Echo Valley Free-mo, Regina, SK Electrical Layout as of 221001 (using 4 power districts)



Echo Valley Free-mo, Regina, SK Setup Diagram as of 221001 (using 4 power districts)



Free-mo Setup Notes - Electrical

Concept of the Digitrax System

By way of analogy, a modern car's Electronic Control Unit (ECU) is often referred to at the "brain" of an engine because it continuously checks many things and adjusts components without any driver input. To increase the speed of the car, the driver presses on the accelerator which cause more air to enter the engine. The ECU detects the added air and, in turn, increases the amount of fuel injected into the cylinders to keep the optimum air/fuel ratio – it does this without any additional input from driver. The ECU continuously makes small but quick adjustments, striving for lowest emissions and smooth operation.

In a Digitrax setup the Command Station is equivalent to the ECU in a car – it is the "brain" of the system. If an operator wishes their locomotive to do something, they press a button or turn a knob on a handheld controller (or app on a smart phone). Say the operator presses button 2 to sound the locomotive horn. This creates a digital instruction which travels along a network of cables called "ThrottleNet" by way of plug-in jacks on the side of a module or a mast-mounted radio. The ThrottleNet network is plugged into jacks on devices called LNRPs (Loconet Repeater Modules). ThrottleNet ends at the LNRPs.

An independent network called "BoosterNet" connects to other sockets on the LNRPs. An LNRP analyses the digital instruction received from its ThrottleNet side and filters out any electrical noise that might have been created in ThrottleNet, say from a poor throttle jack connection. The LNRP automatically passes the cleaned digital instruction into BoosterNet. Using the car analogy, a driver has no ability to directly adjust the amount of fuel entering the engine – the computer does this by itself.

BoosterNet connects all LNRPs to the Command Station. When the Command Station receives the digital instruction, it first checks to make sure that the operator's locomotive has been entered into the system by way of a unique "address". If so, the Command Station creates a packet of digital information addressed to the locomotive. It sends this packet back along BoosterNet to the Boosters found in the Booster Boxes that are also connected to BoosterNet. Boosters are themselves separate computers. The Command Station may be receiving digital instructions from many operators running many locomotives. It sends the various packets of digital information in an orderly manner so traffic on BoosterNet is organized and without conflict.

When the Boosters receive the digital packet, they pass it along into the Track Buss which carries electric power to the rails. A digital decoder in the operator's locomotive receives the addressed digital instruction via the locomotive wheels and carries out the instruction by sounding the horn. The whole process takes fractions of a second, without any involvement by the operator aside from pressing button 2 on the throttle – much like the car speeding up after the ECU determines that more fuel needs to be injected into the engine in response to the driver pressing on the accelerator.

Terminology

ThrottleNet – Is the network which receives digital instructions from train operators (selecting locomotives, operating horn/bell, adjusting speed/direction), either from throttles plugged into UP5/UP7 devices mounted on the sides of modules or via wireless throttles that send signals to UR92/UR93 radios mounted on masts. ThrottleNet is separate from BoosterNet. All ThrottleNet "flat 6" cable is GREY-coloured. ThrottleNet is connected to the "unprotected" jacks on LNRP devices (Loconet Repeater Modules) in Booster Boxes. ThrottleNet ends at the LNRPs.

BoosterNet – is the network that begins at the LNRP devices. BoosterNet connects the "protected" jacks on LNRP devices found in the Booster Boxes and in the Command Station Box. Each LNRP is, in turn, connected to its respective Booster and Command Station. All BoosterNet "flat 6" cable is BLACK-coloured.

LocoNet – is a term used by Digitrax and collectively includes all components of both ThrottleNet and BoosterNet above. To avoid confusion, the term "LocoNet" will not be used in this narrative except when step-by-step programming instructions are provided, in which case consider ThrottleNet and BoosterNet combined as being LocoNet.

Major components

Uninterrupted Power Supply (UPS)

This receives 120-volt AC power from a wall outlet and produces AC power with all electrical interference and voltage spikes removed. The pink extension cords that power the entire model railroad plug into protected sockets (labelled "battery") on the UPS. If there is a utility power outage the UPS will power the model railroad for up to 30 minutes, allowing for an orderly shutdown if necessary and reducing the chance of damage to any components.

