# Known issues with the 21 December, 2004 Command Station software release

**Bug with Wangrow System One Master Cabs with potentiometer thumbwheel speed control:**
When using a WCT-01 cab, once a push button speed control is pressed, the thumbwheel speed control no longer functions. Cycle the power base station to restore the functionality of the thumbwheel.

**QSI decoders vs. Address programming:**
When programming the address (either on the mainline or program track) or using the Momentum button the verbal reporting of the CV values must be turned off (set CV62 = 0). When QSI decoders are 'talking' they do not respond to programming commands. Setting the address involves sending 3 different programming commands in rapid succession. If a QSI decoder is speaking the value of the first CV programmed it will miss the programming of subsequent Configuration Variables.

**QSI decoders vs. The Momentum button:**
The same applies to use of the Momentum button on the ProCab. Two Ops mode programming commands to CV3 and CV4 are sent in quick succession

**Atlas decoders vs. Programming on the Main:**
One sample locomotive, an H16-44 (decoder version 46), let us change the long address any way we wanted using Program on the Main. We couldn't change the short address at all. If we tried to change from a long address to a **new short address** the decoder would activate the **old short address** but it would not accept a new short address under any circumstances. All other Cvs programmed OK.

A GP-38 with factory installed DCC (decoder version 45) would not Program on the Main at all. Apparently some Altas decoders do not support Ops mode programming (Program on the Main) so you will not be able to change the address or use the Momentum button with these locomtives.

**Test for loco in use does not seem to work:**
Test for loco in use is off by default. You can turn it back on under the SET CMD STA menu. You will also need to set STOP PACKETS = 0 for the feature to work.

**Bug in sending function commands to a consist address:**
If you have SEND FUNCTION TO CON enabled all functions commands are sent properly to the lead locomotive address. Commands for F0-F4 and F9-F12 are also sent properly to the consist address. Commands to the consist address for F5-F8 are sent as commands for F9-F12. It has been corrected in the next version of system software.

Workaround:
Select the consist by its consist address and put it in Recall then select consist by the lead or rear loco address. Operate the consist normally. If you need to have F5-F8 controlled on mid consist locomotives then use the consist address in Recall.

**Bug in RB01 radio base station:**
When using Function Mapping via radio your cab will appear to stop working. This is due to a buffer overrun problem in the base station preventing it from sending necessary commands to the cab. We do not recommend function mapping while wireless. If you get into function mapping and the cab gets hung up cycle the power base station to correct the problem.

These pages replace the following sections
of your System One Manual:

OPERATING PROCEDURES (section 3)

PROGRAMMING PROCEDURES (section 4)

SOFTWARE (section 5)


This document is for
Wangrow System One Command Stations
upgraded with NCE's 12-21-2004 EPROM chip


NCE has announced that this will be the last
upgrade chip they will do for the System One

# NCE Corporation
## System Reference Manual
## Version 12/21/04
## for
# System One

**~Please Note ~**
The NCE Corporation 12/21/04 system upgrade provides access to functions 10, 11, and 12 and Momentum. A System One Cab cannot access these features. An NCE Pro Cab is able to access the extra functions as well as Momentum.

**The System One upgrade does NOT support:**
**~ One way radio cabs**
**~ Macro Panels**
**~ Signals, or the**
**~ Binary "A2" command**

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# OPERATING PROCEDURES

## THE "NORMAL" DISPLAY

Loco or consist currently being controlled

Current time from system fast clock

```
LOC:1234 03:00PM
FWD:108  L1-3---
```

Speed and direction of current loco

Status of locomotive decoder functions
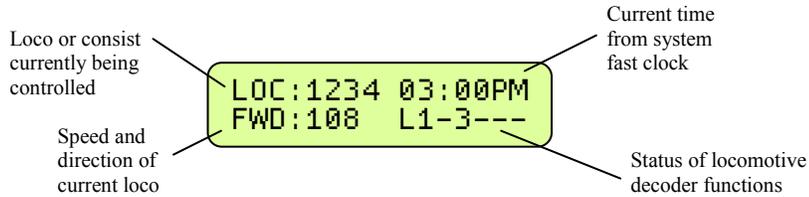
## TOP ROW OF DISPLAY

LOC: Indicates that a locomotive is being operated.
CON: Indicates that a consist is being operated.
2:00PM: Scale Time in either 12 hour or 24 hour format.

## BOTTOM ROW OF DISPLAY

FWD: or REV: Indicates the current direction of loco or consist
108 - Indicates the speed step to which the active loco/consist is presently set.
L123456 or - - - - - - -

Indicates which function outputs are ON. Those outputs that are OFF are displayed as dashes **(-).** The example above indicates that the Headlight, Function #1 and Function #3 are on.
Other status information may temporarily be displayed is this area.

# SELECTING A LOCOMOTIVE OR CONSIST

First a word about locomotive addresses. A decoder can have 2 different addresses, the Short Address (values from 1-127) and the Long Address (sometimes called 4 digit with a range of 0000-9999). A decoder can use one or the other but not both at the same time. Some entry level decoders can only use the Short Address.

As you can see above there is an overlap in the address ranges between the short and long address. You can have a **Long Address** of 6 and a **Short Address** of 6. They are *not* the same. To use a short address (range 1-127) it is selected on the cab by entering only the significant digits (no zeros before you get to the numbers). To enter a long address in the range of 0-127 put a zero before the digits. A long address between 0 and 127 will have an asterisk (*) before the loco address on the cab display as below:

```
LOC:*006 02:00PM
ENTER LOCO:    _
```
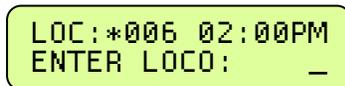
NOTE: You will notice that the short address 0 is not available but the long address 0 is listed as a valid address. Short address 0 is the "broadcast" address for DCC. If you were to send commands to short address 0 all locomotives on the layout would respond causing chaos. For this reason we don't allow use of short address 0. Long address 0 can be used just like any other locomotive address.

## To select a locomotive for operation:

- Press the **SELECT LOCO** button
- Enter the 1 to 4 digit address of the loco/consist to be operated. A "Leading Zero" is necessary for **long** addresses below 128. An asterisk will be displayed before any long address below 128 (example below).
- Press the **ENTER** key.

Locomotive address examples:

4421 = Long Address

006 = Long Address as entered.
*006 = Long Address as displayed

45 = Short Address as entered
045 = Short Address as displayed

**LOC:** will be displayed when addressing a single locomotive
**CON:** will be displayed when addressing a Consist.

# CONTROLLING HEADLIGHTS AND OTHER DECODER FUNCTIONS

Pressing **HEADLIGHT** will alternately toggle the headlight of the locomotive on and off.
To toggle other functions simply press the number key that corresponds to the function you wish to control. E.g. The 'I' key controls function I.
Your cab will display which functions are on and off on the lower right of the display. The letter 'L' stands for Headlight (Function 0) and numbers 1-6 stand for functions 1-6 (functions 7 through 12 are not displayed on the cab but work if you push the buttons). In the example below the headlight, functions 2 and 6 are on.

```
LOC:4449 xx:xxPM
FWD:02   L-2---6
```

# CONSISTS - OLD AND ADVANCED CONSISTS EXPLAINED

Before setting up any consist an explanation is needed to understand the operating differences between Advanced and Old Style consists (also called brute force or Universal). Basic decoders that have a short address but no CONSIST address (Early Lens, MRC 30x!3lx series and Digitrax 120 series Decoders) can not be used with advanced consisting.

## ADVANCED CONSISTS
Decoders that support advanced consisting have an additional short address, the CONSIST address, in addition to their normal Long and Short addresses. The consist address is stored in CV19 and can have a value of 1-127.
A decoder considers itself in a consist if the Consist Address (CV19) is something other than 0 or 128. A decoder is added to a consist when the command station sends a command to set the consist address in the decoder to the consist number. The decoder will now use this new consist address for speed and direction commands. This has many advantages including the need for fewer communications on the track and no need for the operator or command station to keep track of which locomotives are in what consist on the layout. Each locomotive in an advanced consist will still respond to function or programming commands at the original locomotive address. This means the operator can turn lights or other functions on or off for each locomotive individually.
To kill an entire consist, a command is broadcast on the tracks for each decoder with that consist number to clear its consist address and return to individual operation. Locomotives can also be individually dropped from a consist. You can also add locomotives to a consist after the initial set up of that consist.
Advanced style consists can easily be taken from layout to layout and they will continue to operate as a single unit.

## OLD STYLE CONSISTS (also called brute force or Universal)
With an Old Style consist, the command station keeps track of each locomotive in a consist within the memory of the command station. Each speed change of the cab generates a separate speed command to **each** of the decoders in the consist. These extra speed commands on the track have significant ramifications if you have a lot of consists operating at one time as in a club situation. The effect is to slow down locomotive response to the throttle speed controls.
Use this method of building a consist with MRC and Digitrax 120 series decoders. Decoders in an old style consist have no knowledge of being in a consist and will not operate as a unit when moved to another layout. You can add one or more advanced consists to any old style consist.

## SETTING UP AN ADVANCED CONSIST
To set up a consist press **SETUP.** This screen allows you to choose the type of consist to be created. For those consists that will contain advanced decoders, press **ENTER** to select the advanced mode.

```
CONSIST  02:00PM
ENTER=ADV  1=OLD
```

An advanced consist has *no* limit to the number of loco's assigned.
*NOTE. you can not setup, add a loco to. or delete a loco from a consist while the locomotive is moving. It must be at speed 0.* Decoders will not accept consist commands while they are in motion. This prevents reception of false consist make/break commands due to electrical noise generated by the wheels rolling on the track.

## CONSIST ADDRESS:
The consist address can be any number from 1 through 127. The system will suggest the first available consist address (the priority is highest to lowest). Press enter to accept this address.

```
SETUP     02:00PM
CON ADDR:     127
```

You may enter any other number you wish then press the ENTER key. If you have locomotives on the layout using short addresses make sure you don't pick an address already in use. This is one reason to use long addresses with your loco fleet. It will keep the short addresses free for consists.

## ENTERING THE LEAD LOCO NUMBER

Entering the lead loco number is optional but recommended. The command station keeps track of consists by their lead loco number.
The locomotive is the loco that the command station will send function commands to. For example: headlight on/off commands. If the command station did not know the lead loco it would not know which locomotive should have the headlight turned on or off.
The lead loco number also acts as an *alias* for the consist number entered above. Say you have a bunch of consists stored on staging tracks and you wish to operate one of them. After the consist is set up, you can select the consist by pressing **SEL LOCO** then entering either the lead loco number or the consist number. The lead loco number is typically easiest to remember because it is the number printed right on the locomotive. The consist address may not relate to any visible or easily remembered number.

```
SETUP     02:00PM
LEAD LOCO:       _
```

Enter the lead loco number followed by pressing the **ENTER** key.

## ENTERING THE LEAD LOCO DIRECTION

If the locomotive is to operate in the forward direction press ENTER. Press the **DIRECTION** key if you wish to have the locomotive operate in the reverse direction. Subsequent presses of the **DIRECTION** key will keep changing the direction. When you get the direction you desire press the **ENTER** key.

```
CONSIST  02:00PM
DIR THIS LOCO: F
```

This informs the decoder if the loco is in the line-up facing forward or reverse. For instance, in an A-B-A consist the lead A unit and the B unit will be setup in the Forward direction, and the second A unit will be setup in the Reverse direction.

## ENTERING THE REAR LOCO NUMBER

Entering the rear loco number is optional. The command station keeps track of consists by their lead or rear loco number. If you select the consist by the rear loco number the direction of the Consist will be reversed from the direction of operation if you selected it by the lead loco. You don't have to enter a rear loco number if you don't need/want to operate the consist in reverse. The rear loco number also act as an *alias* for the consist number just as the lead loco number.

```
SETUP     02:00PM
REAR LOCO:       _
```

Enter the rear loco number followed by the ENTER key.
NOTE: If you plan on dropping the rear loco from the consist later on, DO NOT enter it as the rear loco. Enter it later on when prompted for mid-consist locos.

