OPERATION & MAINTENANCE MANUAL

FOR

Mobil SIGN

BY

SIGNCO

Out In Front.

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Company Profile

SignCo, a division of Industrial Machine, is a 180,000 square foot production facility in Lincoln, Nebraska. We have been engineering and manufacturing customer products since 1974. In 25 years, we've earned a national reputation for value by producing uniquely durable, quality engineered athletic products.

Our Rotating Genesis

In 1993, the University of Nebraska called us to repair some defective rotating signs they had purchased from another company only one year earlier. We agreed to repair and maintain their signs.

We struggled with the maintenance of those signs. Regularly, they broke down. It became apparent that the design and quality of those signs left much to be desired. At the end of 1993 we told the University "no more," but did agree to design and manufacture a rotating sign at SignCo that would perform properly.

The University was delighted with our results. Using advanced manufacturing practices, quality materials, state-of-the-art technology, careful engineering, and thorough testing, we developed and produced the premier rotating sign.

Confident that our rotating signs were superior, we began to market them nationally. We have successful installations across the country. Athletic facilities are reaping the revenue from these profit machines.

Flexible Ownership Options

We can provide a variety of purchase options tailored to your unique needs. You may buy our units outright, or you may lease or rent them. With SignCo signs you control your inventory and sponsorship programs.

Produced All In One Place

Another SignCo advantage is our ability to offer a total package. We do not *job-out* our work to multiple sources.

We are the single source for . . .

- The mechanical units
- The actual signage
- All creative services, graphic design & photography
- And it's all done in Lincoln, Nebraska, U.S.A

Our Other Divisions

You may already be using our Bison basketball, volleyball and football equipment in your facilities. Bison and Industrial Powder Coating are also divisions of Industrial Machine.

Introduction

SignCo developed its Mobil Rotating Sign System for Mobil Sign LLC. The system was designed to be flexible, so that it can be configured to meet the needs of a wide variety of uses. It consist of 3 sign cabinets, (2) 12' x 6' cabinets located on the driver and passenger side & (1) 6' x 6'cabinet located in the rear of the truck. The cabinets may also be customized, so that they can be of virtually any size desired.

The system is usually controlled by a single laptop computer (Supplied by SignCo) that is to be located per design specifications. The computer is connected to one of the signs, and runs the ProMotion software included in the system, and sends control signals to the sign cabinets via a RS-232 serial connection.

Each individual rotating sign cabinet houses its own advertising panels and its own dedicated on-board computer and electronics that provide the desired rotation.

The sign units are controlled by dedicated electronic circuitry housed in the cabinets. A Sign Control Unit (S.C.U) monitors the internal sensors and controls the servomotors that move the ads. A Single Board Computer (S.B.C) accepts commands from the ProMotion software and controls the input/output of the S.C.U. An RS-485 communications network ties the separate S.B.C's together. Thus, the units receive move commands from the laptop computer, and provide continuous feedback to the computer on the status of the signs, thus assuring you that all sign units are on the correct ad panel and preventing miss-alignment of advertisers.

During normal operation, the system is time-based. A program (configuration) is entered into the ProMotion software that designates the order in which the ads appear, and the duration for which each ad is to be visible. Timing signals are generated internally by the computer. When the required time for the current ad has elapsed, a signal is sent to the cabinets to rotate to the next ad in the sequence.

The system can also be operated in a manual program mode. As before, a program is entered into the ProMotion software that designates the order in which the ads are to appear, and reference duration for which each ad is to be visible. An operator provides the input to the software, which generates the signal to the next ad in the program.

Each ad is uniquely identified with a sensor stripe, a bar-coded sticker, attached to it. The S.C.U can read the sensor stripe with a pair of optical sensors attached to a sensor board that rides on one of the rollers. When an ad is properly displayed, the sensor stripe will be read, and an "address" is for the displayed ad assigned. The address that is read is the "ad number" of the displayed ad.

Each cabinet may hold up to 30 advertisers. The advertising panels are printed on a material with Signco's own in house ink-jet printer. The panels are spliced together with a special sign tape and loaded onto rolls in the sign cabinets.

Although the system was designed to use all cabinets rotating together, the individual cabinets have their own servo control. Thus, if the necessary power connections have been made, one cabinet can be rotated independently from the other cabinet.

SignCo Major Components & Parts

CONTROL SYSTEM

Your SignCo rotating sign system comes equipped with a control system composed of basically 3 components:

- The Sign Control Unit (S.C.U.) (see figure 1.)
- The Singe Interface Board or Single Board Computer (S.B.C.) (see figure 2.)
- The Power Supply (see figure 3.)

Figure 1

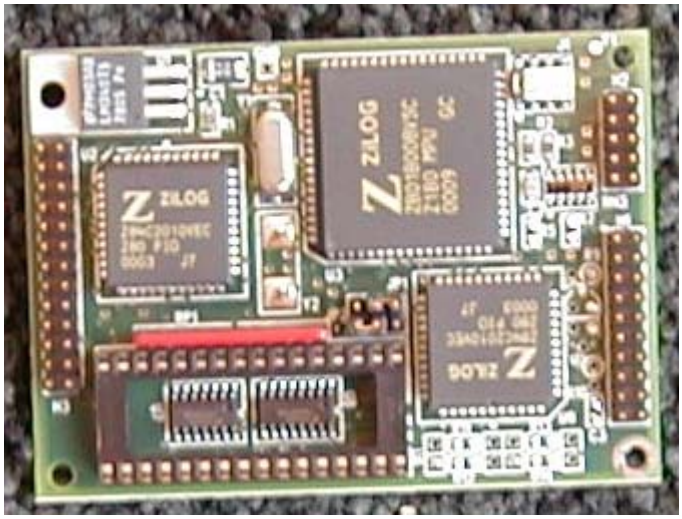


Figure 2

Figure 3

You will find all 3 components on the inside of the control box located in the rear of the sign. Now, while there are lots more than 3 components that make up the control system, we are going to start with these components.

Power Supply

The SignCo Rotating Sign requires a 115 VAC single phase power supply.

S.C.U

The SCU can be used to control the signs manually.

The Single Board Computer (S.B.C)(Z-World Micro G2)

The role of the SBC is to provide:

- Communications with the PC operator interface
- Communications with other SBC's in a network
- Control for the SCU's
- Limited sanity checking

MOTORS & BELTS

We use one of the most durable motors on the market to power our signs. All cabinets house (2) 24 Volt DC servo/tachometer motors. Motors are UL Listed and are proven performers in all climates.

The cabinet also houses (2) Powerlite timing belts. The belt part number is 225L100 if ever needed, but these belts have proven to be very reliable also.

SENSOR BOARD AND SENSOR STRIPES

There is (1) sensor board with (2) sensors attached to the board inside the sign, which rides on the bottom roller. There is a sensor stripe on each ad panel inside the sign. The sensor board must be centered on the sensor stripe in order for the whole operation to work. For more information on the sensors and sensor stripes, please see pages 10 & 11

Normal Operation

For this discussion, we will assume that we have a normal sign system. A normal system includes 3 signs, all having the same scroll. Depending on the complexity of your system, you may be able to follow these procedures to run your system. (Or you may have to modify them).

Powering Up

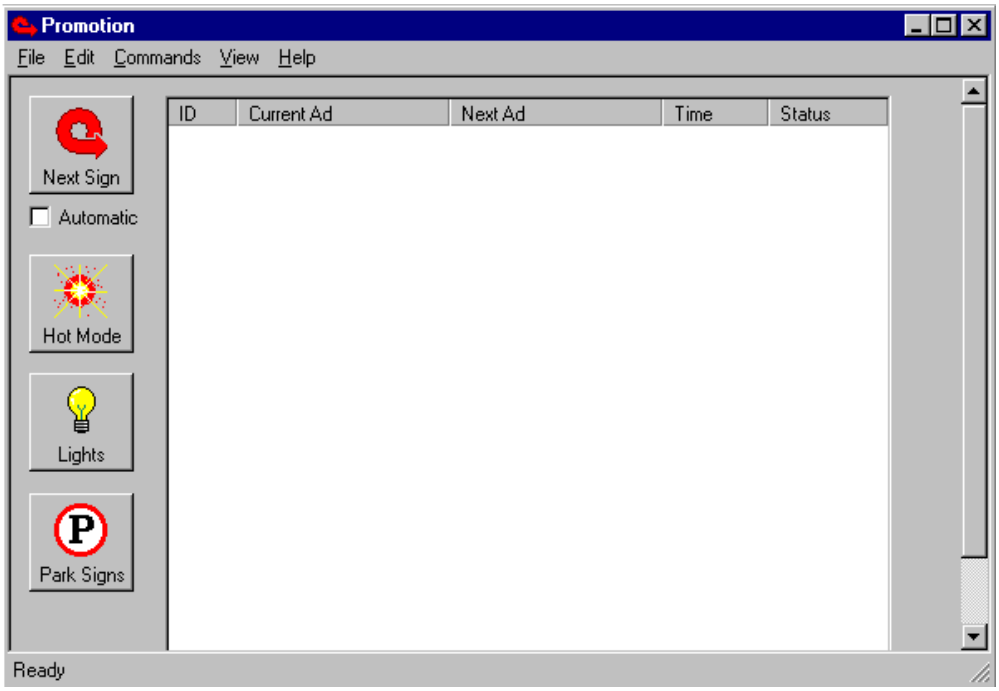
Start off by powering on your signs. It has been observed that systems that have been left powered on, but not initialized for long periods of time are sensitive to environmental electronic noise. The best plan is to start off with a system that has recently powered on (within 10-15 minutes).