Digitrax PS2012 Power Supply (Brown Labels)

A high-capacity power supply that runs off AC power and coverts it to DC power for running major components. The two components powered by the PS2012 are the Command Station Box (holding the Command Station and an LNRP, both of which are powered by the DC power) and the Accessory Box (holding a Booster which supplies power to the Accessory Buss running underneath the layout). The PS2012 should receive its power from the Uninterrupted Power Supply (UPS).

Digitrax PS14 Power Supplies (Silver Labels)

Small wallwart-style power supplies that covert AC power to DC power for various low-power devices. Two of these supply power to the UR92/UR93 radio devices mounted on masts (Silver Labels). The PS14's should receive their power from the large pink extension cords that runs underneath the layout, each of which should plug into the Uninterrupted Power Supply (UPS).

Digitrax PS615 (Blue Labels)

Medium-sized power supply that converts AC power to DC power for both 5-amp DB150 Boosters inside the Blue Booster Box (blue labels) as well as the LNRP mounted in the same box. This should plug into one of the pink extension cords that runs underneath the layout, which should, in turn, plug into the Uninterrupted Power Supply (UPS) battery.

Digitrax PS2012E (Yellow Labels)

High-capacity power supply that converts AC power to DC power for both 8-amp DB210 Boosters inside the Yellow Booster Box (yellow labels) as well as the LNRP mounted in the same box. This should plug into a pink extension cord that runs underneath the layout, which should, in turn, plug into the Uninterrupted Power Supply (UPS) battery.

Command Station Box (Red Labels)

- The Command Station Box contains 1 Digitrax DCS 200, 8-AMP command station and 1 Loconet Repeater Module (LNRP)
- This is the "brains" and "traffic cop" of the operation which:
 - keeps track of all locomotives.
 - runs BoosterNet via LNRP devices and, in turn, issues commands to boosters which, in turn, issue commands to decoders in locomotives via the track buss.
- An LNRP has four (4) sockets, two are "protected" and two are "unprotected". The
 protected sockets are used to power BoosterNet so the booster network is reliable if
 one of the boosters shuts down for some reason the entire model railroad will not shut
 down. The unprotected sockets of the LNRP in the Command Station Box are not used
 because ThrottleNet is only connected to the LNRPs in the Booster Boxes.
- The track power sockets of the command station are not used for anything except to connect to the two screw terminals on the back of the LNRP so the LNRP can show if track power is on via the orange LED on the face of the LNRP.
- Track power to the rails is provided from Boosters located in Booster Box Blue and Booster Box Yellow which are connected to the track buss in four separate power districts.

Booster Boxes (2) (one with Blue Labels and one with Yellow Labels)

- The Blue Booster Box contains two 5-amp DB150's which are configured as a boosters.
 To operate as a booster there must be a jumper connecting the "CONF A" and "GROUND" terminals on the front of each DB150. If this jumper is missing or becomes disconnected the DB150 runs as a command station and, since a layout cannot have two active command stations in operation at the same time, the system will not operate.
- The Yellow Booster Box contains two 8-amp DB210's which are boosters (it is not possible to configure these as command stations).
- Each of the four boosters supplies power to the track buss running under the layout. The layout is divided into four separate power districts. If there is a fault such as a short circuit in one power district, only that power district will be affected, leaving the other three power districts unaffected.
- Mounted on the exterior of both Booster Boxes, beneath the output Anderson Power Poles connected to the track buss of each power district, are double-pole-double-throw rocker switches which are used, if necessary, to reverse the phase of the power sent to the rails (think of this as "reversing polarity"). If locomotives won't run properly

between power districts, throw the switch beneath the output jacks feeding the power district into which the stalled locomotive is trying to enter.

- Each Booster Box receives its electrical power from either a PS615 (for the Blue Booster Box) or a PS2012E (for the Yellow Booster Box) DC power supply which should be plugged into the AC power coming from the battery UPS via the pink extension cords.
- Each Booster Box receives its digital signals from the Command Station Box via BoosterNet.

Accessory Power Box (1) (White Labels)

- Contains a DB210 which is a booster but is not connected to the rails or to ThrottleNet. This is strictly used to provide power to the Accessory Buss to power accessories on modules. This has 8 amps of power.
- Is connected to BoosterNet so a command given to the Command Station to shut down power to devices and the layout will also remove power from the accessory buss.
- The accessory buss uses the equivalent of alternating current (AC). Therefore, the buss has no positive or negative wires.
- All accessories fed from the accessory buss must be able to operate using AC power. If an accessory requires DC power it is a relatively simple matter to convert AC to DC using diodes or, more simply, a bridge rectifier. A bridge rectifier must be rated for at least 18 volts with an amperage sufficient to serve the power requirement of the device to be powered (purchasing a bridge rectifier rated for, say, 50 volts and 5 amps would be more than enough for any model railroad accessory).