## ENTERING THE REAR LOCO DIRECTION

If the locomotive is to operate in the normal direction press ENTER. Press the **DIRECTION** key if you wish to have the locomotive operate in the reverse direction. Subsequent presses of the **DIRECTION** key will keep changing the direction. When you get the direction you desire press the **ENTER** key.

```
CONSIST  02:00PM
DIR THIS LOCO: F
```

## ADDING A MID-CONSIST LOCO

At this point you can start to add more locomotives to the consist. Enter the next locomotive (decoder address) followed by pressing the **ENTER** key. If you don't want to add any more locomotives to the consist just press **ENTER**.

```
CONSIST  02:00PM
ADD LOCO:        _
```

## ENTERING THE LOCO'S DIRECTION

```
CONSIST  02:00PM
DIR THIS LOCO: F
```

As with the lead locomotive, this informs the decoder if the loco is in the line-up facing forward or reverse.
If the locomotive is to operate in the normal direction press **ENTER.** Press the **DIRECTION** key if you wish to have the locomotive operate in the reverse direction. Subsequent presses of the **DIRECTION** key will keep changing the direction. When you get the direction you desire press the **ENTER** key.
At this point you will be prompted to add additional locomotives. If you don't want to add any more locomotives to the consist just press **ENTER** or **PROG/ESC** without entering an address.

## DROPPING A LOCOMOTIVE FROM AN ADVANCED CONSIST

To delete a consist locomotive press DEL

```
DEL LOCO 02:00PM
ENTER LOCO:    _
```

This will drop the loco identified from whatever consist it was part of. There is no need to know the consist number for this operation. You cannot drop a lead or rear loco without clearing the entire consist. Deleting a loco sets CV19 to a value of 0 in that loco.

## ADDING A LOCO TO AN ADVANCED CONSIST

Select the consist.

```
ADD LOCO 02:00PM
CONSIST ADDR:  _
```

Press **ADD**. Enter the address of the consist, or lead loco, to which the loco is to be added and then press the **ENTER** key.

```
ADD LOCO 02:00PM
ADD LOCO:      _
```

Enter the loco number to be added and press the **ENTER** key.
Enter the loco's direction

```
CONSIST  02:00PM
DIR THIS LOCO: F
```

If the loco is to operate in the normal direction press **ENTER,** otherwise press the **DIRECTION** key followed by pressing the **ENTER** key. This informs the decoder whether the locomotive is in the line-up facing forward or reverse.

## CLEARING AN ADVANCED CONSIST

Press **CLEAR**. Select the consist to be cleared.

```
LOCO:444902:00PM
KILL CONSIST:  _
```

Enter the lead or rear loco number and press **ENTER.** This sends a command to all decoders with this consist address to clear the consist address from the decoder. You can also enter the consist address if you know it. All locomotives that were assigned to this consist will no longer respond to the consist address.

## CHANGING THE LEAD/REAR LOCO

Under some circumstances it is desirable to change which locomotive is to act as the lead loco of a consist. One of these circumstances is when you want to drop the lead/rear loco from the consist. The command station will not allow you to drop the lead/rear loco so you will want to assign a new locomotive as lead/rear. Then you will be able to drop the old lead loco.

```
SETUP    02:00PM
CON ADDR:      _
```

The first step is to press **SETUP**. Then enter either the consist number of the current lead loco number (address). Then press **ENTER**.

```
SETUP    02:00PM
LEAD LOCO:     _
```

Enter the *new* lead loco number and press **ENTER**. If the new lead loco is to operate in the forward direction press **ENTER**. Press the **DIRECTION** key if you wish to have the locomotive operate in the reverse direction. When you get the direction you desire press the **ENTER** key.

```
CONSIST  02:00PM
DIR THIS LOCO: F
```

You are now finished changing the lead locomotive of the consist.

Use a similar procedure to change the rear loco.

# OLD STYLE CONSISTS

Once set up, an old style consist will stay with the cab until assigned to another cab or cleared. It may be "stored" in recall if you wish to operate another train.

## SETUP AN OLD STYLE CONSIST

```
CONSIST  02:00PM
ENTER=ADV  1=OLD
```

Press **SETUP.** This screen allows you to choose the type of consist to be created. For those consists that will contain any basic decoders, press 1. Please note that the limit on an old style consist is four locomotives or advanced consists. NOTE: Once you setup an old style consist you will not be able to select a new locomotive to run unless you store the consist away by pressing recall (or clear the consist). Each cab may have up to 6 old style consists in recall.

## INITIAL SCREEN DISPLAYED

```
CON: 000 02:00PM
  000  000   000
```

This screen is displayed to show all 4 "slots" for loco's in the consist are empty. Press the **ENTER** key to continue.

## ENTERING THE LEAD LOCO NUMBER

```
CON: 000 02:00PM
ADD LOCO:       _
```

Enter the loco number followed by the **ENTER** key. The first loco to be added will be the lead loco (the lead loco number will be displayed on the screen during normal operation). The consist will respond to this number.

## ENTERING THE LOCO DIRECTION

```
SETUP     02:00PM
DIR THIS LOCO: F
```

The locomotive direction is assumed to be forward, if it is to operate in reverse press the **DIRECTION** key. This informs the command station if the loco is in the line-up facing forward or reverse. This effects only the direction of the loco, not lighting. Press the **ENTER** key to continue.
The operator needs to press **ADD** for every loco to be added. This operation leaves the consist as the active unit for this Cab.

## OLD STYLE CONSIST FULL

```
CON: 012 02:00PM
CAN NOT ADD LOCO
```

The consist contains four loco's which is the maximum amount that we support in this style of consist. Press the **ENTER** key to continue.

## FOLLOW-UP SCREEN

```
CON: 012 02:00PM
CONSIST NOW FULL
```

This screen reaffirms the previous screen. Press the **ENTER** key to continue.

```
CON: 042 02:00PM
  008R 101   4449R
```

The **R** indicates that the loco is reversed in the consist.
Loco 42 is the lead loco (short address of 42).
Loco 8 is a loco operating backwards.
Loco 101 is a locomotive operating forward.
Loco 4449 is a locomotive operating backwards.

## ADDING A LOCO TO AN OLD STYLE CONSIST

```
CON: 012 02:00PM
FWD: 000 L------
```

With an Old Consist, you can only add a loco to an active consist on your cab. If the consist is not active press **RECALL** until you have the consist active or acquire the consist from another cab by "ASSIGN LOCO TO CAB".

## ENTERING THE LOCO NUMBER

```
CON: 012 02:00PM
ADD LOCO:      _
```

Enter the loco number to add and press **ENTER.**

## ENTERING THE LOCO DIRECTION

```
CON: 012 02:00PM
DIR THIS LOCO: F
```

If the locomotive is to operate in the forward direction press **ENTER.** Press the **DIRECTION** key if you wish to have the locomotive operate in the reverse direction. Subsequent presses of the **DIRECTION** key will keep changing the direction. When you get the direction you desire press the **ENTER** key.

## DROPPING A LOCO FROM AN OLD STYLE CONSIST

```
CON: 012 02:00PM
FWD: 120 L------
```

You can only delete a loco from an active consist on your cab. If the consist is not active press **RECALL** until you have the consist active or acquire the consist from another cab by "ASSIGN LOCO TO CAB".
Press **DEL.**

```
DEL LOCO 02:00PM
ENTER LOCO:     _
```

This will drop the intended locomotive from old style consist. Enter the loco number and the press **ENTER**.

## ERROR MESSAGE

```
DEL LOCO 02:00PM
NOT IN CONSIST
```

This message will display when the loco selected is not in the active consist.

## CLEARING AN OLD STYLE CONSIST

```
CON: 012 02:00PM
 024  056   078
```

Press **CLEAR.** You can only clear an old style consist if it is the active consist on your cab. If the consist is not active press **RECALL** until you have the consist active or acquire the consist from another cab by "ASSIGN LOCO TO CAB".

## CONFIRM THAT THE CONSIST IS TO BE KILLED

```
KILL?    02:00PM
ENTER=NO   1=YES
```

Press 1 to clear the consist from the Command Station memory. All locomotives that were in the consist may now be selected and operated independently.

# CONTROLLING TURNOUTS AND OTHER ACCESSORIES

## ENTER THE ACCESSORY NUMBER TO BE OPERATED

```
CONTROL  02:00PM
ACC NUMBER:    _
```

Press **SELECT ACCY** key. Enter the address of the accessory to be operated. Followed by pressing the **ENTER** key. Valid accessory addresses range from I to 2044.

## TURN ACCESSORY ON OR OFF

```
ACC: 003 02:00PM
1=N(ON) 2=R(OFF)
```

Press **1** to turn accessory ON. (Switch machine set to Normal)
Press **2** to turn accessory OFF. (Switch machine set to Reverse)

# THE MOMENTUM BUTTON

When you press the momentum button you are prompted to enter a momentum level. There are 9 levels of momentum (1-9) plus 'direct drive'(0). Pressing a digit button from 0-9 will automatically set the acceleration and deceleration rates of the locomotive(s) being controlled.

Pressing 0 sets the momentum of the train to 0 effectively turning it off.  1 is the smallest amount of momentum, 9 is the most. If you are operating an Advanced or Old Style consist setup in the command station all locomotives will have their momentum set. If an Old Style consist includes one or more Advanced consists all locomotives in the Advanced consist (up to 6 per advanced consist) will also have their momentum set properly.

    **Technical stuff** - what happens when you set momentum:

    The digit entered is multiplied by 8 (factory default) and sent to CV3. The value sent to CV4 is 1/2 half (factory default) the value sent to CV3. You can change these multipliers.

    You can setup the following momentum parameters in the SET CMD STA menu:

    The acceleration multiplier can be set to a value in the range of 0-25.

    The deceleration can be set to FULL or HALF the value sent to CV3.

    You can disable the sending of momentum commands to consists.

If a decoder follows NMRA Recommended Practice 9.2.2 the rates will be as shown below with the factory default settings (multiplier = 8 and deceleration = half).

    Rate I = 7 seconds to full speed, 3 seconds to stop

    Rate 2 = 14 seconds to full speed, *7* seconds to stop

    Rate 3 = 21 seconds to full speed, 10 seconds to stop

    Rate 4 = 28 seconds to full speed, 14 seconds to stop

    Rate *5* = *35* seconds to full speed, 17 seconds to stop

    Rate 6 = 42 seconds to full speed, 21 seconds to stop

    Rate 7 = 49 seconds to full speed, 24 seconds to stop

    Rate 8 = *54* seconds to full speed, 27 seconds to stop

    Rate 9 = 61 seconds to full speed, 30 seconds to stop

If a consist is active when MOMENTUM is pressed the button will do nothing unless "CONSIST MOMENTUM" is enabled (factory default) in the SET CMD STA menu.

Momentum commands will be sent to a limit of 6 locos per Advanced consist.

**Notes regarding momentum commands and decoders:**
There are special commands for setting *consist* momentum (CV23 and CV24) but many decoders *do not* support these CV's.

CV3 and CV4 are *required* and have standardized values in decoders per RP-9.2.2.

Support for consist CV23 and CV24 is *not required* in decoders, this is why we use CV3 and CV4 for consist momentum.

Sound equipped locomotives that verbally speak the value of CVs must be turned off by setting CV 62 to a value of 0 for momentum to work properly. Setting CV 62 to a value of 1 turns the verbal response back on.

# USE MACROS TO CONTROL TURNOUTS

## MACROS EXPLAINED
Macros are really a list of turnouts controlled by accessory decoders that you wish to operate as a group. There are a total of *256* of macros, each one capable of controlling up to 10 turnouts. Macros may be 'chained' with other macros to create complex routes with hundreds of turnouts.

## ENTER THE MACRO NUMBER TO BE EXECUTED

```
LOC: 102302:00PM
MACRO NUMBER:   _
```

• Press **MACRO** key.
• Enter the number of the macro *(0-255)* to be executed
• Press ENTER.

## MACRO NOT SET UP

```
ERROR:    02:00PM
-MACRO IS EMPTY-
```

This message will be displayed if no macro has been programmed for the number entered.