Starting the P.C.

Start up the PC, and connect the serial cable to one of the serial ports. Keep in mind that the sign that you plug into will become the system "master" (the rest are "slaves"). A system can only have one master, so you will either run the system from where you plug in, or reset the system, if you choose to move to a different sign.

Starting the Software

Most installations will have a short cut to the Promotion software on the desktop of the PC. Start the software by double clicking on the icon. Once the Promotion software starts you will see a dialog box asking "Connect to sign network?" Click "Yes," and then you should see a status box with a bar graph. This means your signs are initializing. If initialization completes and the automatic network verification matches your configuration, you should see an informational check box that reads, “To initiate sign motion, click the Next Sign button or check Automatic.” Select “O.K.” and then you will be at the main screen of Promotion, which should look like the one below.



Manual Mode

Your signs should move now by simply pressing the “Next Sign” button. There is a built in delay of about 4 seconds before the software will accept another move command, but clicking the next sign button after a brief wait will let you cycle through your sequence manually.

Automatic Operation

To use the times assigned to the ads in the configuration, enable Automatic mode by checking the Automatic box directly under the "Next Sign" button. The signs will now run without intervention from the operator, even if the promotion program is minimized. To stop automatic operation, just uncheck the box.

Hot Mode

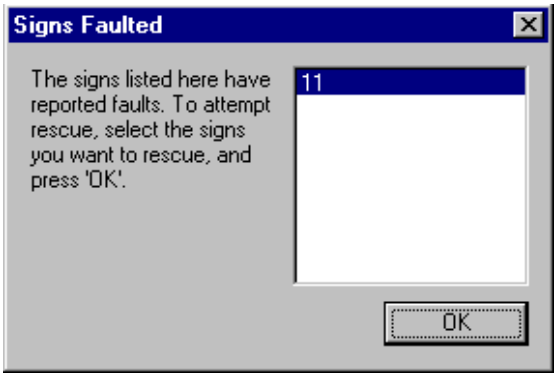
"Hot Mode" is a way for you to decide which ad to manually move to. This allows you to operate the signs in a random manor, moving to ads regardless of their scroll order. The times in the configuration have no effect in this mode. To enter hot sign mode, click on the "Hot Mode" button. A window will come up. Choose which sign you want to move in the left hand window. If signs have the same scroll, you can select all of them by double clicking on one of them. Next from the pull-down menu on the right, select the ad that you want to move to. Click on "Go!" to start the move. If you were in Automatic mode before you chose Hot mode, then when you exit by clicking "Close", the signs will move to the ad in the sequence they were on before you entered Hot mode.

Clearing Faults

In the event that a sign cannot perform a move, or if an abnormal condition is present, a sign will report a fault. A fault may be caused by (but is not limited to):

- A person (Player, spectator, press photographer etc) leaning against the front of the sign.
- Torn or damaged art work.
- Mis-tracking of the ad scroll into the side of the cabinet.
- Overheating, or other damage to the controls.
- Placing the control in manual mode thru the front panel.

If a fault happens, The "Sign Faulted" dialog box will pop up (see below). The box at the right will have the sign number(s) of faulted unit(s). They will be selected by default. You can unselect a sign from the list by clicking on it, if it is not safe to clear the fault at this time. Clicking the "OK" button will send the command to clear the fault on the selected signs. This dialog box will pop up even if the program is being run minimized.



A list of errors you may receive while operating the signs is listed on pages 12-18.

Powering Down

Now you will notice there are two more buttons on the main screen of the Promotion in which we have not talked about yet. One is the buttons labeled “Lights.” This is how you can turn on and off the lights built into you sign system. The other button is the “Park Signs” button. On each scroll, there is what we call a park ad. A park ad is an ad in the scroll that has been designated for the signs to rotate to at the end of each game or event. Its primary reason for being in the scroll is for keeping the “paying” advertisers ads from being damaged. It is an ad that can get “beat up” more or less. At the end of each day, it is always a good habit to hit the “Park Signs” button and allow the signs to go to the designated park ad. This also assures you that nobody damages any of the sponsors ads.

After parking the ads, you may exit Promotion by going to “File” and then selecting “Exit” or by just simply clicking on the “x” in the upper right hand corner of Promotion. You may then close Windows and turn off the computer. Disconnect the serial cable from the serial port on the computer. Unplug the computer and remove it from the truck.

Error Messages and Diagnostics

If the procedure described above under Normal Operations for clearing faults does not reset the controller, turning off the power to the faulted cabinet, then turning it back on will sometimes restore the system to proper operating status. If it does not, then it will be necessary to go the cabinet that indicates the fault and check the unit directly. A display on the left hand door on the back of the cabinet is partially visible above the scorer's table. The LED next to the word FAULT will be blinking, indicating that the cabinet has faulted. This display is built in to the Sign Control System (S.C.U) internal to the cabinet. It runs on 24 V.D.C., and supervises itself and the motors attached to it. If something that is being supervised goes out of tolerance, the S.C.U disables the motors and indicates a fault condition. There is also end-of-scroll protection that causes a fault indication and prevents movement in the wrong direction. The following conditions can be diagnosed from the display on the cabinet.

FRAME shows 0

This indicates movement was attempted beyond the lowest numbered ad. The cabinet has rotated past the initial panel ("ad" number 1) and is at the leader on the top roller. The S.C.U will not allow further movement in the down direction while this fault is present. The sign should be put in the manual mode by pressing the SEL button under MODE on the S.C.U display. The sign should then be SKIPped in the up direction until the number 3 appears in the FRAME window. The RES button under MODE should be pressed to reset the S.C.U, and then the unit should be put back into Auto mode by pushing the SEL button again. Caution: the signs may start moving immediately as the program seeks to bring the sign into sync with the rest of the cabinets. If the ad scroll is not at the leader panel, and the frame shows 0, then the sensor may have mis-read a sensor strip. This can occur if the ad scroll is not tracking properly and the sensor isn't lining up with the sensor strip, or if the sensor voltage is not adjusted properly. These conditions are addressed in the paragraphs below. This fault can also be cleared simply by pressing the RES button to reset the S.C.U. At this point, there is no protection against the sign trying to move the wrong direction. Damage to the Tyvek® panels could result. This approach is NOT recommended.

FRAME shows 31

This indicates movement was attempted beyond the highest numbered ad. The cabinet has rotated past the last ad and is at the leader on the bottom roller. The S.C.U will not allow further movement in the up direction while this fault is present. The sign should be put in the manual mode by pressing the SEL button under MODE on the S.C.U display. The sign should then be SKIPped in the down direction until the number of the last ad appears in the FRAME window. The RES button under MODE should be pressed to reset the S.C.U, and then the unit should be put back into Auto mode by pushing the SEL button again. Caution: the signs may start moving immediately as the program seeks to bring the sign into sync with the rest of the cabinets. This fault can also be cleared by simply pressing RES button to reset the S.C.U. At this point, there is no protection against the sign trying to move the wrong direction. Damage to the Tyvek® panels could result. This approach is NOT recommended.

FRAME shows a number other than 0 or 31

There are four possible reasons why the fault may have occurred. First, there is a velocity related problem with one of the drive motors. This could be caused by a number of conditions, such as ad movement while the motor is stopped, loose wiring to the motor or tachometer, missing or broken drive belt, too much slack in the Tyvek®, a jam or high friction in the mechanical drive. If the cause of a jam is evident (something causing a bind with the Tyvek®, a foreign object lodged in the rollers, etc.), removing the cause and resetting the cabinet should clear the fault. If the fault happens again, a more serious problem may have occurred. Second, the power supply voltage to the S.C.U may have dropped below a safe operating level for the S.C.U. This may have been caused by a transient condition, and should be cleared by a simple reset. If the fault occurs again, a problem with the 24 V.D.C. power supply is indicated. Third, a high temperature condition exists with the motor drive electronics of one of the drive motors. It can be caused by high ambient temperature, or by a fault in the motor drive circuitry. The fault clears automatically when the unit cools. Fourth, if the number 8.8 shows under FRAME, then an excess of static charge has built up on the ad panels, interfering with proper operation on the sensor. Draining the static charge from the sensor area will clear this situation. If the reason for the fault cannot be diagnosed or fixed before it is desired to use the system again, the faulted cabinet should be put in the Manual mode by pressing the SEL button under MODE on the cabinet. The MAN indicator on the display should start to blink. This will take the cabinet off-line, and let the other unit continue to operate without it. However, this will probably not be a satisfactory mode for operating during a game.

