ARC3000

ACTION RECORDER CONTROLLER
REFERENCE MANUAL
VERSION 1.1

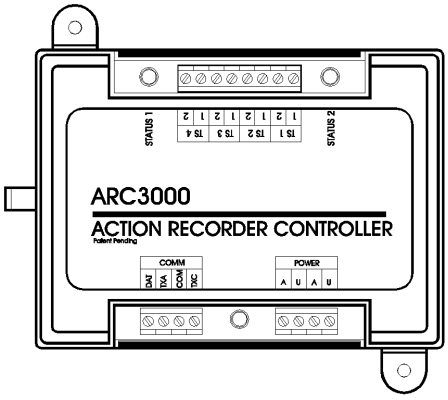
TABLE OF CONTENTS

INTRODUCTION

The ARC3000 Action Recorder is designed to be used with and is completely compatible with the Lionel Trainmaster Command Control system. It is designed to make action recordings of your layout. Any action sequence may be recorded, from the movements of trains, to the operation of switches and accessories. It can be as simple as blowing the horn on a locomotive to a complex switching operation that automatically loads the cars and sends it on it's way.

The ARC3000 allows the CAB-1 remote control to teach the ARC3000 the operations to perform. Each recording can be played back by a single push of the button. Two separate channels are available for making recordings of up to 1 hour in length. Track sensor inputs are included and can be used to the start the playback or to synchronize the train movements with the action recorded.

This manual is designed to take you through the basic operation and wiring details of the ARC3000. Please take the time to read this information before attempting to connect it to your layout.



SPECIFICATIONS

Physical

Size 3.7” x 2.7” x 1.2”

Mounting with two #4 pan head sheet metal screws

Electrical Ratings

Input Voltage 9 Volts to 20 Volts AC

Input Supply Current 50 ma

COMM input signal +/- 12 Volts

Input sensors

Input Voltage for detection 3 Volts to 30 Volts AC or DC

Input Current 10 ma

GENERAL INFORMATION

TERMS

Following are specific terms, words, letters and how they are used in the manual:

- DAT: The RED wire connected to the COMM connector used to receive commands from the command base.
- COMM: Communication Input / Output terminals.
- COM: The GREEN wire connected to the COMM connector used to supply ground for communication.
- TXA: The RED wire is used to transmit commands to other controllers.
- TXC : The BLACK wire connected to the COMM connector used to transmit commands back to the command base.
- POWER A: Lionel terminology for power connection to accessory transformer
- POWER U: Lionel terminology for neutral or common connection to accessory transformer
- TS: Track sensor input connections
- LED: Indicator to let you know the controller is working
- TERMINAL: Connector strip where you connect the wires
- DAISY CHAIN: Linking multiple controllers together to add additional switch and accessory operations

IMPORTANT KEYS

The following is a list of keys that's used from the Remote.

In Record Mode

- **(AUX1)** Is used to start and stop recordings.
- **(AUX2)** Is used to record a mark indicating to wait for a track sensor.
- **(SET)** Is used tell the recording to repeat.

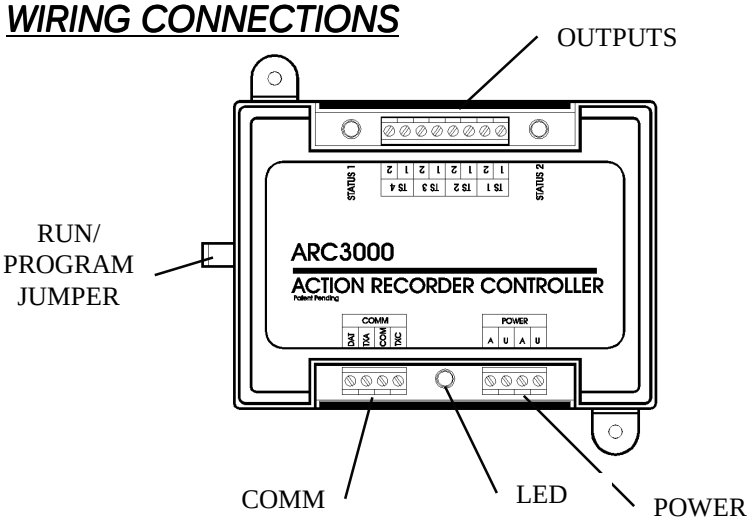
In Playback Mode

- **(AUX1)** Is not used.
- **(AUX2)** Is used to place the ARC3000 in playback mode.
  - Pressing once will select the ARC3000 for playback
  - Pressing twice will over ride the start sensor input
  - Pressing a third time will stop the playback

In General

- **(SET)** Is used to set the accessory address.
- **(ACC)** Is used to begin selecting of the ARC3000.
- **(HALT)** Stop record or playback functions

WIRING CONNECTIONS



POWER

The Power connections on the ARC3000 are located in the lower right hand corner and are marked as POWER. This is the power to run the module.