## MACRO PROGRAMMING
To program a macro see the PROGRAMMING MACRO section.

# PROGRAMMING PROCEDURES

## ACCESSING PROGRAMMING MODES

To access the various programming modes, press the **PROC** key. The following messages will be displayed for each press of the **PROC** key. When the desired mode is displayed, press the **ENTER** key to enter that mode. To quickly get to a programming mode, press the **PROC** key and then press the number of the screen. If you have pressed the **PROC** key by mistake, or want to exit without having to press the **PROG** key several times, press **EXPN**. Refer to the following sections for the individual programming instructions. To escape from any programming session press the **PROG/ESC** key.

To program locomotive decoders on the main (OPS mode) press **ENTER**

```
SEL MODE 02:00PM
PROGRAM ON MAIN
```

To assign a locomotive/consist to a Cab press **ENTER**. [2]

```
SEL MODE 02:00PM
ASSIGN LOCO->CAB
```

To start, stop, or set the System Clock press **ENTER** [3]

```
SEL MODE 02:00PM
SET SYSTEM CLOCK
```

To program on the program track press **ENTER** [4]

```
SEL MODE 02:00PM
USE PROGRAM TRK
```

To set command station parameters press **ENTER** *[5]*

```
SEL MODE 02:00PM
SET CMD STATION
```

To set the Cab parameters press **ENTER** *[6]*

```
SEL MODE 02:00PM
SET CAB PARAMS
```

To program accessory decoders on the main press **ENTER.** [7]

```
SEL MODE 02:00PM
PROG ACCESSORIES
```

To setup macros (routing through turnouts) press **ENTER**. [8]

```
SEL MODE 02:00PM
PROGRAM MACROS
```

To browse through all the advanced consists in the system, press **ENTER** [9]

```
SEL MODE 02:00PM
BROWSE CONSISTS
```

To program accessory decoders on the main press **ENTER**. [10]

```
SEL MODE 02:00PM
PROGRAM SIGNALS
```
Not avail on SysOne

# PROGRAMMING ON THE MAIN

Programming on the Main is also called Operations (OPS) Mode programming. OPS programming allows you to change parameters while the loco is on the main track (even while it's *running)*. This does not affect other locomotives on the track. You can even change the locomotive address.

```
OPS PROG 02:00PM
PROG LOCO:   003
```

We first begin by telling the system which locomotive to program. If you want to program the locomotive you are currently operating just press **ENTER.** If you wish to program a different locomotive just enter its address at the above prompt.

## WHAT TO PROGRAM

After determining which locomotive you wish to program you will see the following display. The Power Pro system provides 9 different OPs mode programming options.

```
LOC:1022 02:00PM
1=ADR 2=CV 3=CFG
```

The first three options are displayed. Press **ENTER** to see more options. For example: If you wish to set the locomotive address press I, if you want to program CVs press 2.

Descriptions of each programming option are described below.

```
1.......... SET UP LOCOMOTIVE ADDRESS
2.......... CHANGE ANY CV IN THE DECODER
3.......... SET UP THE DECODER CONFIGURATION (CV29)
4.......... MOTOR CONTROL
5.......... FUNCTION MAP
6.......... NCE EFFECTS
7.......... SOUNDTRAXX
8.......... QSISOIJND
9.......... BINCV
```

# ADDRESS PROGRAMMING (Option 1)

This option provides a means by which to program the address of your locomotive. Most decoders allow programming of the locomotive address while on the mainline. The first thing to do is decide if you want to program a long or short address into the locomotive.

```
SET ADDR 02:00PM
1=LONG  2=SHORT
```

In DCC there are 2 kinds of addresses (loco numbers), long and short. Short addresses range from 1 to 127 and long addresses range from 0-9999. We normally recommend using long addresses for all your locomotives. Consists require the use of a short address so it is better to conserve short addresses by using long addresses for individual locomotives. Push the digit button that corresponds the type address you wish to program. You will then be presented with the display below.

```
SET ADDR 02:00PM
LONG ADDR:      _
```

Enter the new address for the locomotive. The new address will be sent to the locomotive and you will be returned to the normal display with the locomotive selected and ready to run. Most decoders allow programming the address while on the mainline. If you are using a locomotive with a sound decoder from QSI you will need to turn off verbal programming acknowledgment (set CV62 to 0) for the address to be set properly. If your locomotive does not allow setting the address on the mainline you will need to set it on the programming track. You can press **PROG/ESC** to escape out of setting the address without affecting anything in the decoder. No commands are sent until you press **ENTER** after typing in the address.

# CV PROGRAMMING (Option 2)

This option allows you to change *any* configuration variable (range of 1-999) in your decoder.

## ENTER CONFIGURATION VARIABLE NUMBER

All configuration variables can be set while on the mainline. Just pressing ENTER without typing in a number will return you to the main OPS programming prompt. Pressing **PROG/ESC** will completely exit from programming and return you to the normal display.

```
PROG CV  02:00PM
ENTER CV NUM:  _
```

## ENTER THE VALUE

The value to be programmed into the CV should be entered at the above prompt. Pressing **PROG/ESC** before or during number entry will completely exit from programming and return you to the normal display.

```
PROG CV  02:00PM
ENTER VALUE:   _
```

# SET DECODER CONFIGURATION (Option 3)

This option will setup the various decoder configuration parameters. There are six of these parameters squeezed into one CV. You will be asked a series of questions regarding the basic operation of the locomotive. If you are in doubt about the proper answer just press **ENTER** and you will usually be OK.

## DIRECTION BIT - NORMAL OR REVERSE

Press **ENTER** for the locomotive to operate in the normal direction or press **1** to switch the direction of operation.

```
DIR BIT? 02:00PM
ENTER=NORM 1=REV
```

## SPEED STEPS - 28 OR 14

Press **ENTER**. All decoders made since 1997 support 28 speeds. NOTE: If you are wondering how to set the decoder for 128 speed operation, you do not have to program anything. 128 speed mode is always enabled in decoders that support 128 speed step operation.

```
SPEED    02:00PM
ENTER=28 1=14   _
```

## DC (Analog) MODE

Press **ENTER** to turn DC operation mode off, press **1** to turn DC mode on. We recommend leaving DC mode off for most layouts. This is to prevent all your locomotives from taking off at once in case of a failure in your power station or someone accidentally connecting the track to a DC power supply (it happens more often than you might think).

```
DC MODE  02:00PM
ENTER=NO 1=YES _
```

## ADVANCED ACKNOWLEDGE

Press **ENTER** to turn Advanced Acknowledge mode off, press **1** to turn Advanced Acknowledge mode on.

```
ADV ACK? 02:00PM
ENTER=NO 1=YES  _
```

NOTE: advanced acknowledgment is not operational in any decoders at this time as the NMRA has not defined how it is to work.

## SPEED TABLE SELECTION

If the Standard Speed Table is to be used, press **ENTER**. If the Alternate (uploadable) Speed Table in the decoder is to be used, press **1**.

```
SPEEDTBL 02:00PM
ENTER=STD 1=ALT_
```

## ENABLE LONG OR SHORT ADDRESS

The short address is used when operating on DCC systems that do not use long addresses.

```
ADDRESS  02:00PM
ENTER=S 1=LONG _
```

# SET MOTOR CONTROL PARAMETERS (Option 4)

This option can be used to setup the various locomotive motor speed control parameters. You can skip adjusting any of these parameters (CV5) by pressing **ENTER** without entering the first adjustment is:

## START VOLTAGE (CV2)

Start voltage is the amount of voltage the decoder sends to the motor when a speed step 1 command is sent to the locomotive. This is some extra voltage to help get the motor running. You can put in any value from 0-255. If you put in a value of 10 then 10/255 (about 4%) of the full motor voltage will be applied to the motor at speed step 1.

```
   OPS PROG 02:00PM
   START VOLTS:     _
```

In most decoders the start voltage is added to each speed step. A good way to setup the Start Voltage is to first set your throttle to speed 1 then go into this Start Voltage programming and try different values until you get the desired starting speed. This approach can be used with most of the motor speed adjustments. You may exit programming at any time by pressing **PROG/ESC.**

## MAXIMUM VOLTAGE (CV5)
This is the amount of voltage applied to the motor at full speed. A value of 255 means send the full available track voltage to the motor. Lower numbers will tell the decoder to send proportionally less voltage when full speed is called for.

```
   OPS PROG 02:00PM
   MAX VOLTAGE:     _
```

A value of 192 will cut the maximum speed to 192/255 (about 75%) of the track voltage. Most decoders interpret a value of 0 to mean 255.

## MID SPEED VOLTAGE (CV6)
This is the amount of voltage applied to the motor when the middle speed step (14 or 64 depending on speed mode) is requested. A value of 128 means to send about 1/2 the available track voltage (128/255 of the voltage) to the motor.

```
   OPS PROG 02:00PM
   MID VOLTAGE:     _
```

Lower or higher values will send proportionally higher or lower voltages at mid-speed. Most decoders interpret a value of 0 to mean 128.

## ACCELERATION (CV3)
With this CV set to 0 the decoder will be in what is commonly called 'direct drive'. The decoder will instantly jump to the speed requested by the throttle. You can add momentum by adjusting this parameter.

```
   OPS PROG 02:00PM
   ACCELERATION:    _
```

A value of I will force a delay of 0.007 seconds between speed steps in 128 speed mode (0.032 seconds in 28 speed mode). This is equivalent to 0.896 seconds (0.007 x 128 speeds) to go from speed 0 to full speed. A value of 10 will yield about 8.9 seconds to full speed.

## DECELERATION (CV4)
Deceleration works to delay the slowing down of the motor with the same timing as acceleration.

```
   OPS PROG 02:00PM
   DECELERATION:    _
```

## MOTOR PWM FREQUENCY (CV9)
DCC decoders almost always drive the motor of the locomotive with Pulse Width Modulation (PWM). This is a series of full voltage pulses that vary in width from very narrow for low motor speed to very wide providing higher power to the motor. How often the pulses are sent is called the frequency.

```
   OPS PROG 02:00PM
   PWM FREQ:        _
```

The frequency is adjustable on some decoders. Settings for this CV vary so consult your decoder manual for the proper value. If your decoder is capable of 'silent' operation usually a 0 is required.

## NCE TORQUE COMPENSATION KICK RATE (CV116)
Newer NCE decoders provide Torque Compensation for smooth low speed operation. Torque Compensation gives a steady stream of 'kicks' to the motor when running at very low speeds. You can adjust how *often* the motor is kicked (Kick Rate) and how *hard* it is kicked (Kick Strength). CV116 controls the rate.

```
   OPS PROG 02:00PM
   KICK RATE:       _
```

The typical value is 2-4 with the maximum practical value of about 6. The smaller the number the more often the motor gets a brief voltage kick. A value of 0 turns off the kick. A value of 1 kicks to the motor continuously (not very useful). When using Torque Compensation set the Start Voltage to 0 for best operation.

## NCE TORQUE COMPENSATION KICK DEPTH (CV117)

This is how hard the motor is kicked at low speed. Typical values range from 1 to 40. High quality motors (Kato) need very little kick strength where lower quality motors such as old Athearn and LifeLike need relatively (30-50) large values for slow speed crawling,

```
OPS PROG 02:00PM
KICK DEPTH:    _
```

Tips for setting up T/C (Torque Compensation):
- Start by setting the locomotive speed to 1 on your throttle. Then use PROGRAM ON THE MAIN to:
- Adjust the Kick Rate to 2.
- Set the Kick Depth to 20 then adjust this value up or down until the locomotive just barely crawls.

It may be easier to set the T/C with the body shell removed from the locomotive so that you can see the flywheels turn. When you get fairly good slow speed operation go back to the Kick Rate and try bumping the value up by 1 or 2 to see if the operation improves.

## DECODER OUTPUT/FUNCTION MAPPING (Option 5)

General Discussion of function mapping:

Function mapping is used to customize which lighting outputs (or sound effects) are controlled by which function keys on your handheld throttle. Each function command, F0 through F12, is assigned a unique CV that allows the corresponding function command to be redirected to up to 14 different lighting outputs or sound effects.

A single function key can control more than one output if desired.