Note: A good way to prevent problems is to set up well before game time. Starting the system and running it 2 hours before the game starts allows time to verify that the system is assembled and functioning correctly before the scoreboard, possession arrow, phones, and other apparatus are in place. These must all be removed if a problem occurs during a game.

Here is a list of error strings that the GUI can produce, along with some information about them. Note that other application errors may be reported by the operating system, and will vary.

Error Messages Originated from Promotion

"Unknown display mode."
Fault/Com Error dialog. Should never occur.

"Timeout waiting for GOTO."
Operation mode. Occurs if master does not respond to $g command. This could happen if the master is handling a fault when it gets a move command from the GUI.

"Unexpected characters in GOTO echo: "%s""
Operation mode. Occurs when master responds to $g with something other than $g or "Error..." or "Warning..." or "Invalid...".

"OLE initialization failed. Make sure that the OLE libraries are the correct version"
Grid Control internal error.

"Bad status CRC."
Status packet received from master is not valid. This could be caused be excessive noise on the serial link between the master and the PC.

"ERROR: Parse error in report."
Report ('R') is invalid.

"Invalid ad ID in status data."
A status byte for a sign is reporting an ad number that does not match anything in that signs scroll. This will happen if a sign mis-reads it's sensor stripe, and cannot recover.

"GOTO command failed."
Serial port failure while sending binary go.
"Bad sign state transition. Cluster update incomplete."
Something "unusual" has happened, e.g. a sign has started moving after finishing its normal move, but is still waiting for other signs in the cluster.
"Unable to park signs."
Serial port failure while sending binary go during park operation.
"Scroll %s not found. Reference to it will be removed from sign %d."
Something weird happened while validating edited configuration. Should never happen.
"Path for default configuration must be set in options. No configuration loaded."
Default configuration path is not set on the options dialog.
"Communication error while contacting network."
Can occur during "Establish Communications" if serial connection is bad, or the signs are not powered on.
"Network initialization failed."
Something bad happened while waiting for network to initialize.
"Communication error while initializing network."
Timeout while waiting for response to "i" or "mmm".
"Unexpected response to initialize request."
Network responded with something other than "master!" or "Initializing..." to "mmm" or "i".
"Unable to determine network configuration."
Error of unknown origin occurred while querying network for status and ad lists.
"Could not make serial connection to signs."
Unable to open serial port.
"Memory allocation failed."
An unrecoverable out-of-memory condition exists. FATAL.
"Could not initialize comm. port."
Sign Language Dialog was unable to open serial port.
"Comm. error."
Sign Language Dialog timed out waiting for input from master.
"SetItemText failed!"
Grid control failure. Should never happen.
"Error sending command to sign %d."
Serial port failure sending "R" command.
"Communications error waiting for report from sign %d. "
"(Expecting report; received "%s")" Timeout waiting for response to "R" command.
"Error processing report."
Report had more lines than expected.
"Error processing sign data. Expecting %s; received "%s""
Parse error while processing report data.
"Data error: Expecting integer; received "%s""
Parse error while processing report data.
"Ad count mismatch."
Error in report data. Ad count does not match ad list.
"ERROR: Status reply exceeded buffer size."
Something really strange happened. Response to binary status command exceeded 1K.
"Status Timeout!" "Lost contact with master. Network not responding."
Timeout waiting for status reply. Master has not responded to subsequent "mmm".

Error Messages Originated from the S.B.C Firmware

Errors from the S.B.C in the "sign language window." Some of these messages will only be produced by ROMs with "Chatty Errors" enabled. There are some error messages that are caused by more than one thing, and are listed more than once. You should be able to figure out which is which from context.

"Error: brake still engaged when moved attempted"
SBC attempted to call the movement routine without calling the brake release routine first. Chatty errors only. Should never happen.

"Error: invalid direction of: "
The movement routine was passed a bad direction value. Chatty Errors only. Should never happen.

"Error: Could not get a stable ad_num reading: "
The signal de-bounce routine failed on the address lines. Could be caused by a bad SCU, bad wiring, or excessive electronic noise. Chatty Errors only.

"Error: Could not get a stable addr_strobe reading: "
The signal debounce routine failed on the address strobe line. Could be caused by a bad SCU, bad wiring, or excessive electronic noise. Chatty Errors only.

"Error: Could not get a stable fault reading: "
The signal debounce routine failed on the fault line. Could be caused by a bad SCU, bad wiring, or excessive electronic noise. Chatty Errors only

"Error: invalid ad: "
The sign saw an unexpected ad number. Could be caused by bad sensor adjustment, bad sensor stripe, bad wiring. Chatty Errors only.

"Error: Got a fault while not moving"
The SBC detected a fault. Chatty Errors only.

"Error: Handling a fault while not moving"
The SBC is about to attempt to reset a fault. Chatty Errors only.

"Error: got fault while moving"
The SBC detected a fault. Chatty Errors only.

"Error: move took too long"
A move has taken longer than ERROR_UINT_TIME. Chatty Errors only.

"Error: missed ad too many times. "
"Must be really messed up. Can't get to the ad after trying many times. Chatty Errors only

"Error: tried to move too many times. "
Follows the "missed ad too many times" message. Chatty Errors only.

"Error: The SBC did not respond to the address strobe in time."
The SBC thinks that it has missed the address strobe. Chatty Errors only.

"Error: The SBC was late in sending the stop signal to the SCU."
Same as above.

"Error: invalid sign of "
The routine that generates the "$s" output was passed and invalid sign number. This should never happen. Chatty Errors only.

"Error: command too long"
The length of a command from the PC is larger than the input buffer.

"Error: can not move to invalid ad "
The master does not have the ad it was told to move to. This can happen from a "g" command that is for a slave sign which does have the ad.

"Error: invalid sign number of "
The sign number argument to the "R" command is invalid.
"Error: can't go down from ad "
A "d" command tried to move past the end of the scroll.
"Error: can't go up from ad "
A "u" command tried to move past the end of the scroll.
"Error: invalid ad number of "
The ad number argument to the "G" command is less than or equal to zero, or greater or equal to 31.
"Error: invalid sign number of "
The sign number argument to the "G" command is invalid. The sign does not exist on the network.
"Error: delay too long: "
The delay time argument to the "w" or "W" command is longer than 3600 sec. (1 hour).
"Error: delay too short: "
The time delay argument to the "W" or "w" command is smaller than 1 sec.
"Error: invalid sign number of "
The sign number argument to the "!rscu" command is invalid.
"Error: Could not reset the SCUs on sign "
The "!rscu" command fail to be aknowaged by a slave.
"Error: invalid default sign number of " ""
The sign number argument to the "!sign" command is invalid.
"Error: invalid units per sign: "
The number of units argument to the "!units" command is invalid. Only 0 (for testing) or 1 units are allowed.
"Error: invalid fault delay time: "
The fault delay time argument to the "!config" command is longer than MAX_FAULT_DELAY (1 min).
"Error: invalid max missed ad retries: "
The max missed ad retries argument to the "!config" command is larger than MAX_MISSED_AD (10).
"Error: invalid auto reset tries: "
The number of auto resets argument to the "!config" command is larger than MAX_AUTO_RESET (10).
"Error: invalid number of simulated signs: "
The number of signs argument to the "!sim" command is larger than MAX_SIGNS (120), or zero.
"Error: Sign is not alive: "
Attempt to kill an already killed sign, or a sign that does not exist on the network.
"Error: invalid aux port number of "
The port argument to the "!aux" command is invalid. It must be greater than 0 and less than 2.
"Error: invalid aux value number of "
The bit argument to the "!aux" command is invalid. It must be either 1 or 0.
"Error: invalid sign number of "
The sign argument to the "!aux1" command is invalid. Either the sign has been killed, or it does not exist on the network.
"Error: invalid aux port number of "
The port argument to the "!aux1" command is invalid, valid ports are 0,1 or 2.
"Error: invalid aux value number of "
The bit argument to the "!aux1" command is invalid, it must be either 0 or 1.