Two connections are required between the ARC3000 and the transformer:

- The first connection to the ARC3000 is the **POWER A** terminal. It is connected to the **accessory A terminal or power** side of the transformer.

- The second connection is the **POWER U** terminal. It is connected to the **U terminal or common side** of the accessory transformer.

It is recommended that you use separate accessory transformer with the output of 12 Volts AC. This will allow the ARC3000 to function regardless of whether the track voltage is ON.

Additional terminals are supplied to easily daisy chain the accessory power to other ALC3000 family members. To do this simply repeat the connection of both the A and U terminals to the other ALC3000 family member. It is recommended to color code both the A and U wires and maintain this color coding throughout the layout.

COMM

The COMM connections on the ARC3000 are located in the lower left hand corner and are marked as connector terminal COMM. These connections supply the communication or COMM to each ALC3000 family member. It tells the ALC3000 family controller what you want to do. The ARC3000 must be the first connection between the command base. Additional controllers are linked together after the ARC3000.

Two groups of connections are necessary. First the connections between the command base and the ARC3000, then the connections between the ARC3000 and the rest of the IC Controls ALC3000 Controllers.

Three connections are needed between the ARC3000 and the Lionel Command Base. To make these connections, you will need 22 gauge stranded wire with a DB9 connector on one end. The interface cable plugs into the Lionel Command Base connector marked **Computer**. IC Controls can provide ready to use cables for connecting together the entire ALC3000 Family. You may purchase these cables by ordering part #ICC3005-6 or -20 depending on length.

- The first connection is the DAT (DATA) connection. This would be the **red** wire of the IC controls ICC3005 cable.

- The second connection is the TXC (Transmit Data to Command Base) connection. This would be the **black** wire of the IC controls ICC3005 cable.

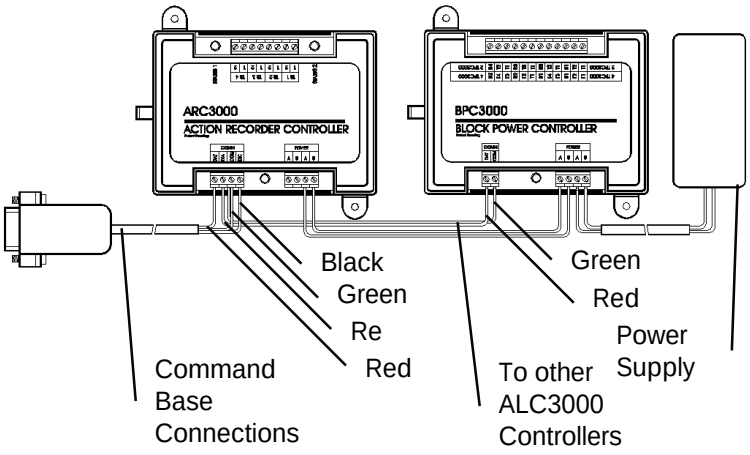
- The third connection is the COM (Common wire of the communication port) connection. This would be the **green** wire of the IC controls ICC3005 cable.

Two additional connections are required to link the ARC3000 with the rest of the ALC3000 family members. These connections provide the communications for operating the other ALC3000's.

- The first connection between the ARC3000 and the other ALC3000 controllers is the TXA (Transmit Data to ALC3000). This connection should be the **red** wire to follow the color coding.

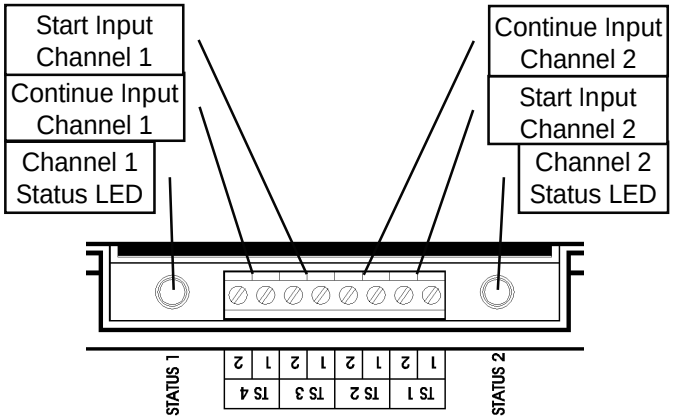
The second connection is COM (Common wire of the communications port) connection. Simply place a second wire in the terminal marked COM. This connection should be the **green** wire to follow the color coding.

