



## INFRARED DIGITAL COMMAND CONTROL SYSTEM

**RAIL-LYNX™** is a unique infrared, digital command control system, which has been in production since 1989.

- **SIMPLE**

System consists of a handheld wireless Transmitter and Receivers in each locomotive. That's it! No black boxes or power boosters, no programming! Eliminates complicated layout wiring. Only 12 volt DC power supply required.

- **WIRELESS**

Direct wireless control of locomotives. Stay with your train and enjoy the fun. No tether to get tangled with other operators. No watching your train go by, then unplugging and walking well ahead, and watching it come to you.

- **EASY TO USE**

All control functions are performed using the handheld, wireless Transmitter. Command signals are transmitted direct to the receiver in the locomotive. No signals sent through the track. Operation Manual is only 4 pages long.

### Summary of Features:

- ◆ Wireless transmission direct to loco — not via track.
- ◆ All changes and configurations via hand-held transmitter.
- ◆ No track programming required — make changes any time.
- ◆ 255 channels — each loco can store two channels; primary & secondary.
- ◆ Second channel for on the spot multiple unit capabilities (consists).
- ◆ Multiple-operator control of same loco — hand-off / staging.
- ◆ Emergency stop — stops any loco, regardless of channel, with instant recovery — no delay.
- ◆ Eight levels of momentum with braking.
- ◆ Loco speed matching — 5 selectable speed curves, one customer designed, plus offset.
- ◆ Park command — prevents inadvertent starting of a loco
- ◆ Headlight and rearlight off/50%/75%/100% plus 2 auxiliary outputs (MARS, ditch or strobe) on all receivers except RX-3 and RX-3P which have one auxiliary output on the RX-3 (MARS or strobe).
- ◆ Simple DC power supply (no power boosters).
- ◆ Simple one block wiring.
- ◆ Compatible with most DEC systems — (use on friends' or club layouts).
- ◆ No computer required — it's in your hand and in the loco!
- ◆ Minimal initial investment.

### HAND-HELD TRANSMITTER

The transmitter consists of a hand-held unit containing the controls, and an integral battery pack (4 'AAA' or 4 'AA' alkaline cells, or rechargeable batteries). With the standard 'AAA' battery pack the Transmitter will function for 50-100 hours of operation (depending on how often commands are sent). A lanyard is attached, so the Transmitter can be hung from the neck to keep it off the floor or layout while the operator is not using it. NOTE: the transmitter only sends data when a button is pushed or the speed knob is rotated. It is not necessary to continuously point the transmitter

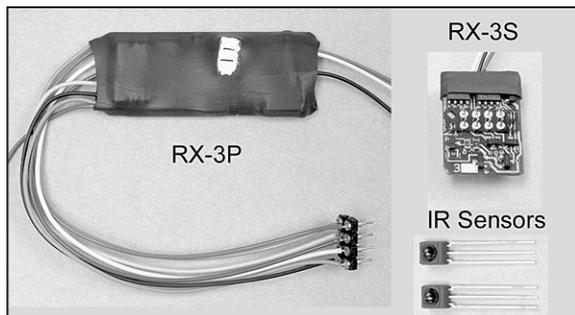


in the direction of the loco. Once a loco receives a command it will continue to do whatever it was last told to do, until it receives another command, or loses power. It is therefore possible to start one train running, change the transmitter channel, and control another locomotive. This is great for demonstrating your railroad to visitors, as you can control multiple locos with one transmitter by simply changing the channel switches.

Two or more transmitters may be set to the same channel to share operation of the same loco. This can be used to handoff control of a loco from one operator to another or to monitor and, if necessary, override the commands that a visitor or trainee may have sent. This is very useful during a crowded open house, where it might be difficult for operators to follow their trains. Operators can be positioned around the railroad and control each train as it passes nearby by selecting that train's channel. This is actually a form of tower-to-tower control!! Any number of hand-held transmitters may be used simultaneously on the railroad.

### LOCOMOTIVE RECEIVERS

Each loco must be equipped with a receiver. The receiver contains a microprocessor, non-volatile memory, bridge rectifier, and a motor driver. All receivers can supply 1.3 amps of current. Two small 0.25" x 0.25" x 0.1" sensors (shipped with each receiver) can be mounted in the cab facing out each side to receive the Infrared signals or a single sensor may be mounted on top of the locomotive, or in the coal pocket on steam engines.



