper value.


#### 5.3.1. Adjusting Improper System Time

When the notification message that follows is displayed onscreen you must set the correct time and date.

Improper System Time  
Set Time & Date

 **CAUTION:** *To ensure accurate feed data, history logs, and other important system information, you must set the correct time and date whenever prompted.*

To adjust the time and date when the “Improper System Time” notification appears, follow the steps outlined in section “5.3. Time & Date”. Once the time and date has been adjusted, the notification message disappears, the system clock is set, and accurate data is ensured.

 **Note:** *The notification message repeatedly disappears and reappears until the time and date are set.*

## 5.4. Installation Setup

The following section describes how to customize the controller for your particular application. Normally, this setup needs to be done only once.

**Enter Password** — Use the menu select buttons to select the INSTALLATION main menu. *\*A password may be required to access this menu. By default, the password is set to 6-1-0.*

Enter password  
06 01 00

- The following parameters are presented below in the order they appear on the display. To modify a parameter, press MODIFY button then use the arrow keys to change it. When you are finished adjusting a parameter, press MODIFY button once again to validate the new value and return to the display mode. Press the down-arrow key to move to the next parameter.

**Proxy Switch Status** — Choose the normal status of the proximity switch relay: Normally Open (NO) or Normally Closed (NC).

Proxy Switch  
Normally Open

**Proxy Switch in Drop Tube ?** — This parameter tells where the proximity sensor is located. Select “Yes” if it is mounted in the last drop tube to be filled in the Chain Disk System or select “No” if it is located on the Chain Disk System line after the last drop and before the fill hopper.


Proxy switch in  
drop tube? No

**Continuous Feeding Delay** — Depending on the location of the proximity sensor, this delay takes a different meaning:

Cont. Feeding  
Delay 0:30

1. If the proximity sensor is mounted in the last drop tube to be filled in the Chain Disk System, the “Continuous Feeding Delay” tells when to start a feed cycle from the moment the drop tube is empty (no feed is detected in the last drop).

2. If the proximity sensor is mounted on the Chain Disk System line after the last drop and before the fill hopper, the “Continuous Feeding Delay” is an estimation of time it will take for the animals to eat the feed.

 **The main difference between both possibilities is that in the first case, the system is considered as being empty when the proximity sensor stops detecting feed; in the second case, it is considered empty after a user-defined delay (after Continuous Feeding Delay).**

**Feed Sensor Bypass** — The Chain Disk System runs during this delay after the Continuous Delay has elapsed. This delay ranges from 0 to 30 minutes.

# APCD-600

Feed Sensor  
Bypass 0:30m:s

Over Current  
Delay 4:00m:s

**Maximum Current** — Select the maximum allowable current that can be consumed by the Chain Disk motor. Adjustable from 1 to 14 Amp. *\*See recommended settings on Table 1.*

Max Current  
6.0Amp

**Window Size** — This is the current difference, below the Max. Current, at which the auger motor restarts. The auger motor restarts at: Max Current - Window Size. It can be adjusted from 0.5 to 3.0 Amp. *\*See recommended settings on Table 1.*

Window Size  
1.0AMP

**Over Current Delay** — An alarm is set off when the Chain Disk motor's current consumption exceeds the Maximum Current limit for this delay. The Over Current Delay can be adjusted from 30 seconds to 15 minutes.

**Critical Amperage Draw & Delay** — Specify the critical amperage level and the maximum amount of time this level can be maintained before the system stops. The Critical amperage draw ranges from 6 to 15Amp and the delay ranges from 0 to 2 minutes. To prevent damage to the motor and to the electronic components of the controller, we recommend limiting the delay to 4 seconds or less. *\*See recommended settings on Table 1.*

Cri. Amp. 8.0Amp  
Delay 0:10m:s

**Auger's Delay** — The auger starts running when this delay has elapsed, right after the start up of the Chain Disk System (once the Continuous Delay has elapsed). Adjustable from 0 to 60 minutes.