Physical Setup

The main components of the Free-mo electrical system are labelled 1 through 8, in some cases the labels might say "1 of 3" meaning, for that component there are three items to be connected.

Every one of the following components must be connected and powered on for the Free-mo layout to work. It is suggested that the components be assembled in the order shown.

The following abbreviations are used below:

APP – Anderson Power Pole Connector ("APP *BlueYellow"* means Anderson Power Poles Blue and Yellow)

RJ12 – 6-wire flat cable connector used for throttle jacks, ThrottleNet and BoosterNet

Placement of devices:

The Free-mo layout should be divided into two halves for the Accessory Buss and four quarters for the Track Buss.

Place components 1 through 5 (orange extension cord spool, UPS Battery, Digitrax PS2012 DC Power Supply, Command Station Box and Accessory Power Box in the same vicinity under the layout at the half-way point where the Accessory Buss will split.

Place component 6 (Blue Booster Box) under the layout between two power districts – the pink extension cord and the BoosterNet 6-conductor flat black cable will be run from the location of components 1 through 5 to the Blue Booster Box.

Place component 7 (Yellow Booster Box) under the layout between the other two power districts – the pink extension cord and the BoosterNet 6-conductor flat black cable will be run from the location of components 1 through 5 to the Yellow Booster Box.

Place a radio tower close to each of the Blue and Yellow Booster Boxes, fastening the mast to the leg of a module.

The following diagram is a simplification of more detailed diagrams found attached as the first two pages of the document named "YYMMDD Regina Freemo Layout Setup and Operating Instructions".



Number	Label Colour	Description	Inputs (1 single)	Outputs (1 single)	Comment
1	orange	orange extension	plug into 120- volt wall	120-volt socket into which the	spool has a red rocker switch which must be
1 item		cord 100-	outlet	UPS battery is	on for power to flow
		foot spool		plugged; only	(glows red when on)
				one socket used	
				for layout –	
				other three can	
				be used to	
				power other	
				devices such as	
				battery charger	





Note colour wire labelling – colour closest to the end of the wire shows which device it plugs into; colour farthest from end of wire shows the device the wire is coming from.

Number	Label	Description	Inputs (1	Outputs (2 pair)	Comment
	Colour		single)		
3	brown	Digitrax	120-volt	Command	slider switch <u>MUST</u> be
		PS2012 DC	socket on UPS	Station Box	set to HO scale (supplies
1 item		power	battery	(red) APP	15 volts, DC); rocker
		supply	labelled	BlueYellow;	switch on front turns
			"battery"	Accessory	on/off – <i>suggest not</i>
				Power Box	turning on until all
				(white)	remaining components
				APP BlueYellow	connected



Number	Label Colour	Description	Inputs (1 pair)	Outputs (6 single)	Comment
4 1 item	red	Command Station Box	APP BlueYellow From PS2012 DC power supply	3 RJ12 connectors of BoosterNet flat 6-conductor cable (BoosterNet cable is black); 3 APP <i>Green</i> on green ground buss wires to Accessory Power Box and each Booster Box (the fourth green output is not used)	Place the Command Station box so the lid opens to the side of the Free-mo layout where it will most likely to be accessed (will need to be accessed to perform purging of Command Station memory before an operating session – see separate instructions on how to reset Op Switch 39 to closed)
	4 (1 OF 1 INPL	1) JT PS-2012			

Number	Label	Description	Inputs (1 pair	Outputs (2 pair)	Comment
	Colour		plus 2 single)		
5	white	Accessory	APP	2 pair of APP	Place under layout near
		Power Box	BlueYellow	<i>White,</i> one pair	PS2012 DC power
1 item			From PS2012	feeds the white	supply
			DC power	accessory buss	
			supply;	under ½ of the	
			APP Green	layout and the	
			from	other pair feeds	
			Command	the white	
			Station Box	accessory buss	
			(green ground	under the other	
			buss wire);	½ of the layout	
			one RJ12		
			connector of		
			BoosterNet		
			(black cable)		
			from		
			Command		
			Station Box		
	-		A 1. 3.	1 states	99
A CONTRACTOR				The	No to the second
	5 (10F 1	2			5 (1 OF 1)
T	3 INPUTS	S			
					1 OUTPUT
1					
					ACCESSORY BUSS
			THROTTLE JACK ONLY		
		-		6	
2 / C	GROUNI	DSTERN OSTERN		•	
		<u>8</u>	UNIVERSAL PANEL UP5	0	