"Error: invalid sign number of "
The sign argument to the "!aux1" command is invalid. Either the sign has been killed, or it does not exist on the network.
"Error: Invalid slave sign of "
The check_slave_msg() routine received a reply from a slave that does not exist. This should not happen. Chatty Errors only.
"Error: sent to sign %s received from sign "
The check_slave_msg() routine sent a status request to a slave and got a reply from a different slave. The CRC on the reply must be good to get this message.
Chatty Errors only. Do you have two signs with the same number?
"Error: sign %s sn %d rn %d"
A slave answered a status query with an out of sequence network packet. The slave has a problem. Chatty Errors only.
"Error: got a nak from sign %s"
A slave sent a "nak" (not aknowaged) reply to the master. The packet from the master was malformed upon receipt. Chatty Errors only.
"Error: no reply from sign "
A slave do not respond to a status query. Chatty Errors only.
"Error: could not send a "%s" message to sign %s, command failed."
The master sent a message to a slave and did not receive acknowagement from the slave. The slave may be handling a fault, the network may be broken, or
the slave is not powered on. Chatty Errors only.
"Error: no reply from sign %s, %d times"
The master sent a message to a slave and did not receive acknowagement from the slave this many times. Chatty Errors only.
"Error: invalid crc from sign "
A reply from a slave had a bad CRC. Could be a noisy network, or 2 or more signs may have been transmitting at the same time. Chatty Errors only.
"Error: unknown sendOp22 return value of "
The sendOp22() function failed. This should never happen. Chatty Errors only.
"Error: invalid slave of "
The send_slave_msg() function was passed and invalid sign number. This should never happen. Chatty Errors only.
"Error: could not send a "%s" message to sign %d. %d not replied to," %d errored.
the send_slave_msg() function is not able to talk to a slave. Chatty Errors only.
"Error: broadcast_slave_msg called while expecting an addr strobe!"
Internal SBC error. Should never happen. Chatty Errors only.
"Error: Invalid ad number: "
Something went wrong with an "a" command. Could be too many ads (more than 30), a ad number smaller than one or larger than 30.
"Error: Duplicate ad number: "
The "a" command detected duplicate ad numbers in ad list.
"Error: Must have at least one sign."
get_new_ad_list() found a zero length ad list. This can't happen, as the command parser would catch this error.
"Error: Invalid ad number found"
get_new_ad_list() has followed a null pointer. This should never happen.
"Error: could not update ad list for sign "
An error occurred when sending a slave an updated ad list.

"Error: Timeout while trying to read binary goto command.\n"
It took longer that 200 msec to read a "$g" command from the PC.
"Error: Invalid crc."
The "$g" command from the PC had a bad CRC.
"Error: could not get config from sign "
The "r" or "R" command failed. There was a problem sending the query to the slave.
"Error: Couldn't write to eeprom! Write failed on %s"
The slave reported that the the last message failed after a broadcast_slave_msg() command to write config to EEPROM.
"Error: Invalid pass number: "
The "!learn" command did something odd. do_learn_sign() thinks that it was not on pass 1, 2, or 3. This should never happen.
"Error: Sign move took too long."
The "!learn" command looked for an address strobe for more than MAX_MOVE_TIME (8 seconds for ad-to-ad move time). Either you have a very slow sign, a very big sign, both, or a broken sensor.
"Error: Detected more than MAX_ADS ads on the scroll."
The "!learn" command found more than 30 ads.
"Error: Detected ad number %d which wasn't the expected ad number of %d that was learned."
Pass 1 and pass 2 of the "!learn" command differ on the master. Could it be that you can read a stripe from one direction only?
"Error: Detected wrong address stripe %d instead of $d"
"!learn" found that you have your 0 and 31 mixed up.
"Error: Fault detected."
A fault happened while doing a "!learn".
"Error: Sign 0 could not learn its scroll and timing constants"
The "!learn" command failed on the master.
"Error: Sign %s Couldn't learn the scrolls and timing constants! Failed on %s"
The "!learn" command failed on a slave.
"Error: invalid late stop delay of "
Internal testing.

Updating the Software

ADDING AN AD

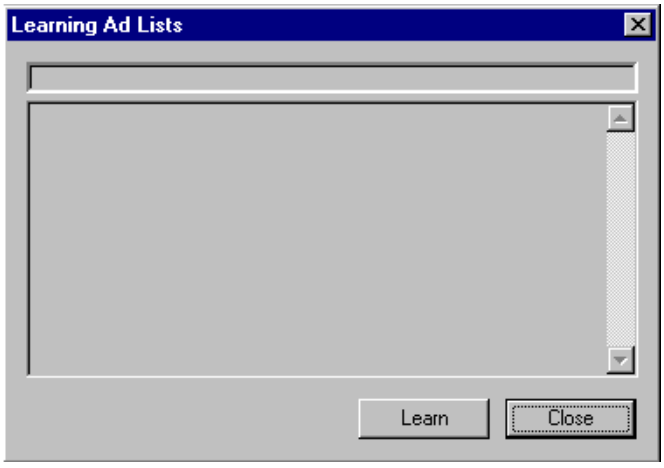
When new ads panels are added to the scroll, both the software on your P.C., and the firmware in the signs need to be updated. To update the software and firmware, use the following procedure.

1. The first thing to do is to get the correct ad list. You can do this by pressing the "SEL" button and then pressing and holding down the "Jog Down" button until the display reads 0 on the back of the sign. After you get to "0", press the "Skip Up" button once, now you will need to write the number down that is displayed on the control panel and the ad that is displayed on the front of the sign. Press the "Skip Up" button once again and again write down the number displayed and the ad displayed. Do this until you get to the number "31". After you get to "31" press the "Skip Down" button once.

2. Now you can go into the Software part of updating. Go ahead and "Connect to the Sign Network".

3. After connecting, go to the "Commands" pull down menu and select the "Learn ad list" option.

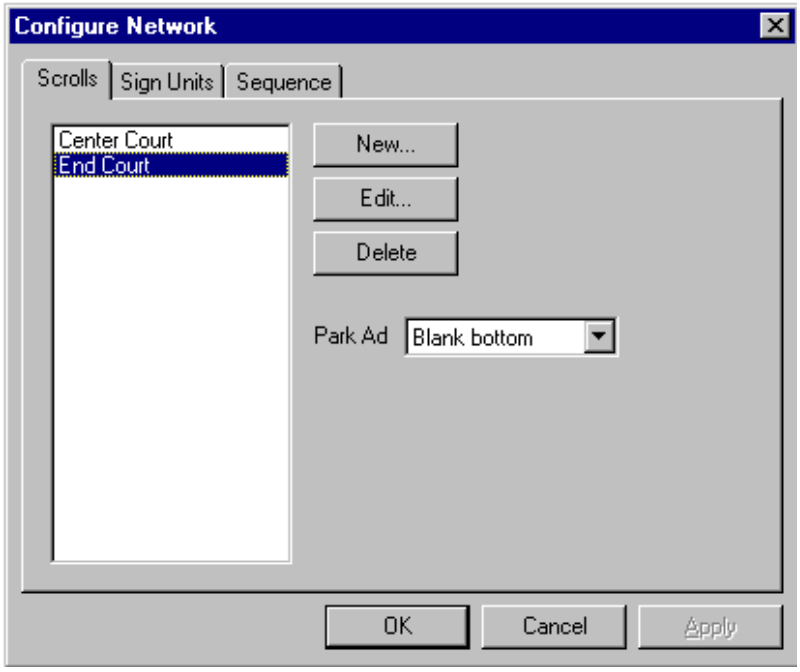
4. Now you should notice a confirmation check box that has two options, either "Learn" and "Close". Click on the "Learn" button and another confirmation box will come up saying something like it may take 15-20 minutes. Go ahead and click on the "O.K" button.

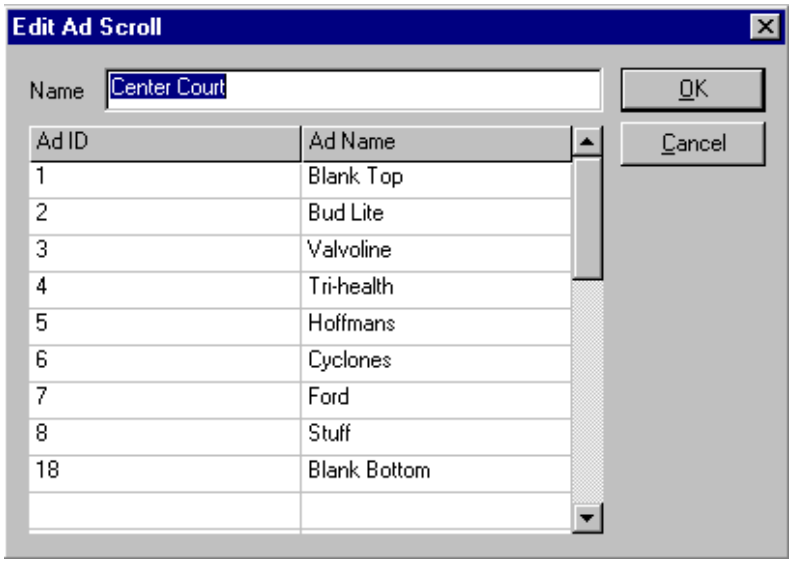


5. Your signs should now be moving to the top of the scroll, then down to the bottom and back to the top. Lots of information will scroll on the dialog box. Most of this can be disregarded. Wait for the sign to stop moving. If all went well, you should get a check box that reads, "Commit ad list" and you should select the "Yes" button. Now you can click on the "Close" button on the box labeled "Learning ad list"

NOTE: If your signs were unable to learn, skip to "Updating the EEPROM using sign Language" on page 18.