Auger Delay  
0:15m:s

Chain Disk Motor		Recommended Settings				
Type	Voltage	Recommended number of loops through current sensor	Window size	Max Current		Critical Amp
				New blue gearbox (1.5HP or 2HP motors)	Old grey gearbox (2HP motors only)	
Single phase, 60 Hz	208 - 230	1	1.0	6.0	9.0	2 amps over Max Current setting
Single phase, 50 Hz	190 - 230	1	1.0	6.0	9.0	
Three Phase, 60Hz	208 - 230	2	1.5	8.0	9.0	
	460	3	1.0	6.0	7.0	
Three Phase, 50Hz	190	2	1.5	9.0	10.0	
	203	2	1.5	8.0	10.0	
	380	3	1.0	7.0	9.0	

Table 1: Recommended Settings as a Function of Gearbox Type

**Max Run Time** — The Max. Run Time is the maximum allowable running time of the Chain Disk System. Whenever the Chain Disk System reaches this running time, an alarm is set off and the system stops operating until the alarm is acknowledged. The Max Run Time can be adjusted from 0 to 18 hours.

Max Run Time  
1:30h:m

**Time Mode** — Select the desired time display format: 12h or 24h mode.

Time Mode 12h

**Contrast** — Set the contrast of the LCD screen to the desired value (from 10 to 100%).

Contrast: 80

**Shut Down Delay** — Once feed is detected by the proximity switch at the end of the line, a delay is launched before stopping the Chain Disk motor. The bin auger also stops bringing feed into the line over this delay. The shut down delay can be adjusted from 0 to 10 minutes.

Shut down delay  
0:10m:s

**Use Password** — Select "Yes" to enable a password; this password is used to restrict the access to the following menus: Installation, Feed cycles & Manual Mode menus.

Use password?  
Yes ▾

**Change password?** — Select "Yes" if you wish to modify the controller's password then press the down-arrow key.

Change password?  
Yes ▾

EnterNewPassword  
\*\* \*\* \* ▾

- Press MODIFY. The first two digits of the password flash on the display.
- The new password must be entered, one number at a time. Use the arrow keys to enter the first number. Press MODIFY to step to the next number. Use the arrow keys to enter the second number, etc.

**Version** — Show the current version of your controller.

APCD-600  
Version X.X

## 5.5. Manual Mode

This mode allows to manually perform a feed cycle: the Chain Disk System runs up until feed is detected by the proximity sensor. The Manual Mode led is lit when this mode is in use.



**Do not forget to select the automatic mode again once the manual feed cycle is completed.**

1. Use the menu select buttons to select the **MANUAL MODE** menu.

```
Feed Cycles
Mode:      Auto
```

Press MODIFY to change the feed cycle mode; use the arrow keys to choose the proper mode (Auto / Start/ Stop). Press MODIFY once again to validate.

2. The new mode is validated after an 8 second delay if the user does not press on the Modify button.

### 5.5.1. Toggle Switch

It is possible to connect a toggle switch to the main board. This switch allows to manually stop the Chain Disk System and auger motors. If the toggle switch is turned off for 30 consecutive seconds, the *Chain Disk is Not Running* alarm will be activated. Refer to the wiring diagram enclosed with this manual to connect the toggle switch.



**The toggle switch DOES NOT cut the power lines to the Chain Disk controller. SHUT OFF the CIRCUIT breaker For servicing and maintenance.**

## 5.6. Alarms

The following table shows the possible alarms conditions. When an alarm occurs, the system stops operating until the alarm

is acknowledged.

**Trouble Light:** It is possible to connect a trouble light to the main controller. This light turns on whenever an alarm occurs. Refer to the wiring diagram enclosed with this manual to connect the trouble light.

ALARM	MEANING
<b>CHAIN DISK IS NOT RUNNING</b>	The Chain Disk motor uses less than 0.5A
<b>CURRENT OVERLOAD OCCURRED</b>	The Chain Disk motor's current consumption exceeded the <i>Max. Current</i> limit for a time period exceeding the <i>over Current Delay</i> .
<b>MAX RUN TIME OCCURRED</b>	The run time of Chain Disk System exceeded the <i>Max.Run Time</i> . This alarm can only occur if a proxy switch sensor is enabled in the installation setup.
<b>CHAIN DISK SAFETY SWITCH</b>	The Chain Disk's safety switch has been reached.