Number	Label	Description	Inputs (3 single	Outputs (2 single	Comment
	Colour		to PS615)		
6	blue	Blue	Barrel Jack	2 RJ12, one	Place under layout near
		Booster Box	from Digitrax	each on 6-	PS615 DC power supply
2			PS615 DC	conductor flat	
items,			power supply	grey cable to	
box			(the PS615 is	ThrottleNet	
plus			powered by	under each	
PS615			one pink 120-	power district;	
DC			volt extension	2 pair of APP	
power			cord running	<i>Red,</i> one pair of	
supply			under the	which feed the	
			layout); APP	track power	
			<i>Green</i> from	buss for one	
			Command	power district	
			Station Box	representing ¼	
			(green ground	of the layout	
			buss wire);	and the other	
			one RJ12	pair which feed	
			connector of	the track power	
			BoosterNet	buss for	
			(black cable)	another power	
			from	district	
			Command	representing 1/4	
			Station Box	of the layout	
				(note that two	
				pair of the APP	
				<i>Red</i> outputs are	
				not used)	
	6 (1 OF	2)			6 (1 OF 2)
	3 INPL	JTS			4 OUTPUTS
-					
	PS-615			THROTTLENET	
	GROUN	BOOSTERN			
			LNRP	TRACK POLARITY	

Number	Label	Description	Inputs (3 single	Outputs (2 single	Comment
	Colour		to box; 1 single to PS615)	plus 2 pair)	
7	yellow	Yellow	APP RedBlue	2 RJ12, one	Place under layout near
		Booster Box	from Digitrax	each on 6-	PS2012E DC power
2 items,			PS2012E DC	conductor flat	supply
box plus			power supply	grey cable to	
PS2012E			(the PS2012E	ThrottleNet	
DC			is powered by	under each	
power			one pink 120-	power district;	
supply			volt extension	2 pair of APP	
			cord running	<i>Red,</i> one pair of	
			under the	which feed the	
			layout); APP	track power	
			<i>Green</i> from	buss for one	
			Command	power district	
			Station Box	representing ¼	
			(green ground	of the layout	
			buss wire);	and the other	
			one RJ12	pair which feed	
			connector of	the track power	
			BoosterNet	buss for	
			(black cable)	another power	
			from	district	
			Command	representing ¼	
			Station Box	of the layout	
				(note that two	
				pair of the APP	
				Red outputs are	
				not used)	



Number	Label	Description	Inputs (2 at mast	Outputs (2 single, 1	Comment	
	Colour		bottom, 2 at mast	from each		
			top, 2 ThrottleNet)	ThrottleNet box)		
8	silver	Radio	Barrel jacks from	2 RJ12, one each	Fasten	
		equipment	PS14 bottom of	on 6-conductor flat	each mast	
8 items			each mast; PS14	grey cable to	to a	
(2 masts &			plugged into end	ThrottleNet under	module leg	
brackets,			of pink extension	each power	nearby	
2 boxes for			cords using	district;	each	
Throttlenet			expansion outlet;	2 pair of APP Red,	Booster	
connections,			RJ12 input from	one pair of which	Box	
2 PS14 DC			ThrottleNet into a	feed the track		
power			black box; RJ12	power buss for one		
supplies, 2 UR			output from black	power district		
92 radios)			box which inputs	representing ¼ of		
(a UR93 radio			to RJ12 at bottom	the layout and the		
was added in			of each mast; APP	other pair which		
2022 and			RedYellow and	feed the track		
should be			RJ12 at top of	power buss for		
substituted			each mast into	another power		
for one UR92			UR92 or UR93	district		
for better			radios	representing ½ of		
radio				the layout (note		
reception)				that two pair of the		
				APP Red outputs		
				are not used)		
UR 92 radios (x2) UR 93 radio (x1) - pick 2 out of 3 radios, normally 1 UR92 + UR93 brackets to featon mode to						
connect	sis io gs t showi ions		1A			
		A		PS14 I power	DC supplies	

Key Points on Command Stations & Boosters Digitrax DCS 200

Note: the term "LocoNet" is used herafter because it is Digitrax terminology – LocoNet consists of ThrottleNet AND BoosterNet as if they were set up as one network.