Each receiver permanently stores the primary and secondary channel assignment, momentum, park, lighting, speed offset, and speed table selection, until they are changed.

## CONTROL

The speed and direction of the loco is controlled in two ways. Direction is selected by pressing one of the two direction buttons. The speed knob is then used to start and stop the loco, just as with a standard power pack. The loco will continue to restart in the same direction until the other direction button is selected.

If the stop button is pushed while the loco is running, the loco will come to a smooth stop. Either of the direction buttons can then be pushed, and the loco will start in that direction and accelerate to the speed setting last left on the knob. This allows one handed, three button control of the loco for switching operations. Just set a comfortable speed on the knob, a momentum setting that is fairly low, and you can stop and ramp back up to the selected speed using just the stop and the two direction buttons.

If the loco is running in one direction, and the other direction button is pushed, the loco will ignore the command and not suddenly reverse direction. The loco must be stopped before a direction change can be made. A small slide switch provides for reversing the phase of the direction buttons, when using a reversing loop, wye, or turntable.

## 255 CHANNELS

The *RAIL-LYNX* system provides 256 (00 - 256) primary channels, or addresses, of which 255 are available for allocation to individual locomotives. The 00 channel is reserved for the Emergency stop function. Each channel equates to a single locomotive. All receivers are shipped set to channel 01. After installation the channel of a particular receiver/locomotive combination would normally be changed, usually to the last 2 digits of the number of the locomotive. Channels are selected on the Transmitter using two thumbwheel switches. The 255 channel capacity may seem like overkill, but you can take advantage of it in many ways. It is also possible to assign secondary channels, which make the creation of MU'ing or creating consists easy.

## MU'ing or CONSISTS

Each of the participating locos is loaded with the same secondary channel and is set to run in the correct direction. This is done, using the Transmitter, anywhere on the railroad and no programming of the track is involved. Why not assign the train number as the secondary channel number. This works well with staging yards (even with one loco) as you do not need to know the loco number, only the train number.

Note that the primary channel is always active, regardless of whether or not a secondary one has been loaded, so that any one of a set of MU'ed locos may still be operated independently of the others by using it's primary channel. You can cut off a helper and run it

to the water tower by selecting it's primary channel, return it to the train, set the Transmitter back to the secondary channel and resume the helper operation.

The multiple assignment can be canceled at any time, by using the Transmitter to cancel the secondary channel in one (using it's primary channel) or all locos (using the secondary channel). Note that locos can be added or deleted at any time, as when you add or cut off helpers.

## HELPER OPERATION

Using separate channels and operators with mid-train and/or rear-end helpers can be a rewarding challenge.

## RELIABLE CONTROL DISTANCE

The *RAIL-LYNX* transmitter sends the signal directly from the hand-held transmitter directly to the sensor in the loco. No control signals pass through the track. The track only provides power to the loco. Reliable command distance is about 10 to 15 feet, and therefore you must remain within that range for proper operation. The best operation is achieved by bouncing the signal off the ceiling/backdrop, with the transmitter pointed at about a 45 degree up angle (a natural position of your hand) and in the general direction of the loco. Pointing directly at the loco is not required.

On multi-level layouts, signals can be bounced off the ceiling on the upper levels, bounced or directed on the middle levels, and pointed directly on the bottom level.

## EMERGENCY STOP

An emergency stop button is provided which will stop any train within range, regardless of channel assignment. This may be used to stop another operator's train to prevent a collision or some other embarrassing event! All momentum is bypassed with this command, so the train will stop as fast as possible.

**Note:** there is no delay in recovering from an emergency stop command.

## COMPATIBILITY

Because the *RAIL-LYNX* System only requires 12 volt track power, it is truly portable. It can be used on any standard 12 volt DC powered layout (some power packs may require a filter capacitor) It will operate simultaneously and independently on top of any of the popular tethered command control systems! It has been tested with: CTC 16 (MR magazine), CTC 80 (Keeler Rail Specialties), Rail Command (CVP), Onboard (Keller Engineering), and the NMRA DCC standard. In general most Dynatrol (PSI) (no longer manufactured) systems are also compatible with the *RAIL-LYNX* Infrared Command Control System.