Making your own cable is explained in detail under CONNECTING THE CABLE FROM THE ARC3000 CONTROLLER TO THE COMMAND BASE. The completed connections to the ARC3000 are shown below.



Complete command base wiring diagram

Input Connections & Status LED's for ARC3000



ARC3000 LED Channel Status

The ARC3000 has two-output status LED's located at the top of the ARC3000, one for each channel. These LED's are used to show the current state of the channel. This is done through different types of flashing. The meaning of the flashing depends on whether the ARC3000 is in record or play mode. In record mode, the LED flashes possible are:

- 50% ON 50% OFF or equal on off times indicates recording command signals.
- 10% ON 90% OFF or a quick flash indicates track sensor mark made in recording.
- Flashing LED stops flashing indicates the end of record mode.

In play mode, the following LED flashes possible are:

- 90% ON 10% OFF or ON most of the time indicates ARC3000 is playing back an action sequence.
- 10% ON 90% OFF or a quick flash indicates the ARC3000 is waiting for track sensor input before it will continue.
- Flashing LED stops flashing indicates end of play.

ARC3000 Track Sensor Input Connections

The track sensor input connections are located at the top of the ARC3000. There are two groups for each channel. Each channel has a start and a continue action playback sequence input.The first, the start action sequence is used to synchronize the start the playback once the channel has been selected. The second, continue action playback sequence is used to halt the playback until the continue input in received.

Each input is activated by placing any voltage between 3 and 30Volts AC or DC across the terminals marked 1 and 2. The terminals marked TS1 and TS3 are start action playback sensors. The terminals marked TS2 and TS4 and are the continue action playback sensors.

The ARC3000 can be configured to start playback as soon as the channel is selected eliminating the need to press **AUX2** twice then playing back an action recording. This is done by connecting terminals 1 and 2 of the start sensor to the U and A terminal of the ARC3000 power terminal respectively.

Use of LED light

The LED light located at the bottom center of the ARC3000 indicates the proper operation of the controller. There are three different types of flashes, the quick flash, short blink, and long blink to indicate the different functions of the controller.

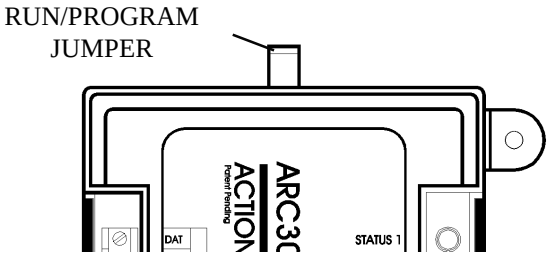
Short Blink **A** 1/2-second short blink indicates the ARC3000 has received a command telling it to do something. It indicates normal operation when an accessory is selected the handheld. For example, when the Short Blink would flash when you select accessory #5 AUX1 and accessory 5 is being control being this ARC3000.

Quick Flash This flash is a 10th of a second in duration. (It flashes so fast you can hardly see it, like if you were to say one thousand and one, you would only be able to say one thou). A quick flash indicates the ARC3000 is receiving information from the command base. It's indicating that the information it's getting is **NOT** for this accessory controller.

Long Blink A one (1) second Long Blink indicates the ARC3000 has a SET command that should be stored into the ARC3000 for later use. An example of the Long Blink is when the Run/Program jumper is removed and a SET Accessory number is done. (Setting an accessory number is covered further in the manual.)

Run/Program Jumper

The Run/Program jumper is located on the left side of the ARC3000. The jumper is a small black connector that is easily removed and replaced. It controls whether the ARC3000 should perform a command, write protect the recording or **SET** its accessory number. The jumper should only be removed when you are setting its number or recording an action sequence.