The "POWER ON" green LED at the bottom left of the front panel glows solid if power is on.

The TRACK STATUS indicator:

- Is orange when the track is getting control signals
- Is not lit if there is no voltage on the track (turn on using throttle press "PWR" followed by "Y+")

The HO toggle setting sets the maximum track voltage to 15 volts.

The green CONFIG indicator shows the primary operating mode. A steady green with a brief blink every 4 seconds means that OpSw 5 is set correctly. Ifhere are 8 blinks every 4 seconds then change OpSw 5 to "closed" (see further instructions later in this narrative). The device will operate correctly in either case.

If the CONFIG indicator is mainly off, change OpSw 1 to "thrown".

The NET indicator is a red LED that displays what the DCS 200 sees on LocoNet. Following are other indicators:

NET LED Indication	Meaning
Solid Red	LocoNet OK
On, blink off	A valid LocoNet message is detected
Off	A short circuit on LocoNet
Off, blink every ½ second	In Option Setup MODE

Number of Beeps	Meaning
1	Powered on successfully or a programming command has been sent
3	A loco address has been purged due to non-use
4	Short circuit shutdown
6	Powered up as a command station in a system that already has an
	active command station (solution: eliminate second command station;
	cause could be a loose jumper wire on a DB150 booster between the
	CONF A and GROUND terminals)
7	CMOS battery is in low condition; replace battery asap (must remove
	the top of the DCS200 using four Philips screws; the battery is a button
	battery which last up to seven years).
8	Local CMOS memory has been corrupted and was reset automatically.
	A technical diagnostic.
9	Transmit failure – there is a device blocking proper message action on
	LocoNet
16	Software timeout failure. No action required; normal operation will
	resume

Audible sounds:

Continuous soft	Low input power supply voltage. If voltage falls below about 9.5VDC or
clicks	8VAC the soft clicks will continue until the low voltage situation is
	corrected.

Option Switch setup (OpSw):

- Factory default settings for DCS200 switches is "t" or thrown. It is recommended that OpSw 5 be set to "c" or closed. This does not affect operations but makes diagnostics easier.
- Changing Option Switches:
 - Ensure power to DCS200 is ON.
 - Disconnect DCS200 from BoosterNet (LocoNet in Digitrax terminology) by unplugging all RJ12 jacks from the front of the command station (or by unplugging the BoosterNet output RJ12 jack located on the front of the Command Station Box).
 - Connect a throttle directly to RJ12 jack A or B on the front of the DCS200 or, if using the BoosterNet output on the front of the Command Station Box, plug the throttle directly to the BoosterNet jack on the front of the Command Station Box.
 - Move the MODE toggle switch on the front of the DCS200 to the "OP" position; LocoNet will go inactive and all other boosters plugged in to LocoNet will shut down.
 - Connect a throttle directly to jack A or B.
 - Press the "SWCH" key on the throttle (on a DT402, DT402D, DT502 or DT502D is on the top-right of the keyboard, next to the "LOCO" button.
 - The screen will show something like "Sw 001 == c".
 - Using the key pad, key in the number of the OpSw to be changed (e.g., 2).
 - Use the CLOC/c key to set the OpSw to c (closed) or the OPTN/t key to set to t (thrown)
 - Exit Option Switch Mode by moving the MODE toggle to "RUN". Remember to reconnect LocoNet. Track power will be off; use the throttle to turn it on.
- Special Instructions for Op Switches 36, 38 and 39 [RECOMMENDED BEFORE EVERY OPERATING SESSION – FOLLOW THE INSTRUCTIONS BELOW FOR OP SWITCH 39 TO CLEAR ALL INTERNAL MEMORY STATES, INCLUDING LOCOMOTIVE ROSTER]:
 - Ensure power to command station is ON.
 - Disconnect the command station from BoosterNet (LocoNet in Digitrax terminology) by unplugging all RJ12 jacks from the front of the command station (or by unplugging the BoosterNet output RJ12 jack located on the front of the Command Station Box).
 - Connect a throttle directly to RJ12 jack A or B on the front of the DCS200 or, if using the BoosterNet output on the front of the Command Station Box, plug the throttle directly to the BoosterNet jack on the front of the Command Station Box.
 - Move the MODE toggle switch on the front of the DSC200 to the "OP" position in which the toggle is pointing straight out from the DCS200 perpendicular to the front edge (it will normally be in the "RUN" position before doing so in which the toggle in its up position).