The *RAIL-LYNX* Infrared Command Control System is well suited for clubs, as each member is not required to convert to command control. Therefore, those who select the *RAIL-LYNX* system may bring their own transmitter and locos on operating night. Just set the voltage for all blocks to 12 volt DC, and the club has command control.

## MOMENTUM / BRAKE

The rate at which the loco is allowed to accelerate and decelerate is determined by the level of momentum selected. There are eight levels to choose from (0-7). The selection is done via the transmitter, and can be changed at any time. As an example, a large amount of momentum might be selected when a heavy train is being operated, then the momentum can be reduced when the loco is cut off and run light to the engine terminal.

If, after being commanded to stop (either by knob or button), the train is not slowing fast enough, additional pushes on the stop button will act as a brake and bring the train to a quicker stop. If you hold the stop button down, it will repeat the command every 1/2 second.

## SPEED OFFSET AND SPEED CURVES

The primary channel is normally loaded when the receiver is first installed, and is never changed. At the same time it is loaded, a speed offset value may also be stored. We recommend that the offset be set so the loco just starts to move on the first click of the rotary knob. This eliminates wasted knob rotation.

In addition, there are 4 different speed curves stored in the receiver, plus one that can be custom designed and downloaded (contact *RAIL-LYNX* for details). The custom curve can be used to make locos with different speed characteristics run well together. Any of these 5 speed curves may be selected at any time anywhere on the railroad.

## HEADLIGHT CONTROL

There are 2 control outputs, which may be used for headlight/rearlight control (off, dim, bright, brighter). No resistors are required if 12-14 volt lamps are installed in the loco. Many railroads used the dimming or turning off of the headlight to signal an oncoming train that a train was in the clear on a siding. Additional outputs can be configured for on/off, MARS light effect, ditch lights, or strobelights depending on receiver. These outputs are rated at 100 mA. (0.1amp) each.

## FLASHLIGHT

An extremely bright yellow LED on the transmitter can be used to read car numbers in dim light, those with severe weathering, or even to locate things that roll under the layout.

## LAYOUT DESIGN CONSIDERATIONS

The wireless feature of the *RAIL-LYNX* Infrared Command Control System is particularly suited to a walk-around railroad. The 3-button control makes it ideal for switching layouts.

## CEILINGS

For best operation, the ceiling area above the railroad should be white or a light color. If there are exposed, dark ceiling beams, the Infrared signal will be absorbed and not reflected back onto the railroad.

## LIGHTING

The system relies on the transmission of Infrared energy from the transmitter to the sensor on the loco. Sunlight and incandescent lights contain large amounts of Infrared energy. Therefore, operation under sunlight will not work (as in a garden railroad). Normal incandescent lighting has little effect on the system, unless it is extremely intense (100 watt bulbs one foot over the loco). Multi-deck designs usually use many low wattage lamps between the decks and they do not cause a problem. Standard fluorescent lamps (2' and 4' tubes for example) emit little Infrared energy and have minimum affect on the system, so no precautions are required.

## POWER

Power can be supplied by any well regulated, low ripple 12 volt DC power supply(s). It can be purchased from a surplus house (10 amps for about \$50), or from RADIO SHACK. The current rating in amps should be equal to the total number of locos that are to be operated simultaneously (not the total on the railroad) with a significant additional margin. In this case, bigger is better.

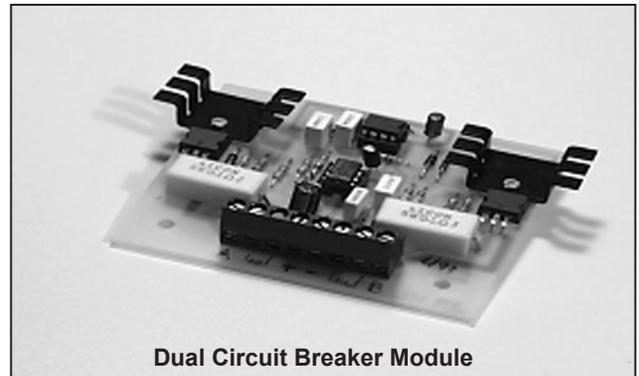
Most common power packs can be used, but may require a filter capacitor to remove the ripple. They normally do not have much current capacity (they usually will only operate 2-3 locos), and the regulation (voltage changes with load) is usually poor.