### 5.6.1. Acknowledging an alarm

1. Use the menu select buttons to select the STATUS menu. The current alarm acknowledgment menu is displayed.

2. Press MODIFY. The acknowledgment status flashes on the display.

3. Press the up-arrow key to acknowledge the alarm then press MODIFY to validate. The alarm is now acknowledged.

## 6. TECHNICAL SPECIFICATIONS

Type.....	APCD-600
Main supply fuse F1.....	F 1A, 250V, fast-blow
Main supply/frequency .....	230V+10% -20%, 12A, 50/60Hz
Housing .....	Plastic casing
Operating temperature .....	0 to 40°C
Storage temperature .....	-15 to 50°C
Ambient relative humidity.....	MAX 95% (non condensing)
Alarm .....	10mA to 2A, 24 VAC or DC MAX
Auger motor.....	230VAC / 1HP MAX, 115 VAC / 1/2 HP MAX
Internal contactor .....	230Vac / 2HP max
Nema Code Letter: .....	A to L max
Full-load amps (FLA): .....	13A max
Locked rotor amps (LRA): .....	170A max



***Running a motor with higher ratings could result in potential controller damages and/or fire. If the Nema Code Letter is not available, exclusively use the LRA ratings!***

Trouble light.....	500W MAX, 115VAC
Installation category .....	Category II : Overvoltage category
Pollution degree.....	2
Altitude .....	Up to 2000m



***The room temperature where the controller is located must always remain between 32 and 104°F (0 and 40°C). For indoor use only!***

## 7. TRANSFER MENU

### 7.1. Communication Speed

1. Simultaneously press and hold the MENU SELECT up- and down-arrow keys for 5 seconds to display the transfer menu.

1. MemoryCard -> Control
2. Control -> MemoryCard
3. Update Firmware
4. Save EventBuffer
5. Comm speed
6. Contrast

2. Choose **5. Comm Speed** and press MODIFY.
3. Set the communication speed to the right value: select the high speed mode if the controller uses the A-BOX communication system or select the low speed if it uses AGNET.
4. Press MODIFY to validate the new value.
5. Simultaneously press and hold the MENU SELECT up- and down-arrow keys for 5 seconds to exit from the transfer menu.

### 7.2. Screen Contrast

1. Simultaneously press and hold the MENU SELECT up- and down-arrow keys for 5 seconds to display the transfer menu.
2. Choose **6. Contrast** and press MODIFY.
3. Set the contrast of the LCD screen to the desired value.\**The contrast can also be adjusted in the setup menu on some controllers.*
4. Press MODIFY to validate the new value.
5. Simultaneously press and hold the MENU SELECT up- and down-arrow keys for 5 seconds to exit from the transfer menu.

### 7.3. Update/Backup with a USB drive

The USB drive allows upgrading the firmware or software of your controller. It can also be used to make a backup of your controller settings or to copy these settings on another controller of the same type.



**Turn off power each time you open the controller's enclosure. This prevents accidental exposure to areas of high voltage.**

1. Turn off power to the controller.
2. Lift the latch to open the front door of the controller.
3. Insert the USB drive in the connector behind the front door.

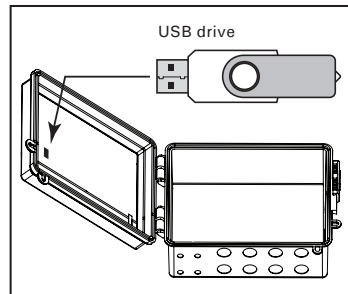


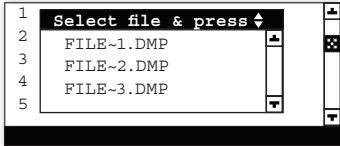
Figure 1: USB Connector

4. Close the front cover and reapply power to the controller.
5. Simultaneously press and hold the MENU SELECT up- and down-arrow keys for 5 seconds to display the transfer menu.

1. MemoryCard -> Control
2. Control -> MemoryCard
3. Update Firmware
4. Save EventBuffer
5. Comm speed
6. Contrast

## 1. MemoryCard -> Control

Choose **1. MemoryCard -> Control** and press MODIFY to load a new configuration file into your controller. This transfer will update your controller's software and parameter settings.

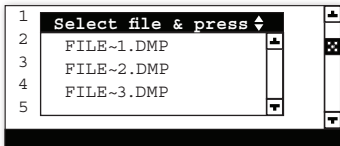


When selecting this option, a list of all configuration files located on the card is displayed (\*.DMP files). Select the desired file and then press the ADJUSTMENT up- and down-arrow keys for 5 seconds to start the transfer.