To set the address of the ARC:

- Remove the **jumper** from the ARC3000
- Select the **ACC button** followed by the accessory number
- Press the **SET** button on the hand held to set the number

The LED will long Blink steady for one (1) second if the command is accepted. After the address has been set. **Make sure to replace the jumper for normal operation.**

The ARC3000 will set the address of both channels at the same time. Channel 1 is always set to the odd address, while channel 2 is always even.

To record an action sequence, remove the run/program jumper from the side of the ARC3000. Record an action sequence then reinstall the jumper. This will write protect the recording from being over written.

ARC3000 Functional Description

The ARC3000 is used to record action segments of your layout that you can playback at any time. Two separate recording can be made. Each can contain up to 16,000 events spaced a maximum of 10 minutes between each event. Track input sensors are also provided to start the recorded sequence or synchronize the next movement. Recordings can be as simple as one button horn blowing to complex train movements that include running the train, throwing switches and operating accessories.

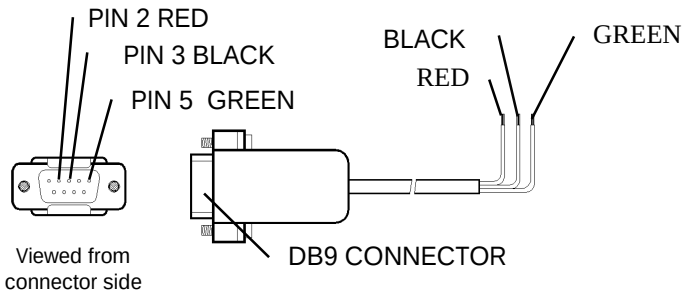
The ACR3000 is addressed as an accessory. Each ARC3000 uses two addresses, one for each channel. The addresses are in order and contain an odd and even number. For example, an ARC3000 set to address 7 would then have addressed 8 automatically set to the second channel. The operation of the ARC3000 is controlled by the use of 3 keys. **AUX1, AUX2 and SET.** The action taken by the ARC3000 depends on the mode of operation. A detailed description of these keys will be listed in important keys.

The ARC3000 is capable of making an unlimited number of recordings, don't be afraid if your recording doesn't come out just the way you wanted the first time, just try it again. Think of it as making a movie. Try to plan out step by step the sequence you are trying to record. This type of planning goes a long way to making great recording in a short period of time.

CONNECTING TO THE COMMAND BASE

The ALC3000 controller family requires a cable to be connected from the Command Base to the ALC3000 controller family. This is done with a three-wire cable. The cable should be made of #22 gauge stranded wire containing a RED, BLACK and GREEN wire. This cable may be purchased ready-made from IC Controls as #ICC3005-6' or -20'. You may choose to build your own cable. The details of how to do this are as follows. The connector required to hook to the command base is called a Male DB-9 (Radio Shack Part #276-1537). Connect the RED (DAT) wire to pin 2 of the DB9 connector. Connect the BLACK (TXC) wire to pin 3 of the DB9 connector. Connect the GREEN

(COM) wire to pin 5 of the DB9. Take the time to locate the markings on the connector. When viewed from the solder side of the connector the pins are counted from the right to the left.



Connecting the ARC3000 to the Command base.

- Start by connecting the DB9 end of the cable to the Command Base marked Computer

- Connect the RED wire to the DAT terminal of the COMM connector located on the ARC3000

- Connect the BLACK wire to the TXC terminal of the COMM connector located on the ARC3000

- Connect the GREEN wire to the COM of the COMM connector located on the ARC3000.

The second sets of connections are between the ARC3000 and any additional ALC3000 family members. This is done connecting a RED wire from the ARC3000 TXA terminal to DAT terminal of any other controller. Connect a GREEN wire from the ARC3000 COM terminal to the COM terminal of the next controller. Additional controllers by can be added by simply daisy chaining the RED (DAT) and GREEN (COM) wires.

Notice the **COMM** and **POWER** cables are looped from one unit to the next. A separate transformer may be needed if noise from the Lionel command control signal interferes with communications. This is indicated by a steady green COMM light located on the ARC3000. If the green light of the ARC is always on, you will need to use a separate supply. If you are currently using other ALC3000 family members with an isolated supply just loop the power from it. Only connect this separate supply to the bottom side to ALC3000 family controllers. Do not connect it to the U terminal of the track or command base. The ARC3000 uses very little power to operate, so many of them can

be connected to one transformer.