- Press the "SWCH" key on the throttle (on a DT402, DT402D, DT502, DT502D or similar is on the top-right of the keyboard, next to the "LOCO" button).
- The screen will show something like "Sw 001 == c".
- Using the key pad, key in the number of the OpSw to be changed (recommended to key in 39 to clear all internal memory states). After doing so, the screen will show "Sw 039 == t" or else "Sw 039 == c".
- Press the "CLOC" key on the throttle throttle (on a DT402, DT402D, DT502, DT502D or similar is on the bottom of the keyboard, between the "OPTN" and "EMRG STOP" buttons). Pressing the CLOC key will result in the screen showing "Sw 039 == c". This closes switch 39.
- Move the MODE toggle switch on the front of the DSC200 to the "SLEEP" position in which the toggle is pointing down; wait for a second.
- Move the MODE toggle switch on the front to "RUN" position in which the toggle is pointing up.
- Remember to reconnect BoosterNet (LocoNet in Digitrax terminology). Track power will be off; use the throttle to turn it on by pressing the "PWR" button at the bottom left of the keyboard and the the "Y +" key in the second row from the top of the keyboard.

OpSw Number	Effect when OpSw set to "c"	Factory Default
5	Command station master	t
	mode (recommend changing	
	to "c")	
18	Extend the booster short	t
	circuit shutdown time from	
	1/8 th to ½ second [THIS HAS	
	BEEN SET TO "c"]	
33	Allow track power to restore	t
	to prior state at power on	
34	Allow track to power up to	t
	run state, if set to run prior	
	to power on	
36	Clears all mobile decoder info	t (see special instructions on
	& consists	how to switch to "c")
38	Clears the loco roster	t (see special instructions on
		how to switch to "c")
39	Clear all internal memory	t (see special instructions on
	states	how to switch to "c")
42	Disable 3 beeps on purging a	t
	loco	

Selected items from the OpSw table (see DCS200 Digitrax manual for a complete list)

Digitrax DB 150

The "POWER ON" green LED at the bottom left of the front panel glows solid if power is on and being used as a command station. If being used as a booster the LED will blink continuously. Power to the DB 150 (or any other Digitrax booster or command station) should never be rapidly cycled on-off-on. When power is switched off, wait 30 seconds before turning the power on.

The TRACK STATUS indicator:

- Is orange when the track is getting control signals
- Is not lit if there is no voltage on the track (turn on using throttle press "PWR" followed by "Y+")

The HO toggle setting sets the maximum track voltage to 15 volts.

Audible	sounds
Audible	sounus.

Number of Beeps	Meaning		
1	Powered on successfully or a programming command has been sent		
3	A loco address has been purged due to non-use		
5	Booster short circuit shutdown		
6	Powered up as a command station in a system that already has an		
	active command station		
9	Transmit failure – there is a device blocking proper message action on		
	LocoNet		
16	Software timeout failure. No action required; normal operation will		
	resume		
Variable clicks	OpSw 41 is closed. Diagnostic clicks will sound when a valid LocoNet		
	command is received		

Option Switch setup (OpSw):

- Factory default settings for DB 150 switches is "t" or thrown, except for 5, 17, 25, 33 and 34 which are "c" or closed.
- Changing DB 150 Option Switches:
 - Move the MODE toggle switch on the front of the DB 150 to "OP" position; LocoNet will go inactive and all other boosters plugged in to LocoNet will shut down.
 - Disconnet LocoNet from the DB 150.
 - Connect a throttle directly to jack A or B.
 - Press the SWCH key on the throttle to enter Sw (Switch) mode.
 - Key in the number of the OpSw to be changed (e.g., 2).
 - Use the CLOC/c key to set the OpSw to c (closed) or the OPTN/t key to set to t (thrown)
 - Exit DB 150 Option Switch Mode by moving the MODE toggle to "SLEEP", then "RUN". Remember to reconnect LocoNet. Track power will be off; use the throttle to turn it on.
- Special Instructions for DB 150 Op Switches 36, 38 and 39:
 - Set the OpSw to c.
 - Set the MODE toggle to "SLEEP".