It is also possible for one output to be controlled by multiple function keys. In this case, the output will be turned on when any of the corresponding function keys are active. That output will turn off only when all relevant inputs have also been turned off. Note that all function commands cannot be mapped to all outputs. The LCD display on your ProCab will indicate only those outputs that can be mapped to each function command.

The F0 function has two CVs - one for forward direction and one for reverse. Function outputs mapped to these CVs will be directional unless the same output is mapped to both CVs. CVs 33 and 34 are both for the F0 function.

On NCE decoders CV33 and CV34 do not provide directionality (see SETUP NCE LIGHTING EFFECTS below) but otherwise operate the same as above. With NCE decoders direction of operation for function outputs is provided by the lighting effects CV5 (120 through 127). Lenz and TCS decoders do not follow NMRA standard function mapping procedures. When you select function mapping you are prompted for the function number to map.

```
PRESS FUNCTION
NUMBER TO MAP
```

The top line of the LCD displays the function number and the output numbers that can be controlled by the function.

```
F2      12345678
OUTPUTS:   4
```

Pressing a digit key will enable the output on the decoder when the function is activated. Pressing the same digit key again will disable the output. In the display above the 4 key has been pressed so that output number 4 will activate when ever the F2 button is pressed on your handheld cab. If you were to press another digit such as 6, both output 4 and output 6 will be controlled by pressing F2.

When mapping functions higher than 3, the top line of the LCD will use small numbers to indicate the output numbers 10 through 14.

To enable/disable these high numbers press the digit key that is 10 less than the output number.

Example: press 0 for output 10, 1 for output 11, etc.

Pressing PROG/ESC will exit from mapping at any time.

## SETUP NCE LIGHTING EFFECTS (Option 6)

You can use this option to customize the lighting effects for your NCE decoder equipped locomotives. This programming option will only work with NCE decoders.

```
NCE EFX  02:00PM
OUTPUT NUMBER: _
```

Function outputs are numbered from 1 to 14. Do not confuse *Output* numbers with *Function* numbers. The headlight is always output 1 and the reverse light is usually output 2. You are prompted for the output number to setup. Press the output number followed by **ENTER**.

```
OUTPUT NUMBER:03
USE THUMBWHEEL
```

Use the thumbwheel or up/down speed buttons to scroll through the different lighting effect options. Press **ENTER** when you get the one you want.

```
┌─────────────────────────┐
│ DIR OF OPERATION        │
│ 1=FW 2=RV 3=BOTH        │
└─────────────────────────┘
```

Next press 1, 2 or 3 to select the 'directionality' of the output. If you want the output active only in the forward direction of travel - press **1**. Press **2** for the effect to operate only when traveling in reverse. 3 activates the output no matter which direction the locomotive is traveling.

```
┌─────────────────────────┐
│ REGULAR BULB  OR        │
│ LED 1=BULB 2=LED        │
└─────────────────────────┘
```

Last, press **1** if the output has a regular incandescent bulb attached. Press **2** if the output has an LED connected. LEDs behave differently when dimmed than incandescent bulbs. Pressing 1 or 2 informs the decoder which set of lighting characteristics to use for this output.

## SOUNDTRAXX TSUNAMI PROGRAMMING (Option 7)

Soundtraxx Tsunami decoders have a special indexed programming method for setting up sound and lighting effects. When programming CVs 120-127 you will be asked for an index number before you are asked for the CV value. CV119 is then automatically set with the index value before the CV is set with the desired data. All other CVs are programmed in the same manner as Option 2 (CV PROGRAMMING).

## QSI PROGRAMMING (Option 8)

**QSI** sound decoders use indexed programming of CV51, CV52, and CV56. You are asked for an index number before you are asked for the CV value. CV49 is then automatically set with the index value before the original CV is set with the desired data.
When programming CV56 you are asked for primary and secondary index numbers before you are asked for the CV value. CV49 and CV50 are then automatically set with the index numbers before CV53 is set with the desired data.
All other CV's are programmed in the normal manner.

## BINARY CV PROGRAMMING (Option 9)

Use this option if you need to build up the value for a CV bit-by-bit. Enter the CV number you wish to program.

```
┌─────────────────────────┐
│ BIN PROG 02:00PM        │
│ ENTER CV NUM:  _         │
└─────────────────────────┘
```

Then press bit number (top line of LCD has bit numbers) to toggle the corresponding individual bits on the lower line of the LCD that make up a binary byte. In the example below the 1, 3 and 7 keys have been pressed to set the corresponding bits in the byte. To set the value of a bit back to 0 press the bit number again.

```
┌─────────────────────────┐
│ CV: 060 76543210        │
│ BITS    10001010        │
└─────────────────────────┘
```

When you get the value built up to the number you desire, press **ENTER** to program the CV.

# ASSIGNING A LOCO TO A CAB   (shortcut = PROG 2)

This selection passes a loco from one cab to another. This is especially useful when the other operator is a novice or has a Basic Cab. The Locomotive/consist is passed to the assigned cab and the locomotive/consist controlled by the other cab is passed back to the original cab. In effect the locomotives controlled by the cabs are "swapped". This way you will not accidentally 'lose' a locomotive in the system.

## ASSIGN THE LOCO

Enter the loco/consist number you want to assign to another cab, then press **ENTER**. If you want to assign the loco you are currently running just push **ENTER.**

```
ASSIGN   02:00PM
WHICH LOCO: _003
```

## ASSIGN THE CAB

You need to know the address of the cab you want to 'receive' the loco you are assigning. Enter the Cab number then press **ENTER**.

```
LOC:1234 02:00PM
TO WHICH CAB?   _
```

This operation is also useful to transfer an old style consist to a smaller cab.

# SET THE SYSTEM CLOCK    (shortcut = PROG 3)

This allows the operator to start/stop the clock, set it, choose 12 or 24 hour operation, or change the fast clock ratio.

## STOPPING THE CLOCK
Press **1** to stop the clock, press **ENTER** to leave the clock running and continue with clock programming. If the clock is already stopped, you will be prompted to start it.

```
STOP?    02:00PM
ENTER=NO 1=STOP
```

## SETTING 12 or 24 HOUR MODE
Press **1** for 12 hour mode, press **ENTER** for 24 hour mode.

```
SET TIME 02:00PM
1=12HR  2=24HR _
```

## ENTERING THE HOUR
Enter the starting hour in 24 hour format. For times in the A.M. use 0 to 11. For times in the P.M. use 12 to 23. Press **ENTER**.

```
SET TIME 02:00PM
ENTER HOURS:   _
```

## ENTERING THE MINUTE
Enter the starting minute. Use 0 through 59. Press **ENTER.**

```
SET TIME 02:00PM
ENTER MINUTES: _
```

## ENTERING THE RATIO
enter the ratio that the clock should run at with 1 being the normal speed. The ratio can be any number from 1:1 to 15:1. Press **ENTER**.

```
SET TIME 02:00PM
ENTER RATIO:   _
```

## STARTING THE CLOCK
If the clock was stopped, entering SET THE SYSTEM CLOCK will display this screen to let you start (or restart) the clock. Press **1** to start the clock, press **ENTER** to leave the clock stopped and continue with clock programming (see above).

```
START?   02:00PM
ENTER=NO 1=START
```

# USE PROGRAM TRACK   (shortcut = PROG 4)

Locomotive decoders remember their operating parameters such as the address, start voltage and lighting effect setups in the decoder's memory. Each storage location is called a Configuration Variable, or CV for short. There is usually a CV for each programmable parameter. The Power Pro allows you to change any or all of the CVs in the loco, including the address. These variables will remain as programmed until you change them. Programming on the Main (covered earlier in this manual) is very useful for modifying one, two or a few CV5 while the locomotive is out on the layout. The Program Track is useful for more intensive initial setup of a locomotive. The biggest advantage is the ability to read out the values of CVs already setup in the locomotive decoder.

Please note: The programming track does not supply enough power to run your locomotive. It has enough power to program the decoder but not enough to cause damage to a miswired decoder or run a motor. You can only run trains on the main track. We recommend that you always try out a newly installed decoder on the Program Track first. If you can 'read' a decoder in the Program Track you can reasonably expect that it is wired correctly and working properly.

## PROGRAMMING OPTIONS

Just as with Programming on the Main there are several menu options you can select. The Power Pro system provides 7 different Program Track options.

Descriptions of each programming option are described below.

1 – STANDARD DECODER SETUP, including
    Address, Configuration and Function Mapping.

2 – CHANGE ANY CV IN THE DECODER
    Reads and programs CVs 1-999.

3 – SET UP THE DECODER CONFIGURATION (CV29)
    Change direction of operation, analog mode on/off, 14/28 speed mode, long or short address, factory or custom speed table.

4 – PAGED MODE PROGRAMMING
    Force the system to use paged mode programming.

5 – DIRECT MODE PROGRAMMING
    Force the system to use direct mode programming.

6 – NCE EFFECTS
    Setup NCE lighting effects.

7 – RECOVERY PROGRAMMING
    Reprograms selected decoder CVs in an attempt to get an 'insane' decoder back to somewhat normal operation.

The first three options are displayed below. Press ENTER to see more options. For example: If you wish to use program the "Standard" locomotive parameters, press 1, if you want to program decoder CVs press 2.
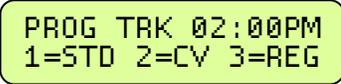
```
PROG TRK 02:00PM
1=STD 2=CV 3=REG
```

This screen allows the user to select the method of programming to suit the decoder you are using. There are 7 programming options when using the Program Track. STD programming (Option 1) will automatically determine whether to use the Direct or Paged programming methods. Paged programming is used by older decoders and can take up to fifteen seconds to read each CV. Direct mode is newer and generally reads CVs in one to two seconds. For various reasons you may wish to 'force' the programming method to one or the other types. You can press 4 for paged programming or press 5 for direct programming. Standard sets the most common decoder parameters.

# STANDARD PROGRAMMING (Option 1)

This option automatically determines if the decoder supports Direct or Paged programming and uses the appropriate method for subsequent programming operations. Use this option for initial setup of your decoder. You will be advised about the manufacturer and the version of the decoder software. You will also be able to setup the decoder address, basic configuration, motor control, NMRA standard function mapping and finally any additional CVs you may wish to program.

## DECODER MANUFACTURER

This is the NMRA assigned manufacturer number of the decoder. All NCE decoders respond with 11. Press **ENTER** to continue.

```
MAIN OFF 02:00PM
MANUFACTURER:011
```

---

You may get this error message:

```
MAIN OFF 02:00PM
CAN NOT READ CV
```

This means the decoder did not respond to attempts to read this parameter value in the decoder. There are several things that can cause a failure to read: a miswired decoder, a broken of missing track pickup wires, the motor is not connected to the decoder, defective decoder, wires to the programming track are disconnected, etc. All decoders require that a motor (or similar "load") be connected to the decoder for proper reading on the programming track. Decoders that draw too much power from the programming track can also cause this message. Most sound decoders draw large amounts of current. The Power Pro can supply the NMRA limit of ¼ Amp or current for initial "charging" of these decoders and 160mA of continuous current for normal program track operation. If the decoder exceeds these capabilities you will get the error message. Press **ENTER** to continue. You will probably still be able to program by ignoring the error. Press **ENTER** and then proceed in the usual manner.

---

## DECODER VERSION

This display indicates the programming method in use on the top line and the version number of the software in the decoder on the bottom line. Press **ENTER** to continue.

```
DIR MODE 02:00PM
DECODER VER: 041
```

## DISPLAY OF ACTIVE ADDRESS

The current active address (long or short) is indicated on the top line of the display. If you wish to change the decoder address press **1**.
Any other button will skip programming the address and continue standard programming.

```
ACTIVE ADR:SHORT
SETUP ADDR 1=YES
```

## ENTERING THE DECODER (LOCOMOTIVE) ADDRESS

The short address is displayed first. If you wish to change it type in the new address and press **ENTER**. If you wish to keep it unmodified just press **ENTER** to skip to the display of the long address.

```
ACTIVE ADR:SHORT
SHORT ADDR:   003
```

If you put in a new address you will see the following LCD screen asking if you wish to make this address the primary address. Only one address can be the primary address – the long or the short. You cannot have both active at the same time. The decoder will not allow it.