Halt Button in Handheld

Pushing the halt button on the handheld will remove the power to the layout by shutting down any ARC3000 that was on. Recordings that are in progress are terminated and action playbacks are stopped. To operate the ARC3000 after halt has been pressed simply reselect the ARC3000 and continue.

OPERATING THE ARC3000

Making a simple recording

This is an example of how to make a recording that will blow the horn three times with a single push of a button. We will assume that the ARC3000 is set to **ACC 9** and we are running a conventional locomotive with a TPC3000 that is **TR 2.** Begin by removing the run/program jumper from the side. This tells the ARC3000 to receive a recording. To start a recording:

- **ACC (9)** followed by **AUX1** starts recording.
- **TR (2)** followed by **HORN** hold the horn button for as long as you would like it to operate.
- Release Horn button for silence
- **TR (2)** followed by **HORN** hold the horn button.
- Release Horn button for silence
- **TR (2)** followed by **HORN** hold the horn button.
- Release Horn button for silence
- **ACC (9)** followed by **AUX1** stop recording.

That's all there is to it. The ARC3000 will remember every thing you did and the time between keys, so when you play it back it will be identical to what was recorded. If you like what you have recorded replace the run/program jumper back on if not run another recording. To play the recording back press:

- **ACC (9)** followed by **AUX2** twice. Once to select play mode and the second time to start the recording.

Making an advanced recording

Making an advanced recording is really no different than the

simple one except it is longer and can involve more than one engine or accessory. The best way to approach this is to plan out the recording ahead of time. Lets take a look at an example of having the log loader place two loads of logs in the car then have the engine respond by blowing the horn, leave the siding and finally throw the main line switch back. Sounds like a lot of work but just break it down into each part one at a time. I won't list every button to push but talk about it as a series of short actions. I am sure you can figure out exactly what buttons to push.

Begin by placing the log car under the log loader. This becomes our starting point. Remember each recording must have a staring point. Think of it as, that the layout must be in the same state it was when you made the recording the first time.

- Select the ARC3000 and start the recorder.
- Select the AMC3000 controlling the Log Loader.
- Turn the knob to clockwise to load the first set of logs.
- Turn the knob counterclockwise to bring the levers back
- Turn the knob clockwise to load the second set of logs.
- Turn the knob counterclockwise to bring the levers back.
- Select the engine that is going to blow it's horn
- Blow the horn, twice if you like.
- Turn the red knob clockwise to start engine moving.
- Wait until the train completely clears the switch
- Select the ASC3000 that controls the main line switch
- Select ARC3000 stop recording

To play it back, place the train with the empty log car back under the log loader. Remember we must put the layout back to the way it was when we started. Then simply select the ARC3000 and press **AUX2** twice. Once, selects the play mode and the second time starts the action playback. There you go, it just repeated every movement that you recorded with all delays and adjustments you made. If you like this sequence replace the run/program jumper and it is ready to go as many times as you would like. If not, no problem, just run another sequence.

Clearing A Recording

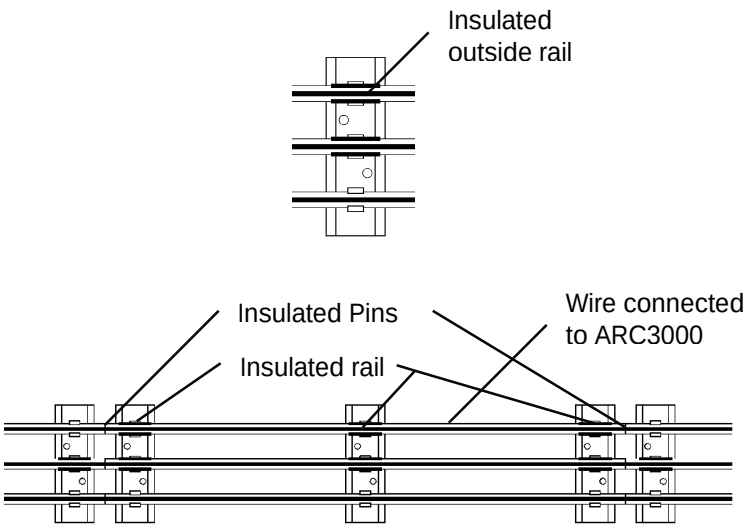
To clear a recording select the number that the sequence is stored in, **ACC (9)** then press the **AUX1**, followed by the **ACC (9)** and **AUX1** again. To keep this clear for another recording, replace the run/program jumper until you are ready to record another sequence.