- Set the MODE toggle to "RUN".
- Set the MODE toggle to "OP".
- Select the desired switch, 36, 38 or 39.
- Exit DB 150 Option Switch Mode by moving the MODE toggle to "SLEEP", then "RUN". Remember to reconnect LocoNet. Track power will be off; use the throttle to turn it on.

- Selected items from the Op Switch table:

OpSw Number	Effect when OpSw set to "c"	Factory Default	
02	Booster only override	t	
18	Extend the booster short t		
	circuit shutdown time from		
	1/8 th to ½ second [THIS HAS		
	BEEN SET TO "c"]		
39	Clear all internal memory	t	
	states		
42	Disable 3 beeps on purging a	t	
	Іосо		
50	Longer booster short circuit	t	
	recovery time		

Key Points on Throttles

DT 402R

- The loco icon at on left and right blinks if the loco address is ready for selection; a steady loco icon means that the loco is currently selected or in use by another throttle; the blinking smoke icon above the locomotive indicates which one is currently active. If the display shows "SEL" no address is selected.
- 2. The small dot at the top right of the screen will be on steady if track power is on. If not shown, then track power is off. If blinking system is idle.
- 3. The mode indicator located at the bottom centre of screen shows the current mode of operation of the throttle. For example, in Fn mode any entry on the numeric keypad will affect functions. In Sw mode, keypad entries will change turnouts and in Lo mode, entries will enter loco address numbers, etc.
- 4. Emergency Stop key factory default is set for "Local" stop meaning that only the active loco selected at the time Emergency Stop is selected will stop; by going in into the Option settings this can be changed (ES->idle) to Global Stop (go to OpSw, select ES->idle and then press "On". This is NOT NORMALLY DESIRABLE. This will cause Emergency Stop to shut down the entire layout and set the track power to IDLE. Track power will then need to be turned back on to operate trains.
- 5. Radio Operation
 - a. Join a Duplex Group by first making sure that there is a good battery installed; plug into LocoNet (the Duplex Group name and channel number should appear, #11 through 26).
 - b. Configuring Duplex Group name Plug throttle into LocoNet; press EXIT; press OPTN and then EDIT; turn the L throttle knob to position the cursor and then the R knob to choose the character and press ENTER to accept the character; repeat until desire name is obtained; press ENTER to change the Duplex Group name (all throttles will need to rejoin on the new Group name).
 - c. Configuring the Duplex Group channel plug throttle into LocoNet; press EXIT; press OPTN then EDIT; press Y/+ to increase the channel number or N/- to decrease; press ENTER to change the channel number (all throttles will need to rejoin).
- 6. Consisting
 - a. Select the loco address of the TOP loco on the R throttle knob.
 - b. Select the address of the loco you want to consist on the L knob.
 - c. Before consisting make sure that both locos are set to operate in the desired direction.
 - d. Press the MU key; press the Y/+ key to add the loco address on the left knob or N/- to remove it.
 - e. The R throttle controls the consist.
- 7. Option setting:
 - a. Press OPT/t key to access the Options menu.
 - b. Use the R throttle to scroll through the options.
 - c. Use the Y/+ or N/- key to toggle the option values.
 - d. When satisfied with all changes, press ENTER.
 - e. Press EXIT at any time before pressing ENTER to cancel all changes.

Option Setting	Description	Options (Default in BOLD)	My Setting
RF1 mode	On enables Simplex	Off	
	radio	On	
Clicks	On enables clicking when making any keypad or knob changes	On Off	Off
NoBlstic	On enables ballistic tracking by providing rate-sensitive knob steps so faster turning gives bigger step changes.	Off On	
STimeout	On shortens the amount of time before the throttle kicks into Power Save when no changes have taken place.	On Off	Off
F3Static	On makes F3 key On/Off action	On Off	
F2 Mom	On makes F2 key momentary action, used for payable whistle where applicable	On Off	
SLFollow	On enables slot following mode for locomotives selected in multiple throttles	On Off	Off
ES->Idle	On stops entire layout when Emergency Stop key pressed. Off stops only locomotive selected in throttle.	Off On	