The long address is displayed next. If you wish to change it type in the new address and press **ENTER**. If you wish to keep it unmodified just press **ENTER** to skip to continue programming.

```
SETUP ADDRESS
LONG ADDR:   1044
```

If you enter a new long address you will be asked if you want to activate it. Press **1** for yes. Any other key continues with programming.

```
      ACTIVATE
THIS ADDR: 1=YES
```

## SETTING UP BASIC DECODER CONFIGURATION (CV29)

This option will setup various the decoder configuration parameters. There are six of these parameters squeezed into one CV. Press **1** if you want to set these parameters. Any other key will skip to Motor Control Setup.

```
SET CFG?
ENTER=NO  1=YES
```

You will be asked a series of questions regarding the basic operation of the locomotive. If you are in doubt about the proper answer just press ENTER and you will usually be OK.

## DIRECTION BIT - NORMAL OR REVERSE

Press **ENTER** for the locomotive to operate in the normal direction or press **1** to switch the direction of operation.

```
DIR BIR? 02:00PM
ENTER=NORM 1=REV
```

## SPEED STEPS – 28 OR 14

If the decoder in this locomotive is an early 14 step decoder then press **1**. (all decoders made since 1997 support 28 speeds). NOTE: If you are wondering how to set the decoder for 128 speed operation, you do not have to program anything. 128 speed mode is always enabled in decoders that support 128 speed step operation.

```
SPEED    02:00PM
ENTER=28 1=14  _
```

Press **ENTER** to turn DC operation mode off, press **1** to turn DC mode on. We recommend leaving DC mode off for most layouts.

```
DC MODE  02:00PM
ENTER=NO 1=YES _
```

This is to prevent all your locomotives from taking off at once in case of a failure in your power booster or someone accidentally connecting the track to a DC power supply (it happens more often than you might think).

## ADVANCED ACKNOWLEDGE

Press **ENTER** to turn Advanced Acknowledge mode off, press **1** to turn Advanced Acknowledge mode on.

```
ADV ACK? 02:00PM
ENTER=NO 1=YES _
```

NOTE: advanced acknowledgment is not operational in any decoders at this time as the NMRA has not defined how it is to work.

## SPEED TABLE SELECTION

If the Standard Speed Table is to be used, press **ENTER**. If the Alternate (uploadable) Speed Table in the decoder is to be used, press **1**.

```
SPEEDTBL 02:00PM
ENTER=STD 1=ALT_
```

## ENABLE LONG OR SHORT ADDRESS

The short address is used when operating on DCC systems that do not use long address.

```
ADDRESS  02:00PM
ENTER=S 1=LONG _
```

## SETTING UP MOTOR CONTROL PARAMETERS

This option can be used to setup the various locomotive motor speed control parameters. You can skip adjusting any of these parameters (CV5) by pressing **ENTER**. Press **1** to adjust motor control.

```
SET UP MOTOR
CONTROL?   1=YES
```

The first adjustment is:

## START VOLTAGE (CV2)

Start voltage is the amount of voltage the decoder sends to the motor when a speed step 1 command is sent to the locomotive. This is some extra voltage to help get the motor running. You can put in any value from 0-255. If you put in a value of 10 then 10/255 (about 4%) of the full motor voltage will be applied to the motor at speed step 1. In most decoders the start voltage is added to each speed step.

```
OPS PROG 02:00PM
START VOLTS:    _
```

A good way to setup the Start Voltage is to first set your throttle to speed 1 then go into this Start Voltage programming and try different values until you get the desired starting speed. This approach can be used with most of the motor speed adjustments. You may exit programming at any time by pressing PROG/ESC.

## MAXIMUM VOLTAGE (CV5)

This is the amount of voltage applied to the motor at full speed. A value of 255 means send the full available track voltage to the motor. Lower numbers will tell the decoder to send proportionally less voltage when full speed is called for.

```
OPS PROG 02:00PM
MAX VOLTAGE:    _
```

A value of 192 will Cut the maximum speed to 192/255 (about 75%) of the track voltage. Most decoders interpret a value of 0 to mean 255.

## MID SPEED VOLTAGE (CV6)

This is the amount of voltage applied to the motor when the middle speed step (14 or 64 depending on speed mode) is requested. A value of 128 means to send about 1/2 the available track voltage (128/255 of the voltage) to the motor.

```
OPS PROG 02:00PM
MID VOLTAGE:    _
```

Lower or higher values will send proportionally higher or lower voltages at mid-speed. Most decoders interpret a value of 0 to mean 128.

## ACCELERATION (CV3)

With this CV set to 0 the decoder will be in what is commonly called 'direct drive'. The decoder will instantly jump to the speed requested by the throttle. You can add momentum by adjusting this parameter.

```
OPS PROG 02:00PM
ACCELERATION:   _
```

A value of I will force a delay of 0.007 seconds between speed steps in 128 speed mode (0.032 seconds in 28 speed mode). This is equivalent to 0.896 seconds (0.007 x 128 speeds) to go from speed 0 to full speed. A value of 10 will yield about 8.9 seconds to full speed.

## DECELERATION (CV4)

Deceleration works to delay the slowing down of the motor with the same timing as acceleration.

```
OPS PROG 02:00PM
DECELERATION:   _
```

## MOTOR PWM FREQUENCY (CV9)

DCC decoders almost always drive the motor of the locomotive with Pulse Width Modulation (PWM). This is a series of full voltage pulses that vary in width from very narrow for low motor speed to very wide providing higher power to the motor.

```
OPS PROG 02:00PM
PWM FREQ:       _
```

How often the pulses are sent is called the frequency. The frequency is adjustable on some decoders. Settings for this CV vary so consult your decoder manual for the proper value. If your decoder is capable of 'silent' operation usually a 0 is required.

## NCE TORQUE COMPENSATION KICK RATE (CV116)

If your decoder supports NCE torque compensation this menu item will be displayed. If not you will be sent to SET UP FUNCTION MAPPING. NCE decoders since 2004 provide Torque Compensation for smooth low speed operation. Torque Compensation gives a steady stream of 'kicks' to the motor when running at very low speeds. You can adjust how *often* the motor is kicked (Kick Rate) and how *hard* it is kicked (Kick Strength).

```
OPS PROG 02:00PM
KICK RATE:     _
```

CV 116 controls the rate. The typical value is 2-4 with the maximum practical value of about 6. The smaller the number the more often the motor gets a brief voltage kick. A value of 0 turns off the kick. A value of 1 gives continuous kicks to the motor (not very useful). When using Torque Compensation set the Start Voltage to 0 for best operation.

## NCE TORQUE COMPENSATION KICK DEPTH (CV117)

This is how hard the motor is kicked at low speed. Typical values range from 1 to 40. High quality motors (Kato) need very little kick strength where lower quality motors such as old Athearn and LifeLike need relatively (30-50) large values for slow speed crawling,

```
OPS PROG 02:00PM
KICK DEPTH:    _
```

## SETUP DECODER OUTPUT/FUNCTION MAPPING
### General Discussion of function mapping

Function mapping is used to customize which decoder lighting outputs (or sound effects) are controlled by which function keys on your handheld throttle. Each function command, F0 through F9, is assigned a unique CV that allows the corresponding function command to be redirected to up to 14 different lighting outputs or sound effects. A single function key can control more than one output if desired. It is also possible for one output to be controlled by multiple function keys. In this case, the output will be turned on when any of the corresponding function keys are active. That output will turn off only when all relevant inputs have also been turned off.

Note that all function commands cannot be mapped to all outputs. The LCD display on your ProCab will indicate only those outputs that can be mapped to each function command.
The F0 function has two CVs – one for forward direction and one for reverse. Function outputs mapped to these CVs will be directional unless the same output is mapped to both CVs. CVs 33 and 34 are both for the F0 function. On NCE decoders CV33 and CV34 do not provide directionality (see SETUP NCE LIGHTING EFFECTS below) but otherwise operate the same as above. With NCE decoders direction of operation for function outputs is provided by the lighting effects CVs (120 through 127). Lenz and TCS decoders do not follow NMRA standard function mapping procedures.
When you select function mapping you are prompted for the function number to map.

```
PRESS FUNCTION
NUMBER TO MAP
```

The top line of the LCD displays the function number and the output numbers that can be controlled by the function. The lower line displays the currently controlled outputs.

Pressing a digit key will enable the output on the decoder when the function is activated. Pressing the same digit key again will disable the output. In the display above the 4 key has been pressed so that output number 4 will activate when ever the F2 button is pressed on your handheld cab. If you were to press another digit such as a 6, both output 4 and output 6 will be controlled by pressing F2.

```
F2      12345678
OUTPUTS:---4----
```

When mapping functions higher than 3, the top line of the LCD will use small numbers to indicate the output numbers 10 through 14.
To enable/disable these high numbers press the digit key that is 10 less than the output number.
Example: press 0 for output 10, 1 for output 11, etc.

Pressing **PROG/ESC** will exit from mapping at any time.

# CONFIGURATION VARIABLE (CV) PROGRAMMING (Option 1)
This option allows you to change *any* configuration variable (range of 1-999) in your decoder. Press PROG/ESC at any time to exit.

## ENTER CONFIGURATION VARIABLE NUMBER
All configuration variables can be set while on the mainline. Just pressing **ENTER** without typing in a number will return you to the main OPS programming prompt. Pressing **PROG/ESC** will completely exit from programming and return you to the normal display.

```
PROG CV  02:00PM
ENTER CV NUM:  _
```

## ENTER THE VALUE
The value to be programmed into the CV should be entered at the above prompt. Pressing **PROG/ESC** before or during number entry will completely exit from programming and return you to the normal display.

```
PROG CV  02:00PM
ENTER VALUE:   _
```

# SET ANY CV (Option 2)
This option allows you to change *any* configuration variable (range of 1-999) in your decoder. Press **PROG/ESC** at any time to exit.

```
PROG CV  02:00PM
ENTER CV NUM:  _
```

## ENTER CONFIGURATION VARIABLE NUMBER
All configuration variables can be set while on the mainline. Just pressing **ENTER** without typing in a number will return you to the main OPS programming prompt. Pressing **PROG/ESC** will completely exit from programming and return you to the normal display.

## ENTER THE VALUE
The value to be programmed into the CV should be entered at the above prompt. Pressing **PROG/ESC** before or during number entry will completely exit from programming and return you to the normal display.

```
PROG CV  02:00PM
ENTER VALUE:   _
```

# REGISTER PROGRAMMING (Option 3)
The programming section is included to make setting of MRC and old Lenz Decoders possible. Refer to the document that is included with the Decoder for register information
.

## ENTER THE REGISTER TO PROGRAM
Enter the register number and press ENTER. The current value of that register will be read from the Decoder and displayed. If you wish to modify the value type in a new number and press ENTER.

```
PROG TRK
REGISTER?  _
```

If you want to keep the value just press **ENTER** without putting in any numbers.
Registers used with decoders that require register programming

| CV # | Description | Register # |
|------|-------------|------------|
| 1 | Short Address (0-99 valid) | 1 |
| 2 | Start Voltage (0-15 valid) | 2 |
| 3 | Acceleration (0-15 valid) | 3 |
| 4 | Deceleration (0-15 valid) | 4 |
| 29 | Configuration byte (set to 6) | 5 |

# PAGED PROGRAMMING (Option 4)
Option 4 forces the system to use Paged mode while doing Standard Programming. Almost all decoders support Paged Mode.

# DIRECT PROGRAMMING (Option 5)
Option 5 forces the system to use Direct mode while doing Standard Programming. Older decoders (built prior to 1/1/2001) do not support Direct Mode programming.