Track Sensors

Making Track Sensors

Track sensors are used to synchronize the recording with the ARC3000 play back. This is necessary because the train don't know where they are and they don't always run at the same speed. This means the train won't be in the same spot as before. To eliminate this problem track sensors are used. A track sensor is used to halt playback until the train reaches the sensor. It puts the movie pack into sync so things can happen in the same place without a concern for the speed of the train. When the train reaches the sensor the action playback continues.

Track sensors can come in many forms, but each uses the same idea. It acts like a switch closing or completing the electrical circuit. The easiest way to make a track sensor is to insulate one of the outside rails. This is done by insulating the rails from the ties, then insulating the rail on each end from the two connecting rails. Connect a wire to the insulated rail to the ARC3000. Refer to the next page for a diagram.



Now when the train comes by it connects the two outside rails together completing the circuit. Optical detectors can also be used. Use the output from the detector to complete the circuit telling the ARC3000 that a train is present. Any method that creates the completing of the circuit will work. You can supply either an AC or DC output to the ARC3000. See drawing below for insulated track method.

Using the Remote or Track sensors to start playback

An action playback can be started in two ways. It both cases the ARC3000 must be set to playback mode. This is done by selecting the ARC3000 the pressing the AUX2. At this point two different methods can be used to start the playback. The first is to use the remote to start it by pressing the AUX2 key again. The second uses the start playback track sensor. This will start the playback sequence when the train reaches the sensor. If you want the sequence to start immediately you can wire the track sensor input to always being on. For wiring details refer to the wiring section.

Using Track Sensors to Continue Playback

The main purpose of track sensors is to keep the motion of a train synchronizes with the action recorded. This is very useful when you are trying to position a car for loading. This car should be stopped within a half of an inch for this to work

correctly. Using a track sensor to suspend the recording until the train reaches an exact spot is the way to solve this problem.

Many track sensors can be paralleled but remember that the train should only be on one of them at a time. That way you can tell which one is which. If you can't avoid this problem use an ASC3000 as a selector to select which sensor is connected to the ARC3000. See diagram for details.

Controlling the Track Sensors

Now lets see how to use a track sensor to control our recording. We will use the previous example but this time we will use two tracks sensor wired together. One to position the train after the sidings switch and a second to spot the car into position. It is assumed that the train is not long enough to be on both sensors at the same time.

So the sequence will go something like this. Let's start the train running around the layout. Lets add to the front of the log load sequence by having the train blow the horn letting us know it's performing for us. Next, have the train stop when it hits the track sensor, throw the siding switch, start the engine back toward the log loader adjusting speed. Wait for track sensor to stop the train under the log loader. Then continue to record the previous example of having the log loader place two loads of logs in the car then have the engine respond by blowing the horn, leave the siding and finally throw the main line switch back. Remember we are just making these recording longer and longer but nothing else has changed.

Begin by starting the train running around the layout and here we go:

- Select the ARC3000 and start the recorder.
- Select engine Blow horn
- Select ARC3000 and press AUX2 to wait for track sensor
- Select the engine and when train first touches the track sensor press direction to stop the train. Direction is best because in does not depend on a certain speed at start up.
- Select the ASC3000 and throw the switch
- Select the engine and turn the red knob to back the train up

- Adjust the speed of the engine with red knob
- Select the ARC3000 and press AUX2 to wait for track sensor
- Select the engine, when the car to be loaded touches the track sensor press the **direction** key to stop it

Complete the same sequence as before to complete the recording

- Select the AMC3000 controlling the Log Loader
- Turn the knob to clockwise to load the first set of logs
- Turn the knob counterclockwise to bring the levers back
- Turn the knob clockwise to load the second set of logs
- Turn the knob counterclockwise to bring the levers back
- Select the engine that is going to blow it's horn
- Blow the horn, twice if you like
- Turn the red knob clockwise to start engine moving
- Wait until the train completely clears the switch or you could use the track sensor to let you know you are clear
- Select the ASC3000 that controls the main line switch
- Select ARC3000 stop recording

Empty the car and start the train running as before placing the layout back to the way it was. Select the ARC3000; press AUX2 to start the action playback.