**!** *Note that the controller can only read the files that are located at the root of the USB drive. It cannot access any sub-directory!*

## 2. Control -> MemoryCard

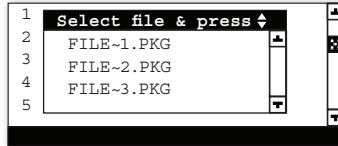
Choose **2. Control -> MemoryCard** and press MODIFY to save your controller settings on the USB drive. The saving process will start as soon as you enter this menu.



The controller will create a new CONTROLLER~1.DMP file at the root of the USB drive. If this file name already exists, it will be saved under a different name ("CONTROLLER~2.DMP" for instance). This way, the controller will never erase a file on the card.

## 3. Update Firmware

Choose **3. Update Firmware** and press MODIFY to download a new firmware file into your controller. This process will not affect your parameter settings.



When selecting this option, a list of all firmware files located on the USB drive is displayed (\*.PKG files). Select the desired file and then press ADJUSTMENT up- and down-arrow keys for 5 seconds to start the transfer.

**!** *Note that the controller can only read the files that are located at the root of the USB drive. It cannot access any sub-directory!*

## 4. Save Event Buffer

Choose **4. Save Event Buffer** and press MODIFY to save the event buffer of the controller on your USB card (event.txt).

***Simultaneously press and hold the MENU SELECT up- and down-arrow keys for 5 seconds to exit from the transfer menu.***

***Remove the USB drive from the connector when the transfer is over!***

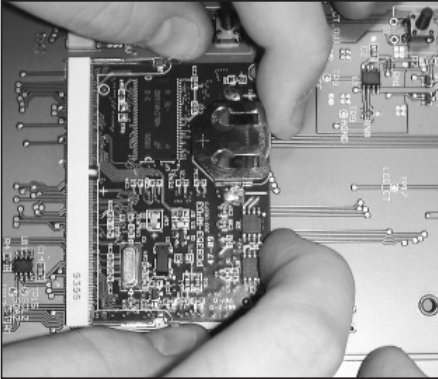
## ANNEX 1: CORE CARD

### Removing a Core Card:

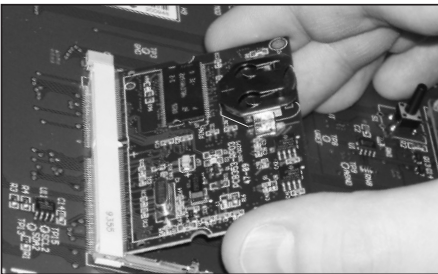


*Before proceeding, switch power off at service panel and lock the switch disconnecting means to prevent power from being switched accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.*

1. Use your thumbs to move away the two metal arms that are retaining the card. While doing so, lift the card upwards with your index fingers.



2. Pull the card out of its connector.

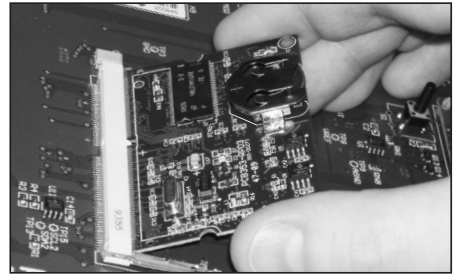


### Inserting a Core Card:

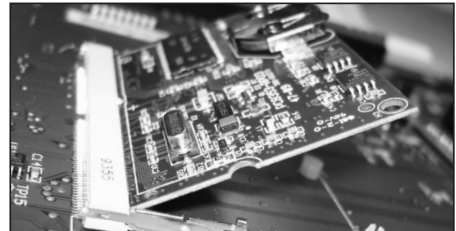


*Before proceeding, switch power off at service panel and lock the switch disconnecting means to prevent power from being switched accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.*

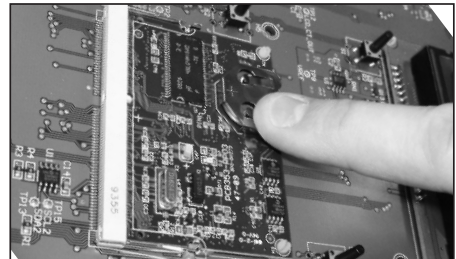
1. Give the card a 45-degree angle before inserting it in the connector.



2. Once it is inserted, the card will stand at the 45-degree position.



3. Press on the card and make it clip to the main board.



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