# SETUP NCE LIGHTING EFFECTS (Option 6)

You can use this option to customize the lighting effects for your NCE decoder equipped locomotives. This programming option will only work with NCE decoders.

```
NCE EFX   02:00PM
OUTPUT NUMBER: _
```

Function outputs are numbered from I to 14. Do not confuse *Output* numbers with *Function* numbers. The headlight is always output 1and the reverse light is usually output 2. You are prompted for the output number to setup. Press the output number followed by **ENTER.** Use the thumbwheel or up/down speed buttons to scroll through the different lighting effect options. Press **ENTER** when you get the one you want.

```
OUTPUT NUMBER:03
USE THUMBWHEEL
```

Next press **1**, **2** or **3** to select the 'directionality' of the output. If you want the output active only in the forward direction of travel press 1. Press 2 for the effect to operate only when traveling in reverse. 3 activates the output no matter which direction the locomotive is traveling.

```
DIR OF OPERATION
1=FX 2=RV 3=BOTH
```

Last, press **1** if the output has a regular incandescent bulb attached. Press **2** if the output has an LED connected. LEDs behave differently when dimmed than incandescent bulbs. Pressing 1 or 2 informs the decoder which set of lighting characteristics to use for this output.

```
REGULAR BULB  OR
LED 1=BULB 2=LED
```

# RECOVERY PROGRAMMING (Option 7)

The programming section is included to allow the user to set *all* registers of the Decoder to the values that were programmed into it at the factory.

```
     RECOVERY
PROGRAM    1=YES
```

## RECOVERY PROGRAM

Press **1** to enter Recovery mode. This will reprogram NCE decoders (and most others) to their original factory values. But will set addresses, motor control CVs and Function Mapping CVs to a useful state so that you can get control of a decoder.
As each CV is programmed the CV number is displayed.

# SETUP COMMAND STATION   (Shortcut = PROG 5)

This allows the operator to view the Command Station's version number and set various system (not decoder) parameters.
If you press "28882" at the "SET CMD STATION" prompt the command station will be reset to all original factory settings.

## DISPLAY SOFTWARE VERSION AND DATE
This screen is important when the time comes to call or write about a question or a problem.

```
VERSION: 02:00PM
TUE  DEC 21 2004
```

The following screens are available should a need arise to change any of the factory settings. There is probably no reason to ever change these settings.
If you get things REALLY messed up you can reset the system to original factory settings (see paragraph above).

## NUMBER OF STOP PACKETS
This adjusts how many times a stop command is sent to the Loco. If you have a large layout or run more than about 40 different locomotives in a session we recommend setting this to 8. This will automatically purge non-necessary speed 0 commands from being sent to the track increasing system response to throttle commands.

```
NUMBER   02:00PM
OF STOP PKTS 008
```

If set to zero all speed 0 commands will continue to be circulated for every locomotive that has been controlled (but now is stopped) since the system was last turned on. Factory default is 8. Press **ENTER** to skip setting this parameter.

## NUMBER OF TEMP PACKETS
This adjusts the number of Function control commands that are sent when a Function control button is pressed. Factory default is 5.
Press **ENTER** to skip setting this parameter.

```
NUMBER   02:00PM
OF TEMP PKTS 005
```

## NUMBER OF ACCESSORY PACKETS
This adjusts the number of accessory control commands sent when an accessory or signal is controlled. Factory default is 4. Press **ENTER** to skip setting this parameter.

```
NUMBER   02:00PM
OF ACC PKTS: 004
```

## NUMBER OF HORN OFF PACKETS
This adjusts the number of times a "horn off" packet is sent when the **HORN** button is released. The factory default is 2 but can be set as high as 16.
Press **ENTER** to skip setting this parameter.

```
NUMBER   02:00PM
HORN OFF PKT 002
```

## NUMBER OF PROGRAM PACKETS
This adjusts the number of times a programming command is sent when a programming a locomotive on the mainline. Factory default is
4. Press **ENTER** to skip setting this parameter.

```
NUMBER   02:00PM
OF PROG PKTS 004
```

## TEST FOR LOCO IN USE
If set to YES, a warning will be issued if you select a loco that is in use by someone else. If set to NO, no warning is issued. Factory default is no. Press **ENTER** to skip setting this parameter.

```
TEST FOR LOCO IN
USE?  1=Y 0=N   0
```

## SEND FUNCTION COMMANDS TO CONSIST ADDRESS
Function commands are normally sent to the lead loco of an advanced consist. They can also be sent to the consist address so that other locomotives in consist can react to these commands if desired. The factory default is yes. Press **ENTER** to skip setting this parameter.

```
  ┌─────────────────────────┐
  │ SEND FUNCTION TO        │
  │ CON?  1=Y 0=N   1       │
  └─────────────────────────┘
```

## CONSIST MOMENTUM

You can disable the momentum button on all handheld cabs that are operating a consist. The buttons are enabled by factory default. Press **ENTER** to skip setting this parameter.

```
  ┌─────────────────────────┐
  │ CONSIsT MOMENTUM        │
  │ ENABLE 1=Y 0=N 1        │
  └─────────────────────────┘
```

## MOMENTUM MULTIPLIER

When you press the MOMENTUM button you are prompted for a single digit indicating how much momentum you want for the loco/ consist you are controlling. Momentum CVs have a range of *0-255* while the button asks for values from 0-9.

```
  ┌─────────────────────────┐
  │ MOMENTUM BUTTON         │
  │ MULTIPLIER:     08      │
  └─────────────────────────┘
```

The value you enter for the momentum button is multiplied by this parameter (factory default of 8) and sent to CV3 in the locomotive. This parameter adjusts the multiplication factor. You can set it from 0-25. Press **ENTER** to skip setting this parameter.

## MOMENTUM DECELERATION RATE

The deceleration rate (CV4) when pressing the momentum button can be either half the value sent for acceleration (CV3) or the full value sent to CV3. Factory default is ½. Press **ENTER** to skip setting this parameter.

```
  ┌─────────────────────────┐
  │ MOMEN DECEL RATE        │
  │ 1=FULL 0=HALF   0       │
  └─────────────────────────┘
```

## EMERGENCY STOP LAYOUT SHUTDOWN

When you press the Emergency Stop button three times the layout power will be shut down and the address of the cab that shutdown the layout is broadcast to all other cabs. Only the cab that shut down the layout can start it up again by pressing ENTER. The shutdown can be disabled. The factory default is enabled. Press **ENTER** to skip setting this parameter.

```
  ┌─────────────────────────┐
  │ ESTOP SHUTDOWN          │
  │ ENABLE 1=Y 0=N 1        │
  └─────────────────────────┘
```

## RADIO FIX ENABLE

If on, steps are taken in the command station to prevent runaways when using radio cabs. The command station notices if speed buttons or a pot is being used on a cab by cab basis. If speed buttons are in use a bit is set and any "full speed" pot commands (the most common kind of erroneous radio Command) are ignored thus preventing most runaways.

```
  ┌─────────────────────────┐
  │ RADIO FIX               │
  │ ENABLE 1=Y 0=N 1        │
  └─────────────────────────┘
```

You may need to disable the "fix if you are using a CAB04e with both "halves" of the cab set to the same cab address AND one half is set to yard mode while the other is set to normal mode or the ProCab set to yard mode. If you have an older ProCab with a potentiometer (1994-1997) you will probably have to disable this feature. It is on by factory default. Press **ENTER** to skip setting this parameter.

## AIU BROADCAST ENABLE

The system can be set to have any connected AIU (Auxiliary Input Unit) automatically output its status via the RS232 port on the system box whenever an AIU input changes. This is disabled by default. Press ENTER to skip setting this parameter.

Not avail on SysOne
```
  ┌─────────────────────────┐
  │ AIU BROADCAST           │
  │ ENABLE 1=Y 0=N 0        │
  └─────────────────────────┘
```

## RS232 PORT BAUD RATE

You can set the system box RS-232 Baud Rate to 9600, 19,200 or 38,400 bits per second. Press the appropriate number to select the baud rate you desire. Factory default is 9600. Press ENTER to skip setting this parameter.

```
  ┌─────────────────────────┐
  │ BAUD RATE 1=9600        │
  │ 2=19.2 3=38.4   1       │
  └─────────────────────────┘
```

## SYSTEM RESET

Selecting this option will reset the system box back to original factory settings. You are asked to press 2 different buttons to make sure you really want to reset. All consist, macros and system set up parameters will be lost. Press **ENTER** to skip setting this parameter.

```
RESET SYSTEM?
PRESS 6 FOR YES
```

## FUNCTION REFRESH RATE

This parameter controls the rate at which Function (F0-F12) commands are repeated on the rails after the "normal" number (TEMP PKTS... see TEMP PKTS above) of commands are sent. When set to zero the function commands are never repeated. If non-zero, Function Group One commands are generated and sent out over the rails for the current active locomotive on each cab. The rate of sending these packets is approximately $0.004 * n$ seconds (where n = value). Example: n = 250 refreshes all function group one packets about once each second. This should only be used when using Decoders (such as LENZ and TCS) that do not remember their Function status after a power interruption. All NCE and some premium Digitrax decoders remember their function status.

```
FUNCTION REFRESH
RATE        _000
```

If you use these brands of decoders exclusively you do not need this set to anything other than zero. It is recommended that this value be set above 400, numbers below 100 will not be accepted. Factory default is 0. Press **ENTER** to skip setting this parameter.

## MEMORY BACKUP OPTIONS

You can backup the memory of your Power Pro to a computer using three options. You must connect your Power Pro to a computer using and RS-232 cable or RS-232 to USB cable to backup your system memory.

Most PCs are supplied with a program called Hyperterminal that can be used to capture setup data from the Power Pro system memory.

## HYPERTERMINAL SETTINGS FOR SYSTEM BACKUP:

CONNECT TO → CONFIGURE menu
>9600 or 19200 baud (38400 only works right on some computers)
>No parity
>8 data bits
>I Stop bit
>Flow Control – none

SETTINGS → TERMINAL MODE
>ANSI

SETTINGS → ASCII setup
>Echo typed characters locally
>Append line feeds to incoming line ends
>Line Delay: 10mS

Use "Capture Text" to receive backup data and save it to the PC disk.

## There are three backup options:

**Macro backup –** saves all 256 macros.
5120 memory locations from 0xC800 to 0xDBFF

**System backup –** saves the system setup (SET CMD STA menus stuff)
80 memory locations from 0XDC00 to 0xDC4F

**Consist backup –** saves the advanced consist tables
1536 memory locations from 0xF500 to 0xFAFF

The data is sent as an ASCII file to the terminal program.
Format for the data is:
:aaaa dddd dddd dddd …. dddd (macro and consist data) or
:aaaa dd dd dd dd dd dd .. dd (system data)
:aaaa = RAM address in hex (high byte first)
dd or dddd = 8 or 16 bit data (high byte first if 16 bit)

The data is formatted for easy(?) modification with a text editor. Well, easy if you know how the data in RAM is setup and understand hex.

**Macro data:** Each line of the Macro data contains one macro. There are 10 two byte macro commands on each line. Macro 0 is at memory location C800. Addresses are in DCC format (Refer to RP-9.2.l).

**System data:** Each line of the system data has 16 bytes of individual system setup 'flags'.

**Consist data:** Each line of the Consist data holds 8 locomotive addresses.
Locations F500-F5FF hold lead loco addresses. The first two bytes are consist address 0 (not used) addresses are in DCC format (bits 6, 7 of high byte set if long address).

Locations F600-F6FF hold rear loco addresses. The first two bytes are Consist address 0 (not used) addresses are in DCC format (bits 6, 7 of high byte set if long address)

Locations F700-FBFF hold mid consist loco addresses. The first 8 bytes are up to 4 locos in consist address 0 (not used) addresses are in DCC format (bits 6, 7 of high byte set if long address).

## HIGHEST CAB TO PROGRAM ON MAIN
This sets the highest Cab address that will be able to access programming on the Main. Cabs above this setting will skip the PROGRAM ON MAIN menu selection. 00 = all Cabs have access. This and the following command station setup parameters are useful for clubs that have a lot of members but want to limit which of those members can access various system options during an operating session. Press **ENTER** to skip setting this parameter.

## LAST CAB TO ASSIGN LOCO
This sets the highest Cab address that will be able to access the Assign Loco to Cab menu. Cabs above this setting will skip the ASSIGN LOCO - CAB menu selection. 00 = all Cabs have access. Press **ENTER** to skip setting this parameter.