6. Now go to the "File" pull down menu and select "Disconnect" and then go back in the "File" menu and select "Edit Configuration." Now you will notice 3 tabs: Scrolls, Sign Units, and Sequence. Under the "Scrolls" tab you should have a name in the white box, highlight it and select the "Edit" button. Here is where you need to compare what you have written down as the ad list with the ad list shown on the screen. Each ad needs to needs to correspond with its respective number. If you have added the new ad in the middle of the scroll, you will need to delete everything below where the new as is to be. Then you can type in the number in the "Ad Id" column, and type in the name of the Ad in the "Ad Name" column. Then you will need to type in the rest of the numbers and there corresponding ads. You do not need to type in the "0" and "31". After you have finished typing this information in select the "O.K" button.





7. Now select the "Sequence" tab. Here is where you will determine how the ads will be displayed when the sign is moving during a game. Click on the number displayed in the box on the left side, and you will notice the names you typed in the "Scrolls" tab will appear. In the box on the right side, the ads and a time will appear. Erase all the ads and all the time, so we may start from scratch. After deleting all the ads and the time put your cursor in box number one on click on the ad side. Now under the center column double click on the top ad and it should appear in box number one on the right hand side. If you want the ads to display for 3:00 then you may proceed. If you want a different time, now is a good time to change the time. Just click on the time and change it. Now keep going down the list. Once you have double click on the bottom ad, go right back up the list but do not double click on the very top ad, because the sequence will start over, and it is already on the top. Make sure you select the "Apply sequence" button when you are done or it will not save. Now click on the "O.K. button and it will ask you if you want to save the configuration. Select Yes.

8. Now you can go to "File" and select "Connect". Go ahead and make sure you have everything the way you want it by pressing the "Next Sign" button until you have completed the sequence. If you have any questions, do not hesitate to call us. We can be reached at 402-474-6646 from 7:30 a.m. – 5:00 p.m. Monday-Friday, and at 402-770-7970 (Charles DeVries Cell Phone) or 402-770-6461(Jeremy Folkerts Cell Phone) at any other time.

Removing an Ad

To remove an ad from the configuration that has been physically removed from the scroll, follow this procedure.

1. Go to "File" and select "Edit Configuration" (You may have to select "Disconnect" first if the "Edit Configuration" box is grayed out)

2. Go to the "Scrolls" tab

3. Find the ads to be removed

4. Click on the ad and delete the ad name and the ad number both

5. Highlight the remaining entries below using the mouse.

6. You can cut the data by using "Ctrl + x"

7. Click on the highest available blank spot on the left side and paste the data back in with "Ctrl + v"

Now we are done in the "Scrolls" tab. Now go to the "Sequences" tab. This should be o.k. Just Check it over. The software should know that an ad has been removed, and deleted it for us.)

Deleting an Ad from the Display Sequence

To keep an ad in the scroll from being displayed, you must remove it from the "Sequence" tab only. Do not remove it from the "Scrolls" menu.

1. Repeat step 1 above and then go to the "Sequence" tab.

2. Pick the ad you wish to remove and delete it by backspacing over the name and time.

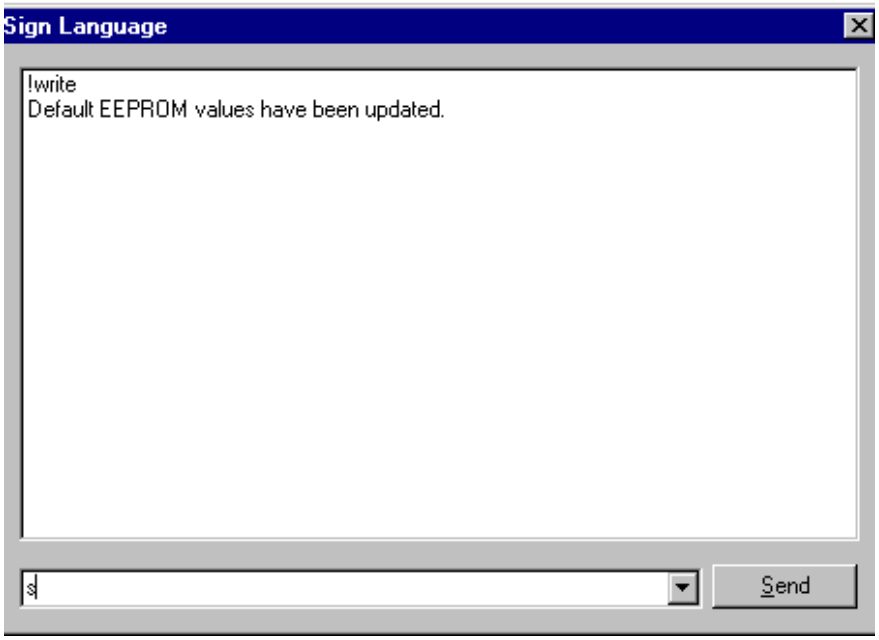
3. Highlight all entries below the blank line with the mouse and cut it by using "Ctrl + x"

4. Click once in the uppermost left hand empty box and paste the data using "Ctrl + v"

5. Select the "Apply Sequence" button and then select o.k. and save.

Update the Eeprom using Sign Language

If your signs were unable to "learn" their ad list, this will force the signs to learn the correct ad list. Connect to the Sign Connect and then go to "View" and select "Sign Language Window" and you will get the box shown below.



In the blank below the box type an "r" and hit enter. This will give you a report of the default sign and the ad list including "0" and "31". It also shows various times constants and etc. The line we are concerned with is the line that says "ad list 0 # # # # # # # # 31" the numbers shown are probably the old ad list. To update this to the new numbers, type a lowercase "a" and then space and now type in your ad list with a space between each number so if you ad list was just 1 2 3 4 5 you would type "a 1 2 3 4 5". You do not need to type "0" and "31" because this is just a given. After typing you're ad list in. Hit the enter key on your keyboard and then type "!write" and hit enter. You should get a response back from the computer which reads "default eeprom values have been updated. You have just updated the eeprom chip on the z-world board. Now you need to update the configuration file. So go to step 6 above on page 20 and follow steps 6 – 8.

Every SignCo Rotating sign has been designed to simplify maintenance and service. In this section we will guide you, step by step, through service and maintenance procedures you may encounter during the life of your sign. If you encounter any problems with your sign, we encourage you to call SignCo before attempting to solve your problem.

Routine inspection can eliminate costly sign delays that are avoidable. These should be conducted at two or three times a year. As a minimum, the following should be accomplished.

IF POSSIBLE, TAKE A CELL PHONE WITH YOU AND CALL OUR SERVICE DEPARTMENT FROM THE SIGN.

DISCONNECT POWER BEFORE ATTEMPTING ANY SERVICE OR MAINTENACE PROCEDURES.

Belt Tension.

Tools required to tighten belts.

1/8" T Handle Allen Wrench

Check belt drives for tightness and wear. If belt is loose, loosen the bolts holding the motor bracket in place and slide the bracket to tighten the belt. Tighten the bolts on the motor bracket. Replace the belts if there is evidence of fraying or excessive wear.

Cleaning the Ad Panels

The panels should not be cleaned with water or detergent. The panel itself is not affected, but the ink on the panels is often adversely affected by the water and/or detergents. Small smudges on the panel can often be removed with an eraser.

Stacking of the Ad Panels

When machines have 15-30 ads there may be some problems with ads properly stacking on rolls. This is caused by improper cutting or splicing of ad scrolls.

Cleaning the Cabinets

The power-coated surfaces of the cabinets can be cleaned with water and most industrial grade cleansers. The use of solvents should be avoided. Do not use water under high pressure, as the cabinets are not sealed

Sensors

Verify proper operation of sensors. Use non-lubricated air to clean optical sensors. Clean sensors periodically with lens cleaner (sold at camera shops) Check alignment of sensors to sensor stripes. Note: if the number of the ads read inconsistently, it may be necessary to calibrate the sensors.

Adjusting the Sensor Voltage

Tools required to adjust sensor voltage.

Digital Multi Meter with hook probes or alligator clips
Very small flat head screw driver
1/16" T-Handle Allen Wrench
Preferrably somebody that know something about electronics or an electrician.

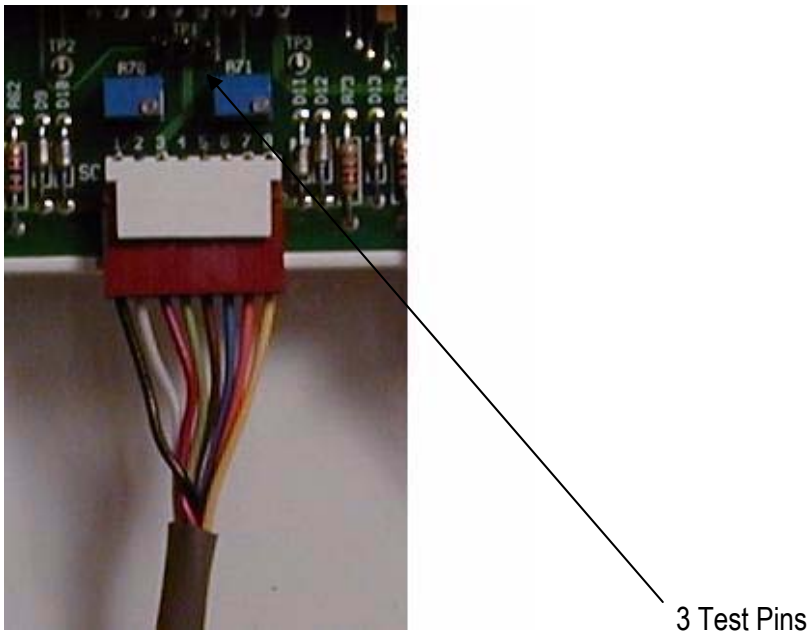
Ok first of all, adjusting the sensor voltage is not just for everyone. It is very easy to cook a S.C.U with a misplaced poke of a test probe. With that in mind here we go.