## WIRING

Simply run a pair of heavy gauge (#12 or #14) power distribution wires around the railroad!! Drop light gauge (#22 or #24) feeder wires from the track to the power distribution wires about every 6 feet).

## DUAL CIRCUIT BREAKER

Optional electronic circuit breakers are available which can be used to divide the railroad into several electrical blocks for isolation of faults (shorts) and to limit the maximum short circuit current. They automatically and continuously attempt to reset three times per second, until the fault is cleared. Each breaker can be set to trip at the desired maximum value required for that block. Thus, even though you may be using a 10 amp supply, the maximum allowed in that block might be only 2 amps. This prevents pitted wheels and melted feeder and frog wiring. The other advantage of using the breakers is that a short in one block will not affect other blocks. So, when someone runs a switch in the yard, the mainline trains keep running. Each module contains two circuit breakers.



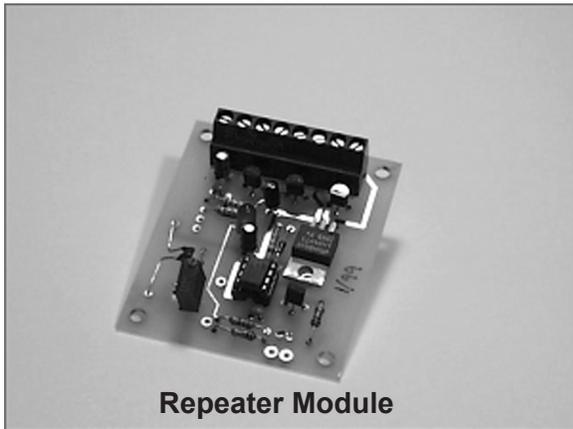
## REVERSING LOOPS

Reversing loops are easy to wire, as all that is required is to reverse the polarity of the loop, while the train is in it. This is the opposite of what is normally done on standard DC wired railroads, where the polarity of the main track is changed while the loco is in the loop.

With command control, polarity of the voltage on the track has no effect on the loco, so it can be changed right under the loco while it is in the loop, and leave the main alone. This can be done manually using a switch, or automatically, by simply using the same signal that controls the track switch at the entry/exit of the loop to control the polarity of the loop. Usually, this can be done using a relay. The automatic reverse loop module manufactured by MRC will also work.

## TUNNELS, HIDDEN TRACK, AND STAGING

Any time the loco is hidden from the transmitter and control is required, a repeater may be used to re-transmit the signal to the loco. The Repeater Unit consists of a sensor (to receive the signal) a repeater printed circuit board (to regenerate the signal), and ten Infrared LED's located in the hidden area (to send the signal to the loco). Each LED can cover approximately 2 feet, so up to 20 feet of hidden track can be controlled with one repeater. If the repeater is powered with 24 VDC, it can drive up to 24 LEDs, and cover 48 feet of hidden track. The LEDs can be distributed among several hidden areas; so one repeater may be used for several tunnels. Repeaters may also be used to provide coverage in non-hidden areas, such as large yards.



**Repeater Module**

## BLOCK DETECTION

Any of the standard block detection systems work well with command control. Most use a diode in series with the negative power return in each block. If any versions of the "TWIN T" are used, only half of the "T" has to be used because the track polarity never changes (a reversing loop is one exception). The only caution is that the maximum voltage that may be applied, if a separate power supply is used, is 12-14 volts.

## RECEIVER & LOCOMOTIVE COMPATIBILITY LIST

### **RX-3**

All locomotives with space available.

### **RX-3P**

All locomotives with a DCC plug and space available.