## LAST CAB TO SET CLOCK
This sets the highest Cab address that will be able to access the Set Clock menu. Cabs above this setting will skip the SET SYSTEM CLOCK menu selection. 00 = all Cabs have access. Press **ENTER** to skip setting this parameter.

## LAST CAB TO USE PROGRAM TRACK
This sets the highest Cab address that will be able to access the programming Track. Cabs above this setting will skip the USE PROGRAM TRK menu selection. 00 = all Cabs. Press **ENTER** to skip setting this parameter.

## LAST CAB TO SET COMMAND STATION
This sets the highest Cab address that will be able to Set Up the Command Station. Cabs above this setting will skip the SET CMD STATION menu selection. 00 = all Cabs. Press **ENTER** to skip setting this parameter.

## LAST CAB TO SET ITSELF
This sets the highest Cab address that will be able to access the Set Cab Parameters menu. Cabs above this setting will skip the SET CAB PARAMS menu selection. 00 = all Cabs have access. Press **ENTER** to skip setting this parameter.

## LAST CAB TO PROGRAM ACCESSORIES
This sets the highest Cab address that will be able to program Accessories while they are attached to the main track. Cabs above this setting will skip the PROG ACCESSORIES menu selection. 00 = all Cabs. Press **ENTER** to skip setting this parameter.

## LAST CAB TO PROGRAM MACROS
This sets the highest Cab address that will be able to program macros. Cabs above this setting will skip the PROGRAM MACROS menu selection. 00 = all Cabs. Press **ENTER** to skip setting this parameter.

# SET UP THE CAB PARAMETERS (Shortcut = PROG 6)

This allows the operator to set the Cab Address, the control method (yard or regular), ballistic tracking of the cab and which functions are activated when the Horn/Whistle and Bell keys are pressed.

## NUMBER OF RECALLS

This adjusts the number of recall "slots" that are cycled through when the **RECALL** key is pressed. Enter a number of Recalls from 1 - 6 and press **ENTER.** This can be set differently for each Cab. (factory default is 2)  Press **ENTER** to skip setting this parameter.

```
NUMBER    02:00PM
OF RECALLS:   02
```

## CLEAR RECALLS

Clears the current **RECALL** storage. Press 1 to clear out the **RECALL** slots, press **ENTER** to leave them alone. Press **ENTER** to skip setting this parameter.

```
CLEAR     02:00PM
RECALLS  1=YES:
```

## SETTING THE CAB ADDRESS

Press **ENTER** to bypass or 1 to set address.

```
CLEAR     02:00PM
RECALLS  1=YES:
```

**NOTE:** The following set of screens may be different depending on the model of the Cab. These screens are for the PROCAB. If you have a different cab consult the instructions that come with it. Press **ENTER** to skip setting this parameter.

## CAB ADDRESS

Upon selecting the SET CAB ADDR mode the cab enters its own *internal set up procedure.* This procedure varies from cab to cab depending upon the capabilities of that cab.

```
CAB ADDRESS: 02
   PROCAB V1.3
```

The Cab address can be any number from 1 through 63 (although we recommend using 2 as the lowest Cab number). Older ProCabs (V1.2 and earlier) will let you set the address to 00. If the Cab allows this it will lock-up, to correct this pull the Cab jack out of the Cab Bus Panel and then with the **SELECT LOCO** key held down plug it back in. Now you can correct the Cab address. On Vl.2 and earlier cab ALWAYS ENTER 2 DIGITS when setting the cab address (followed by the **ENTER** key). Press **ENTER** to skip setting this parameter.

## SEE THE CAB OPERATION MANUAL FOR:
- Selecting yard or regular mode
- Ballistic tracking rate

This ends the Cab specific setup screens.

## ASSIGNING THE HORN/WHISTLE FUNCTION

```
ASSIGN    02:00PM
HORN TO FUNC: 02
```

Enter the function number that should be activated when the Horn/Whistle key is pressed. The NMRA suggests using 2, however any function number may be used. Press **ENTER** to skip setting this parameter.

## ASSIGNING THE BELL FUNCTION

Enter the function number that should be activated when the Bell key is pressed. We recommend using 1, however any function number may be used. Soundtraxx **Diesel** decoders use Function # 1 for control of the Bell.

```
CLEAR     02:00PM
RECALLS  1=YES:
```

Older Soundtraxx Steam decoders use Function # 3 for the Bell. The steam decoders can have the bell "re-mapped" to Function # 1 (Diesel decoders can not re-map the bell to Function # 3). Press **ENTER** to skip setting this parameter.

# PROGRAM ACCESSORY DECODERS (Shortcut = PROG 7)

This allows the operator to set Accessory Decoder CV while they are connected to the Track (Accessory Programming on the Main).

## ENTER THE ACCESSORY ADDRESS

Enter the Accessory Decoder address and press **ENTER**.

```
PROG ACC 02:00PM
ACC. ADDR:     _
```

## ENTER THE CV NUMBER

Enter the CV number that you want to program and press **ENTER**.

```
PROG ACC 02:00PM
ENTER CV NUM:  _
```

## ENTER THE CV VALUE

Enter the value you want in the CV and press **ENTER**.

```
PROG ACC 02:00PM
ENTER VALUE:   _
```

# PROGRAM MACROS (Shortcut = PROG 8)

This allows the operator to program Macros (switch lists).

## SELECT MACRO PROGRAM OR REVIEW

Press **1** to program a Macro or press **2** to review a programmed Macro. If 1 is pressed the following screen is displayed.

```
MACRO:    02:00PM
1=PROG   2=REVIEW
```

## ENTER THE MACRO NUMBER

Enter the Macro number that you want to program (0-255), and press **ENTER.**

```
MACRO:    02:00PM
MACRO NUMBER:   _
```

## ENTER THE ACCESSORY ADDRESS/LINKING MACROS

Enter the Accessory Address that you want to control, and press **ENTER**. A macro can be linked to another macro by entering an accessory address of 9999 at this point. You will be prompted for the macro number to link.

```
MAC: 000 02:00PM
ACCESSORY #:    _
```

You can chain as many macros together as you like but use caution. If you chain macros in a 'circular' fashion the system will appear to crash (it is busy sending macros continuously) until you press PROG/ESC on the cab that issued the macro. If a computer is used the only solution is to cycle the power to the system and fix the circular reference.

## SELECT THE TURNOUT POSITION

Press **1** for Normal or **2** for Route.

```
MAC: 000 02:00PM
ACC: 001 1=N 2=R
```

The above two screens will repeat up to 10 times to allow you to enter up to 10 accessories. After 10 accessories have been entered the SELECT MACRO PROGRAM OR REVIEW screen will be displayed. If you want to enter less than 10 accessories, leave the accessory # blank (just press **ENTER**).

If 2 is pressed on the SELECT MACRO PROGRAM OR REVIEW screen, the following screen is displayed.

## ENTER THE MACRO NUMBER TO BE REVIEWED

Enter the Macro number that you want to review (0-255), and press **ENTER**.

```
REVIEW:   02:00PM
MACRO NUMBER:   _
```

## REVIEW MACRO

The Accessory number and output will be shown. Press **ENTER** to see the next Accessory in the Macro. If there are no more Accessories in the Macro, the following screen will be displayed.

```
MAC: 000 02:00PM
ACCESSORY: 001=N
```

## REVIEW END OF MACRO

After **ENTER** is pressed, the SELECT MACRO PROGRAM OR REVIEW screen will be displayed.

```
MAC: 000 02:00PM
END OF MACRO
```

# BROWSE CONSISTS (Shortcut = PROG 9)

This option lets you see what advanced consists are currently in the memory of the system.

Press **ENTER** at the "BROWSE CONSISTS" prompt. The LCD will display the highest numbered consist in the system memory. It will look something like:
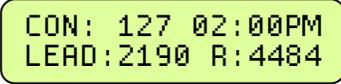
```
CON: 127 02:00PM
LEAD:2190 R:4484
```

Use the speed buttons or thumbwheel to scroll the next higher or lower consist in the list. When you get to the end of the list it will roll over to the 'other' end. Pressing ENTER will show any mid consist locomotives of the displayed consist.

Pressing **ENTER** while the Lead/Rear locomotives are displayed will show any mid-consist locomotives. (The system will remember up to 4 mid-consist locos per advanced consist). Press **ENTER** again to view the next consist.

Pressing **SEL LOCO** will exit browsing and select the displayed consist for running.

Pressing **CLEAR** then pressing **1** at the "KILL CON?" prompt will kill the displayed consist.

Press **PROG/ESC** at any time to exit browsing.

# RS232 SERIAL COMPUTER INTERFACE

## CABLE

You can use a Male 9 pin D connected to a Female 9 pin D with ribbon cable, or use a 9 pin D extension cable. A 9 to *25* pin adapter at the computer end will work if the computer you are connecting to does not have a 9 pin D port.

```
1  o--------------------------------------- o  1
2* o--------------------------------------- o  2*
3* o--------------------------------------- o  3*
4  o--------------------------------------- o  4
5* o--------------------------------------- o  5*
6  o--------------------------------------- o  6
7  o--------------------------------------- o  7
8  o--------------------------------------- o  8
9  o--------------------------------------- o  9
     DB9-S to computer          DB9-P to command station
```

Note: The signals marked with an "i" are the only ones that are necessary.

## COMMUNICATIONS PARAMETERS

The factory default baud rate is 9600 baud. You can use the SET CMD STA menu to change the baud rate to 19200 or 38400. The rest of the Communications parameters are 8 bits, No parity, and One stop bit. If you are using a terminal program on a PC, set it to echo characters. The characters sent to the Command Station are not echoed.

## ASCII COMMAND SET

The ASCII command set is no longer supported except for programming track related commands. These commands are no longer listed as they will be deleted in the next revision of the system software. Use the binary command set.

## BINARY COMMAND SET

The RS-232 port binary commands are designed to work in a computer friendly way.

Command format is: <command number> <data> <data> …

Commands range from 0x80 to 0xBF

Commands and formats supported:

| CMD FORMAT | DESCRIPTION | # OF BYTES RETURNED | POSSIBLE RESPONSES |
|---|---|---|---|
| 0x80 | NOP, dummy instruction | (1) | ! |
| 0x8l xxxx cc | Assign loco xxxx to cab cc | (1) | !, 1, 2 |
| 0x82 | read clock | (2) | <hours> <minutes> |
| 0x83 | Clock stop | (1) | ! |
| 0x84 | Clock start | (1) | ! |
| 0x85 xx xx | Set clock hr/min | (1) | !, 3 |
| 0x86 xx | Set clock l2/24<br>0 = 12 hr, 1 = 24 hr | (1) | !, 3 |
| 0x87 xx | Set clock ratio | (1) | !, 3 |

| CMD FORMAT | DESCRIPTION | # OF BYTES RETURNED | POSSIBLE RESPONSES |
|---|---|---|---|
| 0x88 xxxx | Dequeue packet by loco addr | (1) | !, 1, 3 |
| 0x89 | Enable main trk, kill prog | (1) | ! |
| 0x8A yy | Return Status of AIU yy | (4) | \<current hi byte\> \<current lo byte\> \<change hi byte\> \<change lo byte\> |
| 0x8B | Kill main trk, enable prog | (1) | ! |
| 0x8C | Dummy instruction returns<br> ! followed 0x0D and 0x0A | (3) | !CR/LF |
| 0x8D xxxx mm | Sets speed mode of loco xxxx to mode mm, 1=14, 2=28, 3=128 | (1) | !, 1,3 \<speed mode, 0 to 3\> |
| 0x8E aaaa nn \<16 data bytes\> | Write nn bytes, start at aaaa Must have 16 data bytes, pad them out to 16 if necessary | (1) | !, 4 |
| 0x8F aaaa | Read 16 bytes, start at aaaa | (16) | 16 bytes |
| 0x90 cc xx... | Send 16 char message to Cab cc LCD line 3. xx = 16 ASCII char | (1) | !, 2 |
| 0x91 cc xx | Send 16 char message to cab cc LCD line 4. xx = 16 ASCII | (1) | !, 2 |
| 0x92 cc xx | Send 8 char message to cab cc LCD line 2 right xx = 8 char | (1) | !, 2 |
| 0x93 ss \<3 byte packet\> | Queue 3 byte packet to TEMP_Q Send ss times | (1) | ! |
| 0x94 ss \<4 byte packet\> | Queue 4 byte packet to TEMP_Q Send ss times | (1) | ! |
| 0x95 ss \<5 byte packet\> | Queue 5 byte packet to TEMP_Q Send ss times | (1) | ! |
| 0x96 ss \<6 byte packet\> | Queue 6 byte packet to TEMP_Q Send ss times | (1) | ! |
| 0x97 aaaa xx | Write 1 byte to CMD STA RAM aaaa | (1) | ! |
| 0x98 aaaa xx xx | Write 2 bytes to CMD STA RAM aaaa | (1) | ! |
| 0x99 aaaa \<4 data bytes\> | Write 4 bytes to CMD STA RAM aaaa | (1) | ! |