Option Setting	Description	Options (Default in	My Setting
	On onables Padie /IP	On	
FVVNJAVEI		Off	
	throttle inactivity		
		0.	
Оріхвао	On enables white	On	
	flashlight LED to blink	Off	
	when repeated Duplex		
	radio messages fail.	_	
DxRxLPwr	On enables maximum	On	
	Duplex power saving,	Off	
	disables continuous		
	update of slot		
	following.		
NewTypes	On allows throttle to	On	
	override command	Off	
	station new-type loco		
	speed step settings.		
Nu Type=	128 speed step setting	128	
	14 speed step setting	14	
	28 speed step setting	28	
	Advanced 128 speed	128A	
	step setting		
	Advanced 28 speed	28A	
	step setting		
Recall#	Recall stack set at last		
	4 entries	RC04	
	Last 8 entries	RC08	
	Last 16 entries	RC16	
BackLite	Maximum brightness	MAX 2	
	Maximum brightness	MIN 1	
	but lowest power		
	usage		
FactoryD	Select ON and press	On	
	ENTER key to force all	Off	
	options settings to		
	factory defaults		

Troubleshooting

1. RECOMMENDED BEFORE EVERY OPERATING SESSION AT A TRAIN SHOW (less frequently on a home layout)

FOLLOW THE INSTRUCTIONS BELOW TO SET COMMAND STATION OP SWITCH 39 TO "CLOSED" TO CLEAR ALL INTERNAL MEMORY STATES, INCLUDING LOCOMOTIVE ROSTER]:

- Ensure power to command station is ON.
- Disconnect the command station from BoosterNet (LocoNet in Digitrax terminology) by unplugging all RJ12 jacks from the front of the command station (or on the Free-mo layout by unplugging the BoosterNet output RJ12 jack located on the front of the Command Station Box).
- Connect a throttle directly to RJ12 jack A or B on the front of the command station or, on the Free-mo layout, plug the throttle directly to the BoosterNet jack on the front of the Command Station Box.
- Move the MODE toggle switch on the front of the command station to the "OP" position the toggle will point straight out from the command station, perpendicular to the front edge.
- Press the "SWCH" key on the throttle (on a DT402, DT402D, DT502, DT502D or similar is on the top-right of the keyboard, next to the "LOCO" button).
- The screen will show something like "Sw 001 == c" (could be a different number and the letter could be either "c" or "t").
- Using the key pad, key in the number of the switch to be changed, in this case it is switch 39. After doing so, the screen will show "Sw 039 == t" or else "Sw 039 == c". Even if the screen shows "Sw 039 == c" follow through with all of the following steps to ensure that they switch is indeed changed to "c".
- Press the "CLOC" key on the throttle (on a DT402, DT402D, DT502, DT502D or similar this is on the bottom of the keyboard, between the "OPTN" and "EMRG STOP" buttons). Pressing the CLOC key will result in the screen showing "Sw 039 == c". This closes switch 39.
- Move the MODE toggle switch on the front of the command station to the "SLEEP" position in which the toggle is pointing down; wait for a second.
- Move the MODE toggle switch on the front of the command station to the "RUN" position in which the toggle is pointing up.
- Remember to reconnect BoosterNet (LocoNet in Digitrax terminology). Track power will be off; use the throttle to turn track power on by pressing the "PWR" button at the bottom left of the keyboard and the "Y +" key in the second row from the top of the keyboard.
- 2. When running trains, if the throttle display shows "t-off" this is informing you that you need to turn the track power off and then to turn it back on again. Use a throttle to turn track power off by pressing the "PWR" button at the bottom left of the keyboard followed by the "N -" button in the second row from the top of the keyboard, followed by the "Y +" key.
- 3. When using a DB150 as a booster, there MUST be a jumper connecting the "CONF A" and "GROUND" terminals on the front of each DB150 (if this jumper is missing or becomes disconnected the DB150 runs as a command station and, since a layout cannot have two active command stations in operation at the same time, the system would not operate. If the command station or the DB150 emits 6 beeps in a row when powered on it means that

the DB150 has been powered up as a command station in a system that already has an active command station. Check the terminals on the front of the DB150 to see if the jumper wire is in place – it might have come loose. The solution is to ensure that the jumper is in place and then turn off power to the DB150 and then turn it back on (if this doesn't solve the problem, turn off both the command station and the DB150 for a few seconds after checking the jumper and then turn both back on).