Special Recordings

Repeating A Recording

Recordings can be repeated over and over. To do this, change the last action of the recording from selecting the ARC3000 **AUX1** to stop recording to Select ARC3000 **SET**. This action tells the ARC3000 to start the action playback over. If the track sensor start input is used then it will wait for it until it repeats. Remember that the action recording must be made so that the layout in placed back to the start before the loop is repeated. For it to work correctly

Linking two recordings together

Both action recordings can be link together forming a larger one. To do this, change the last action from Select the ARC3000 and press AUX1 (stop recording) to select the ARC3000 other channel address and press AUX2 (link to other channel). This tells the ARC3000 to continue the playback using what was recording in the other channel. Once again remember to place the layout in a state that is in the beginning of the other recording. You can even tell the other recording to link back to the first in effect creating a repeat action playback.

Tricks and helpful hints

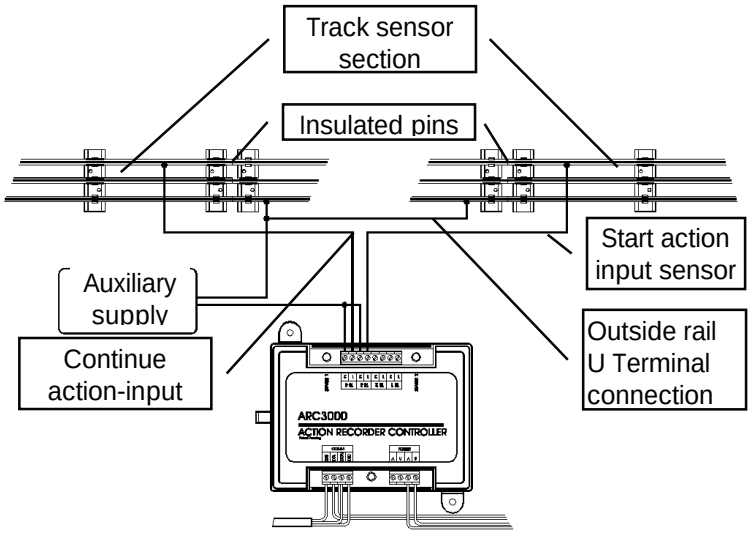
- When making very complex or fast action recordings it may be useful to use two remote controllers one in each hand. Set one to control the ARC3000 and the other to control the engine. This will let you adjust the speed while hitting the wait to track sensor command.
- Try and assign the ARC3000 to a single digit address. This will make it faster to select the ARC3000 for track sensor wait commands. When recording moving trains every second counts.
- Remember that when you are recording a moving train that you can catch your breath when the train is stopped. Take this time to think about the next move then continue on.
- Don’t run trains just over their startup speeds. This is because the mechanisms will not react the same each time. Run the trains at a speed to allow for smooth consistent operation.

- Remember that trains running without track sensors don't know where they are. So for example when doing a switching move without a sensor. Don't stop the train just passed the switch. Go beyond it by a couple car lengths to allow for variation in operation between action playbacks. This will allow for successful execution of the recording even though the engine location or speed varied a bit.

- Use the LED status indicators to help let you know what the ARC3000 is doing. They are very helpful in making successful recordings.

- If the recording doesn't come out the first time don't worry, just make another. You can record with the ARC3000 as many times you like.

Wiring Track Sensors



The above diagram shows the completed wiring for a single channel. Notice that the start and continue action playback sensors are separate. This allows one to start playback and the other to continue. If you want the start and continue to be in the same place, connect both the terminals marked 1 together. If you want the action playback to start when it is selected from the remote, wire the connection from the start action sensor to the

neutral of the auxiliary transformer.

An auxiliary supply is used so the sensors are powered independent of the track voltage. Connect the neutral connection of the transformer to the outside rail U connection. Connect the hot or power connection to the ARC3000 as show above.

Additional Information and Tech Support

IC Control is continually trying to make its products the best in the market place. Your input on our products is very important to us. It allows us to shape our products to your needs. If you have any comments or questions on any of our products please feel free to contact us. We can be reached at:

IC Controls
P.O. Box 296
New Boston, MI 48164
ATT: Marketing Dept.

Warranty Information

IC Controls stands behind their products with a one-year parts and labor warranty. If the product fails to operate because of manufacture defect, IC Controls will repair or replace it at their discretion free of charge for a period of one year from the date of purchase. To return defective product please include the following:

- Defective unit
- Dated sales receipt
- Reason for return
- A check for $5.00 to cover postage and handling

Send the above information to:

IC Controls
P.O. Box 296
New Boston, MI 48164
ATT: Returns Dept.

Please allow 2 to 3 weeks for processing.

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