1. Power off the sign. Check for lights on the S.C.U
2. Gain access to the S.C.U by taking the lid off of the control box.
3. Remove the 24v supply to the S.C.U by removing the green plug with 3 wires on the top of the S.C.U
4. Remove the 4 small round head screws from the front of the S.C.U as shown below. (Try not to lose them, you cannot get them from the hardware store.) Remove the cover.

Remove these 4 screws using a 1/16" allen wrench

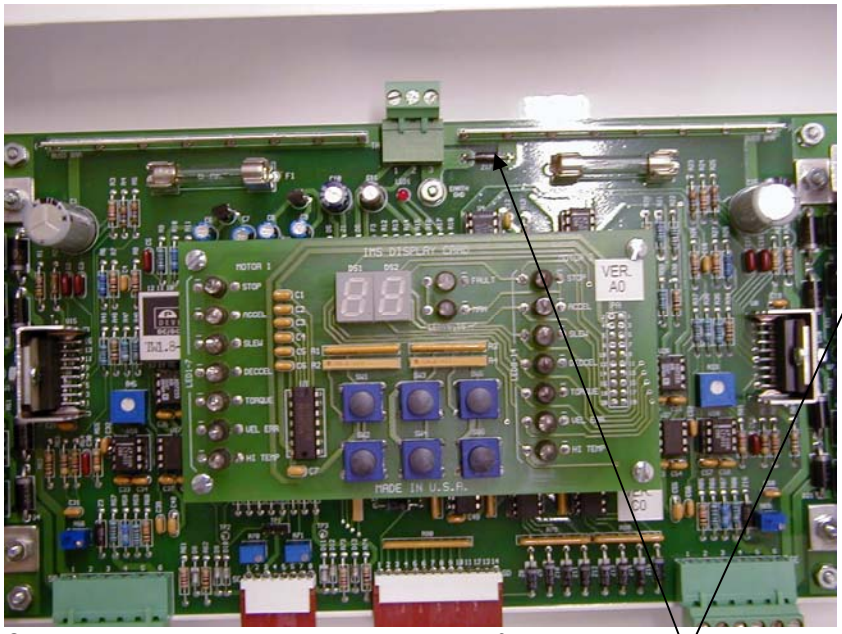
5. Check the green connectors where the motor leads come in (Connectors are labeled). Make very certain that the bare shield wire on the motor connectors does not cross any other bare wires. Check that no conductive stuff (screw drivers, Allen wrenches, etc.) is in contact with the circuit board. Everything should be dry too.

6. Look on the bottom edge of the board, right above where the sensor wires come in, for 3 small test pins marked TP1 right above the 2 blue pots.



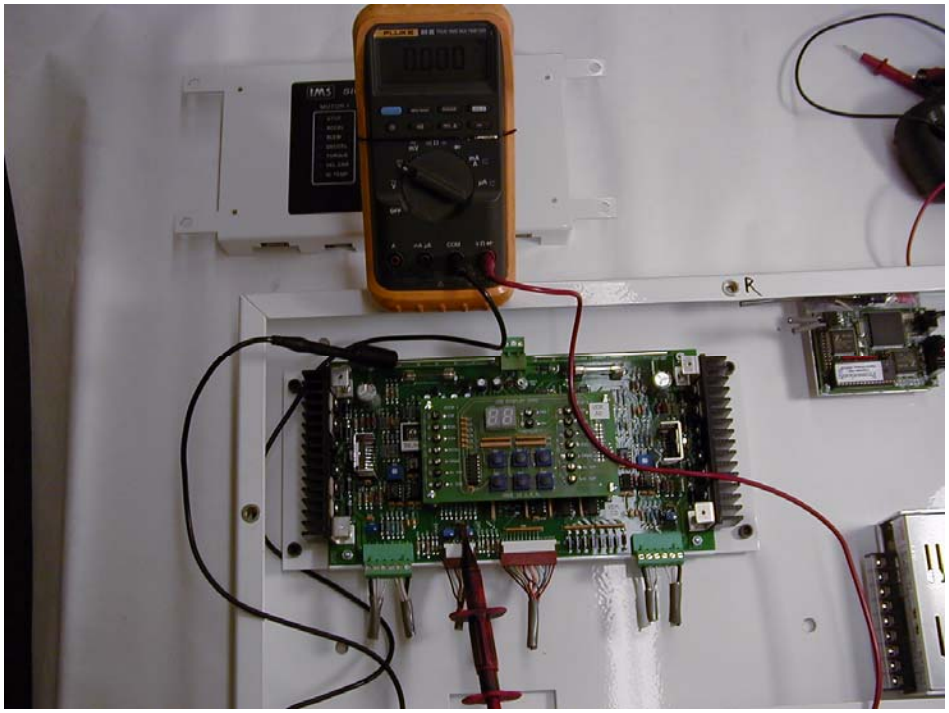
The Left pin adjust the: Black, White, Red, and Green Wires (Left half of the sensor)
The Middle pin is ground.
The Right pin adjust the: Brown, Blue, Orange, and Yellow Wires (Right half of the sensor)

7. Plug the power back in to the sign by plugging the green connector back in to the S.C.U.
8. Manually position some blank white Tyvek under the sensors, by either using the jog button or by turning the rollers by hand. Note, that if you turn the rollers to fast the S.C.U will fault. Try to keep tension on the roll.
9. Get out your Meter, set scale for 2 Vdc range. The black COMMON lead gets connected to common. You can do this along the top edges of the S.C.U board. Don't hook up to chassis ground, it won't work. This is where your hook probes or alligator clips come in handy.

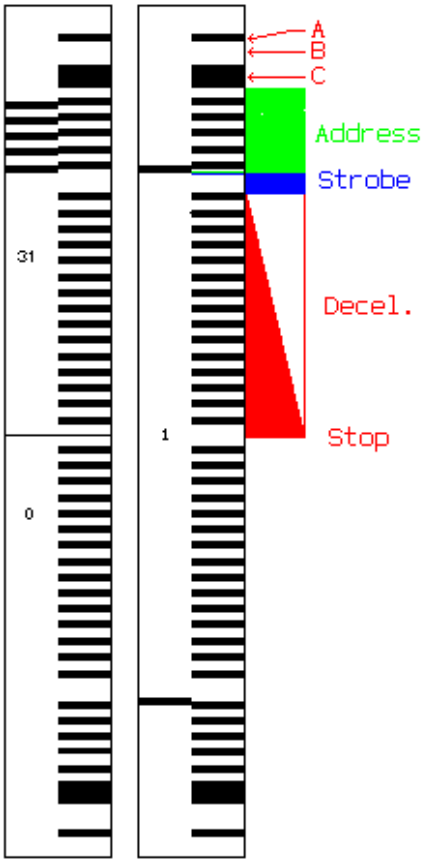


Connect your black common lead to one of the bus bars

10. Using care not to short any adjacent pins, connect the red side of your Meter to TP1-1, the left hand pin. You should in theory see about 1.8 volts to 2.0 Vdc. If the reading is way off, like 1.5 or 2.5 volts, adjust the potentiometer R70 until it comes around to about 2 volts with a very small flathead screwdriver. The potentiometer is a multi turn pot, and it sort of "clicks" when you reach the upper and lower limits. If your pot is max-ed out and you still cannot get the 2 volts, you may need a new sensor board.
11. Now position a black stripe under the sensor and the voltage should at TP1-1 should fall to around 0 volts.
12. Repeat all of the above on the other sensor, testing TP1-3 and adjusting pot R71.



How Does a Sensor Stripe Work?



The strip passes the sensors, starting at the top edge. The right sensor (clock) encounters the first 3 strips, A; a short black line, B; a long white space, C; a long black line. These lines have the relationship in width of:
A x 3.5 = B, B = C

When this sequence is read by the SCU, it will interpret it as a valid strip, and not artifacts from the image.
The next group of 5 black lines are the clock marks for the marks on the left (data) track. As each of these lines are read, the data sensor is checked. Note that the data lines follow the clock lines by half the width of the line. If either the stripe or the sensors are not installed straight, this relationship is lost and an address of Zero will be read. Valid data is no lines (ZERO) through 5 lines (31). Addresses are output by the SCU on lines A0 - A4 as soon as they are read.

The long space after the address section is where the address strobe (AS) is output. The signal AS means that valid data is on the address lines. The duration of AS is from one half the line width of the 5th address clock, and the next black line.