| CMD FORMAT | DESCRIPTION | # OF BYTES RETURNED | POSSIBLE RESPONSES |
|---|---|---|---|
| 0x9A aaaa<br><8 data bytes> | Write 8 bytes to CMD STA RAM aaaa | (1) | ! |
| 0x9B yy | Return status of AIU yy (short form of command 0x8A) | (2) | <current hi byte><br><current lo byte> |
| 0x9Cxx | Execute macro number xx in the range of 0->199 | (1) | ! = success<br>0 = macro "empty"<br>3 = macro number |
| 0x9D aaa | Read 1 byte of RAM from aaaa | (1) | 1 byte |
| 0x9E | Enter programming track mode | (1) | ! |
| 0x9F | Exit programming track mode | (1) | ! |
| 0xA0 aaaa xx | Program CV aaaa with data xx in paged mode | (1) | !0=program track not enabled |
| 0xAl aaaa | Read CV aaaa in paged mode Note: CV data followed by ! for OK. 0xFF followed by 3 for can't read CV | (2) | <data>, (0, ! Prog trak not enabled 0xff, 3 |
| 0xA2 aaaa nn dd | ~~Locomotive speed, function, or consist command~~ **NOT AVAILABLE ON SYSTEM ONE** | | |
| 0xA3<br><3 byte packet> | Queue 3 byte packet to TRK_Q (replaces any packet with same address if it exists) | (l) | !, 1 |
| 0xA4 xx xx ..<br><4 byte packet> | Queue 4 byte packet to TRK_Q (replaces any packet with same address if it exists) | (1) | !, 1 |
| 0xA5 xx xx ..<br><5 byte packet> | Queue 5 byte packet to TRK_Q (replaces any packet with same address if it exists) | (1) | !, 1 |
| 0xA6 rr dd | Program register rr with dd<br>In register mode | (1) | ! = success<br>0 = Prog Trk not enabled |
| 0xA7 rr | Read register rr.<br>Note: CV data followed by ! for OK.<br>0xFF followed by 3 for can't read CV | (2) | <data> !, 3<br>0 = Prog trk not enabled<br>0xFF followed by 3 for can't read |

| CMD FORMAT | DESCRIPTION | # OF BYTES RETURNED | POSSIBLE RESPONSES |
|---|---|---|---|
| 0xA8 aaaa dd | Program CV aaaa with dd in direct mode, | (1) | ! = success<br>0 = Prog Trk not enabled |
| 0xA9 aaaa | Read CV aaaa in direct mode.<br>Note: CV data followed by ! for OK.<br>0xFF followed by 3 for can't read CV | (2) | \<data\> !, 3<br>0 = Prog trk not enabled<br>0xFF followed by 3 for can't read |
| 0xAA | Return software revision number.<br>Format: VV.MM.mm | (3) | 3 data bytes |
| 0xAB | Perform soft reset of command station (like cycling power) | (0) | Returns nothing |
| 0xAC | Perform hard reset of command station.<br>Reset to factory defaults<br>(Note: will change baud rate to 9600) | (0) | Returns nothing |

Commands 0xAD to 0xBF are not used and return '0'

Errors returned:
      '0' = command not supported
      '1' = loco address out of range
      '2' = cab address out of range
      '3' = data out of range
      '4' = byte count out of range
      '!' = command completed successfully

For a complete description of Binary Commands see: http://www.ncecorporation.com/pdf/Bincmds.pdf

# TROUBLE SHOOTING

- Locomotive was running yesterday but today it just sits there – The headlight and other functions are controllable but it won't run. This sometimes happens when you clear a consist but for some reason the decoder misses the command. Use the **DEL LOCO** button to "re-delete" the locomotive. Alternatively use programming on the main to set CV 19 to 0 (same thing as clearing the consist).

- Head Light goes on and off as I change speed – You are operating a loco with an older 14 step decoder in the 28 step mode and the head light is ON only in the even speed steps.

The programmability of the decoders gives the modeler a *lot* of flexibility. However, this can lead to some unpredictable results. Here are a few tips to get you out of some situations:

- Loco won't respond – Check that the short/long address bit is set correctly in the CFG variable (CV 29).

- The loco might be in a consist – Press **DEL LOCO**, the locomotive number then **ENTER**.

- Make sure CV 3, 4, 23, 24 are set to a small enough value to allow the loco to accelerate at a reasonable rate

- Loco won't run on an analog (DC) layout – Check that the DC mode bit is set in the CFG variable (CV 29).

# HELPFUL HINTS FOR OPERATION

- Passing an old style consist: Use ASSIGN LOCO TO CAB to transfer an old style consist to any other Cab on the system. This causes a swap between the active loco/consist on your Cab and the active loco/consist on the target Cab.

- Nesting consists: Say a long freight is approaching a heavy grade and helpers are needed. The train's locomotives are an advanced consist. The two GP9 pushers are also consisted using an advanced consist. The pusher consist is brought out of the siding at the base of the grade and put in place. An "old style" consist is now set up using the freight's lead loco number and the pusher's lead loco number. You can now operate the entire train to the grade crest as one unit. Upon reaching the cutoff siding at the crest the "old style" consist is killed and the pushers are selected to move to the siding. The freight consist continues on while the pushers drift back down the hill.

- When setting up an old style consist, you may want to use a Loco number that does not exist for the first Loco (Consist address). This will allow you to put the actual lead loco in recall to operate the headlight, and the sound loco to operate the Horn and Bell.

- If a cab does not respond after plugging it in, press the **ENTER** key a couple of times. This will cause it to exit from any mode it was in when it was unplugged.

- When making your own cables using RJ plugs be SURE the connectors are "flipped" over at opposite ends of the wire. See the illustration on page 6-2 of the SystemOne Operation Manual for proper cab bus cabling.

## Power booster

- Your power booster can put out considerable power. Sufficient input power is required for it to perform to its optimum. Proper AC wiring and fusing of the transformer is required to prevent melted wiring or possibly a fire.

- Your power booster is internally protected by an automatic shutdown circuit. After shutdown in the presence of a short circuit it will automatically restore power after 2 seconds.

- The 5 Amp power booster is factory set to put out 14.25 volts to the track. This voltage is adjustable from 10 to 18 volts, see the Power Booster portion of this manual for instructions on adjusting the voltage. The voltage delivered to the motor or lights of a locomotive will typically be about 1 volt less than the voltage on the track.

## Using the ProCab

- In DCC there are 2 kinds of addresses (loco numbers), long and short. When entering the address of the loco you wish to control long addresses from 1 to 127 are entered by preceding the actual number by a zero. Short addresses are entered without a leading zero. Long addresses in the range of 1 -127 are displayed on your cab with an asterisk before the loco number. i.e.: "*042" indicates the long address for loco forty-two and "042" indicates the short address. Most modern decoders made since 1997 support long (4 digit) addresses. Older Lenz, Digitrax and MRC decoders only support the short address.

- When entering numbers if you make a mistake there is no "erase" or "backup" key. If you keep pressing digits the display will clear allowing you to start entering your number over again.

- If you wish to abandon what you are doing when in the middle of entering a number push the "PROG/ESC" key and you will be returned to normal operation.

- During various operations where you are doing something other than normal loco operation such as "set up consist" or "select accessory' speed control of the loco is not available, however the Emergency Stop will still work if you need to stop your loco.

- Programming on the programming track the command station first reads the value of a location (such as "short address" or "acceleration") and displays it on your cab. If you wish to accept this value just press ENTER to continue or type in a new number if you want to change it.

## Programming Track

- The command station checks for a short circuit on the programming track before applying power. If your loco has lights or other current drawing devices wired directly to the track instead of a decoder function output the command station will probably think is has a short and will say "SHORT DETECTED" each time you start to program this loco. If you wish you will be allowed to override the short and continue. This short detection is there to protect decoders from damage if they are miswired. For this reason we find always try a new decoder installation on the programming track first instead of putting it directly on the layout. If the programming works the installation is most likely correct.

- If you have tried to use "STD" programming the MRC decoder will no longer respond until you program it using Register mode.

- MRC decoders can be programmed using "REG" programming (option 3 at the "PROG TRK" menu).

# MENU NAVIGATION CHART – Part 1

Press PROG/ESC key to cycle through menu listings, then press ENTER to cycle through listing choices.

PROGRAM
ON MAIN

Prog Loco:

**1 Address**
- Long or Short
- Enter Address
- Run Loco

**2 CV**
- Enter CV #
- Enter Value

**3 CFG (CV29)**
- Direction Bit
- Speed Steps
- DC Mode?
- Adv Acknowledge?
- SpeedTable
- Address

**4 Motor Control**
- Start Volts
- Max Volts
- Mid Volts
- Accel
- Decel
- PWM Freq
- Kick Rate
- Kick Depth

**5 Function Map**
- Function # to Map
- F# = Outputs

**6 NCE Effects**
- Output #
- Choose effect
- Direction of Operation
- Bulb or LED

**7 SoundTraxx**
- Enter CV #
- Enter Value

**8 QSI Sound**
- Enter CV #
- Enter Value

**9 BIN CV**
- Factory Reprogram?

Press PROG/ESC key to cycle through menu listings, then press ENTER to cycle through listing choices.

**2 ASSIGN LOCO TO CAB**
- Loco #
- Cab #

**3 SET SYSTEM CLOCK**
- Start/Stop
- 12/24
- Hour
- Hours
- Minutes
- Ratio

**1 Standard**
- Manufacturer
- Decoder Version
- Set Up Address
- Set Config
- Motor Control
- Function Map
- Set CV

**2 CV**
- Enter CV #
- Enter Value

**3 Register**
- Enter Register #
- Enter Value

**4 Paged Programming**

**5 Direct Programming**

**4 USE PROGRAM TRK**

**6 NCE Effects**
- Output #
- Choose effect
- Direction of Operation
- Bulb or LED

**7 Recovery Program**
- Factory Reprogram?

**5 SET CMD STATION**
- Version
- # of Stop Packets
- # of Temp Packets
- # of Acc Packets
- # of Horn off PKT
- # of Prog Packets

**6 SET CAB PARAMS**
- # of Recalls
- Clear Recall
- Cab Address
- Assign Horn to Function
- Asign Bell to Function

**7 PROG ACCY ON MAIN**
- Accy Address
- Enter CV#
- Enter Value

**8 PROGRAM MACROS**
- Program
- Enter Macro #
- Enter Accy #
- Enter N or R
- Review
- Enter Macro #

**9 BROWSE CONSISTS**

**0 PROG SIG ON MAIN**
- Enter Signal #
- Enter CV
- Enter Value

- Test for Loco in use?
- Send Function to Consist?
- Consist Momentum Enable
- Momentum button Multiplier
- Momentum Decel Rate
- Estop Shutdown Enable
- Restore Memory
- Radio Fix
- AIU Broadcast Enable

- Baud Rate
- Reset System?
- Funct Refresh Rate
- Backup Macro Memory
- Backup System Memory
- Backup Consist Memory
- Restore Memory
- Highest cab # to Prog on Main

- Highest Cab # to Assign Loco
- Highest Cab # to Set Clock
- Highest Cab # to Use Prog TRK
- Highest Cab # to Setup CMD STA
- Highest Cab # to Setup Itself
- Highest Cab # to Prog Accys
- Highest Cab # to Prog Macros