### **RX-3A (Drop In)**

Atlas: GP-7, GP-38/40, RS-1/2/3, C424/425, F-3A/B

Athearn: F-7A/B, RSD-4/5/12, C3--7, U23B, U33C/36C

Kato: Genesis SD-70, SD-80, SD-90

Stewart: GP-35, SD-40, AS16, F-3A/B, F-9A/B, U25B

### **RX-3L (Plug and Play):**

LifeLike: GP-7, GP-9 (NEW), GP-30, SD-60

Bachman: 2-8-0

### **RX-3K (Plug and Play):**

Kato: RS-2, RSC-2, C44-9W

LifeLike: 0-8-0

Bachman: Doodlebug

### **RX-3S**

Atlas: GP-7, GP-40, U23B, U23C, RS-11 & C30-7

Bachmann: 2-8-0, K4 & Acela

Kato: RS-2, RSC-2, GP-35, SD-40-2 & SD-45

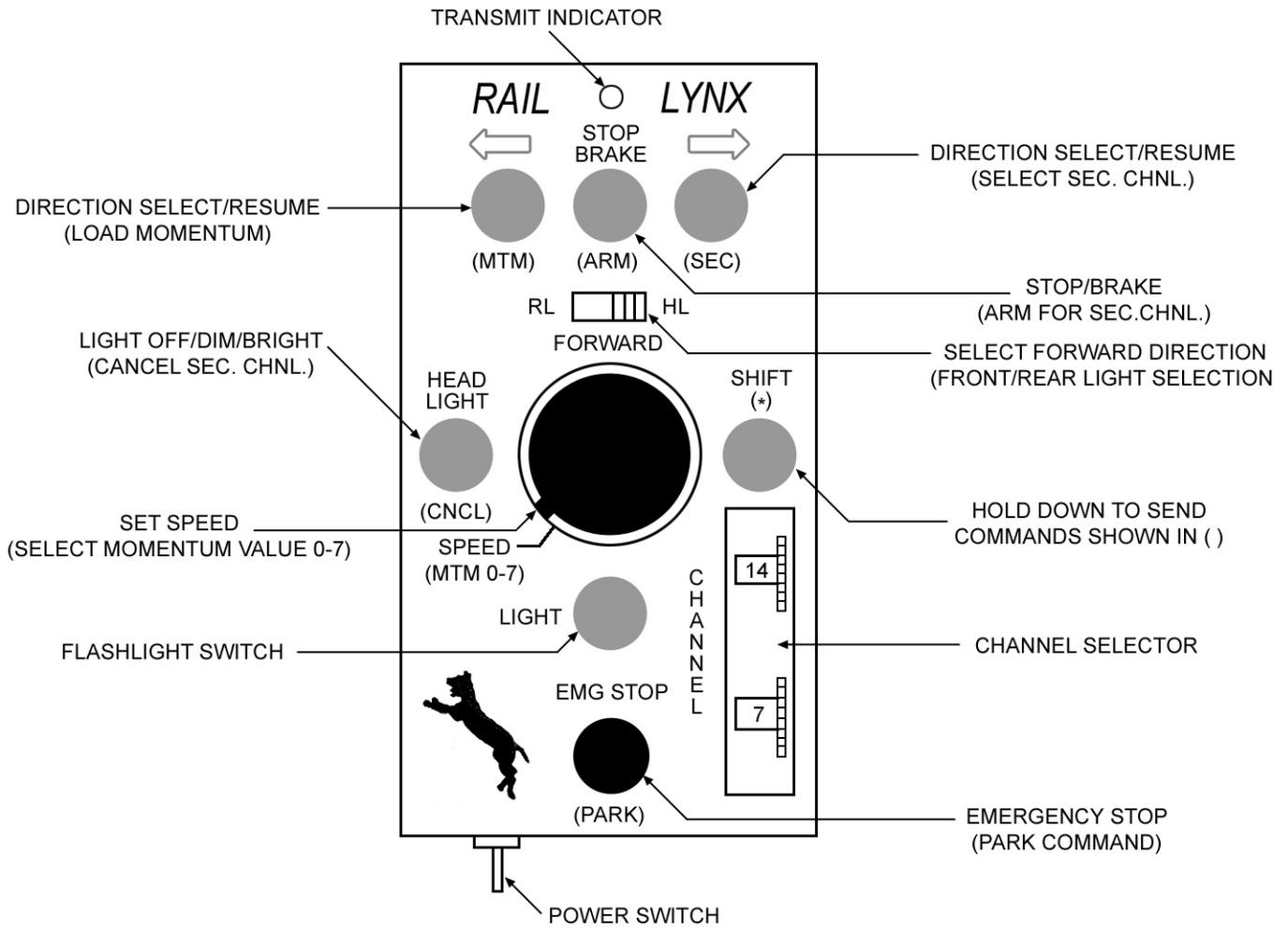
Stewart RS-12

And Others

### **RX-3O**

2-rail 'O' gauge and indoor 'G' gauge locomotives

**RAIL-LYNX TRANSMITTER  
(THROTTLE)**



(ACTUAL SIZE)

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