The SCU will decelerate the scroll if the input line MOVE is inactive before the end of the AS signal. The next 15 clock lines are used by the SCU to control the rate of deceleration. The scroll should stop in the center of the sensor strip.

The SCU does not look at the sensors while accelerating from a stop.

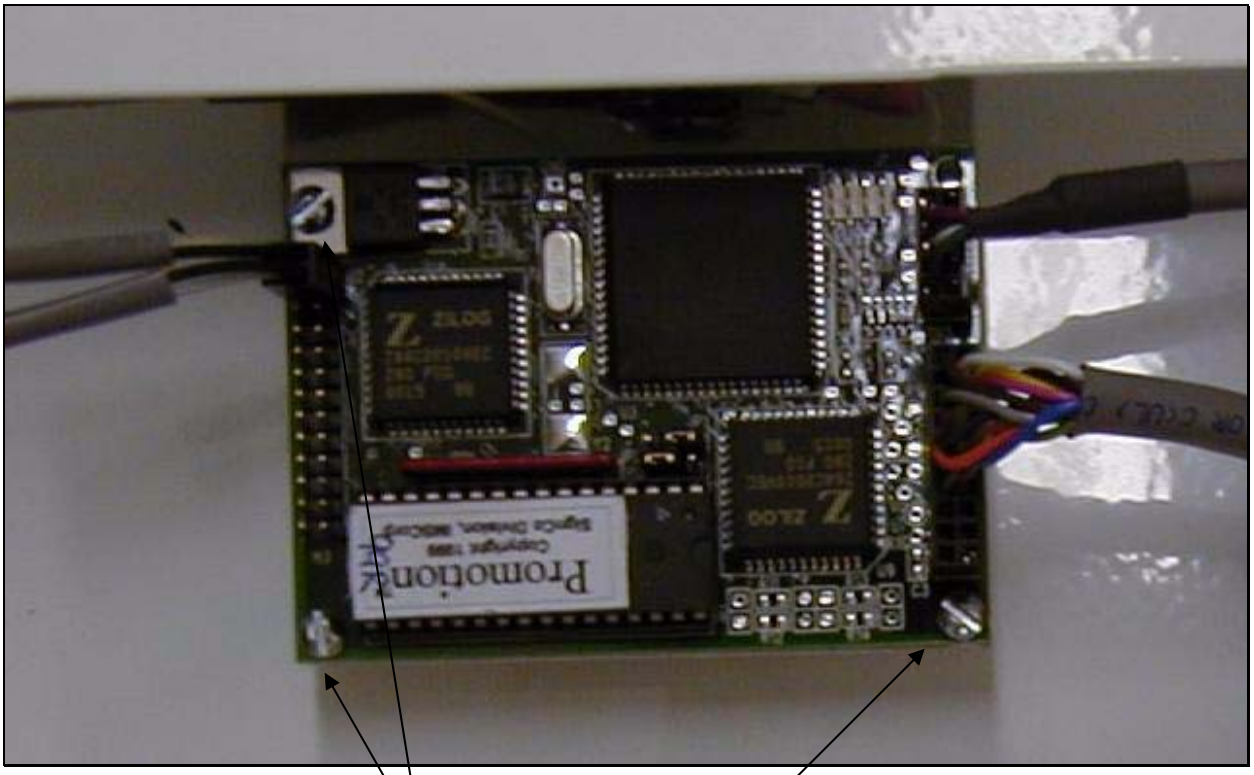
Replacing a Single Board Computer (S.B.C)

Tools required:

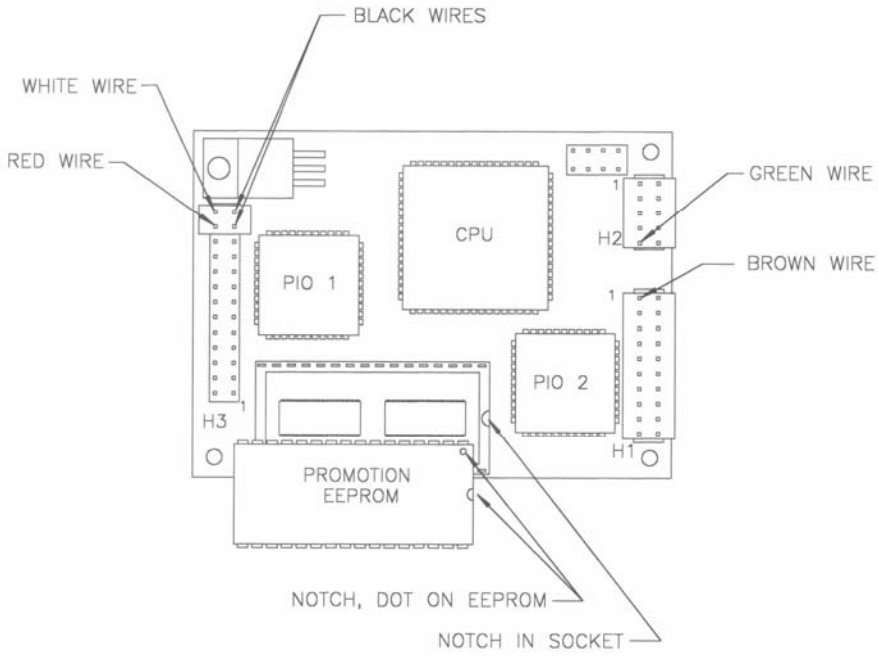
Medium sized screwdriver

1. Unplug the power to the sign from the outlet box on the wall.

2. To replace a Single Board Computer, un-screw the 3 screws that hold computer to the aluminum plate. Try not to lose the screws or the little aluminum standoffs that are under the board. If you do lose a screw, they are #5-40. Next, take the connectors off the board you are replacing and put them on the new board. They must go on the same headers as the old board. The 2 pictures below show you how and where they should go. If you put a connector on in the wrong position, you may burn up a board as soon as power is restored.



3. After putting the connectors on the new board, you may attach the new board back to the aluminum plate. Make sure to orient the board as shown above, and to put the (3) screws back into the same 3 holes you removed them from. Tighten the screws up. The upper right hand of the board does not get a standoff and a screw because there is a solder lead and it will probably short the board out. Now we need to remove the EEPROM from the old board and put it on the new board. Please see the next page to accomplish this task.



Connectors on the board must be plugged in as shown

Replacing a FLASH EEPROM

After replacing your Single Board Computer, you will need to extract the FLASH EEPROM that is on the old board and place it on the new board as shown above. The EEPROM is a fairly delicate object so you will want to be extremely careful when working with one. The best way to remove the EEPROM is by wedging a fairly flat object such as a pocket knife blade between the bottom of the EEPROM and the top surface of the EEPROM socket. Then carefully pry the EEPROM up. The little prongs on the EEPROM are the most fragile. If you manage to remove it without removing any of the prongs, it was a miracle. If you got the EEPROM removed but notice a couple of the prongs got bent, you can try to bend them back so their straight up and down. If you removed the EEPROM and busted off one or more of the prongs, you will need to get a replacement EEPROM. You will want to call one of our Service Technicians at 402-474-6646. If it is after 5:00 p.m. CDT you will need to call either 402-770-6461 (Jeremy Folkerts) or 402-770-7970 (Charles DeVries).

To place the EEPROM in the new board, there are a couple of things to know before getting started. The orientation of the EEPROM is very important. There is a little notch on one end of the EEPROM and a little notch in the EEPROM socket on the board. The notches must line up as shown in the illustration above. If you put the EEPROM in backwards, it will burn the EEPROM up and possibly the Single Board Computer. After identifying the notches in both parts, it's usually best to start out by placing one side of the EEPROM prongs in the socket and then placing the other side in. After you are sure all the prongs are in the socket, press down on the EEPROM and it will "snap" into the socket. After you have the EEPROM placed in the socket, look around the EEPROM to make sure none of the prongs are sticking out of the socket. If no prongs are showing, you may plug the power back into the sign.

NOTE: One of the three control boxes in your truck has a fork connector under the upper right hand screw of the Single Board Computer. If this is the board you are replacing, you will need to put the fork connector under the same screw on the new board.

Installing Software

The following information is furnished to run the software. If the system was purchased though SignCo, the personal computer was outfitted with the software already installed. Any data required to run the software will have been entered, including a default display sequence and display time.

If for some reason one needs to reconfigure the setup, the following sections describe in detail the steps necessary to install the Promotion Sign Control Software required to run the system.

System Requirements

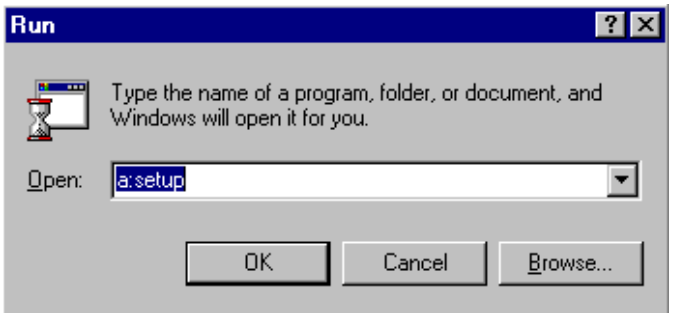
The sign system is controlled by the user from an Intel□□based Personal Computer running one of the following operating systems.

Microsoft Windows NT Workstations□
Microsoft Windows NT Advanced Server□
Microsoft Windows 2000□
Microsoft Windows 98□
Microsoft Windows 95□

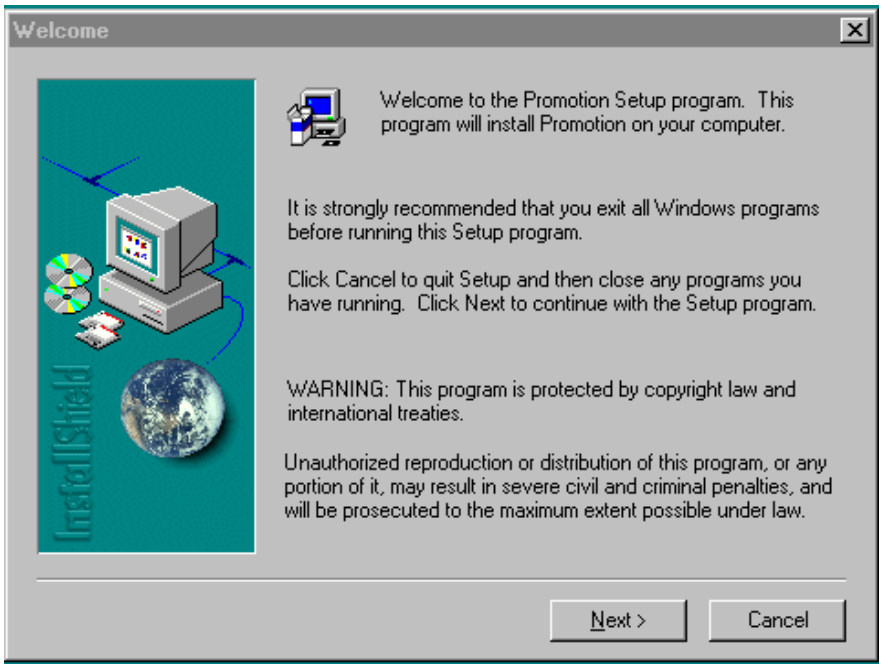
The software requires about 4Mb of disk space, and 8 Mb of memory, and one RS-232 serial port.

Installing Promotion from a Floppy Disk

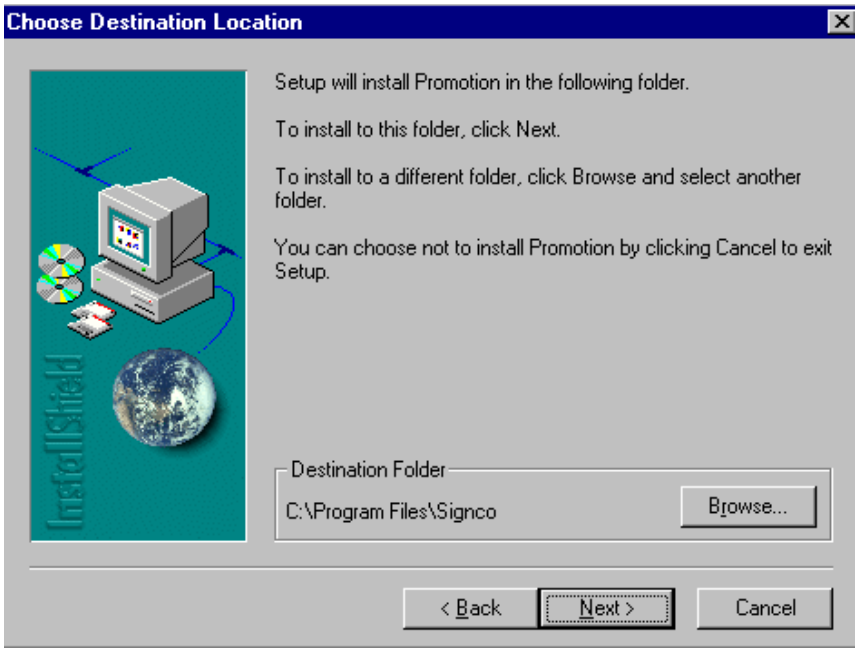
To install the software, insert the distribution diskette in your floppy drive. Go to the "Start" menu and pick "Run". In the run dialog box, type: a:setup



This will start the install program. After the installation files are copied, a welcome window will come up. As stated in the window, it is recommended that you quit any programs that you may have running. Click on the "Next" button.



The next part of the installation is to choose the directory in which the Promotion program, and its files will be copied into. For the ease of future support, please accept the default (C:\Program Files\Signco) by clicking "Next". Following that, there will be a window asking about what folder to install the icons. Again, for reasons of ease of future support, accept the default by clicking "Next". Lastly you will see a screen that shows you the progress. When that screen closes, the installation is complete. There should be a red Promotion icon on your desktop.

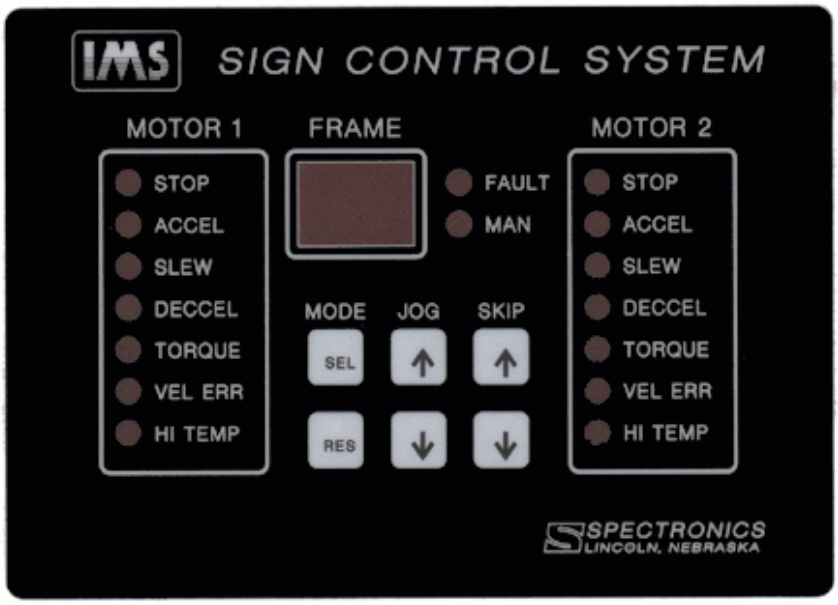


In order to run the software, the user will need two pieces of information. First we need to know which serial port that we intend to use. On Windows 9x systems we can find this by opening "*My Computer*" from the Desktop, then opening "*Control Panel*", and then "System". From the "*System Properties*" dialog click on "Device Manager" and then "Ports (COM & LPT)". Many laptop computers will have an "Infrared Serial Port", and a "Communications Port". The name of the Communications Port is shown in parentheses.

The other piece of information we need is the ad list for each unique scroll. If all of your scrolls are the same, you will have one list that looks something like this

Ad Name	Ad Number
Pepsi	1
Powerbar	2
Cooks Hardware	5
Car Zone	13
Time Warner	18

We can establish this list by manually operating the signs using the sign controller. Apply power to the signs, and hook up all cables necessary. First press the "*SEL*" button and you should notice the "*MAN*" light blinking on the control panel. If you don't see the light blinking, then press the "*RES*" button followed by pressing the "*MAN*" button. Then press and hold down the "Jog Down" button until the display reads 0 on the control panel and the "*Fault*" light flashes. This brings you to the top of the scroll. After you get to "0", press the "Skip Up" button once, now you will need to write the number down that is displayed on the control panel and the ad that is displayed on the front of the sign. Press the "Skip Up" button once again and again write down the number displayed and the ad displayed. Do this until you get to the number "31". After you get to "31" press the "Skip Down" button once. If all of the signs have the same scroll, you have what we need. If not, do the procedure with the rest of the signs.



Initial Software Setup

Connections

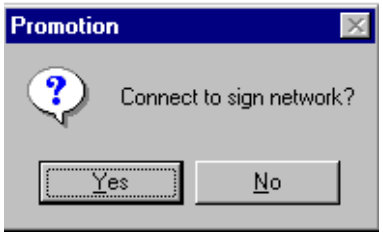
The Personal Computer communicates with a "Single Board Computer" by way of a serial cable. There will be one or more "Serial Ports" There is an female 9 pin "D-shell" connector located on the sign, and a usually a male 9 pin D-shell on the back of the PC. Connect the supplied cable between the signs and the PC. Ensure that the signs are powered on and all the cables connecting the signs to each other are in order.

The first time Promotion© is run, a new set of configuration files is created automatically. Since these files are based on our best guesses about your signs, and computer, the files will be inaccurate, and incapable of running the signs.

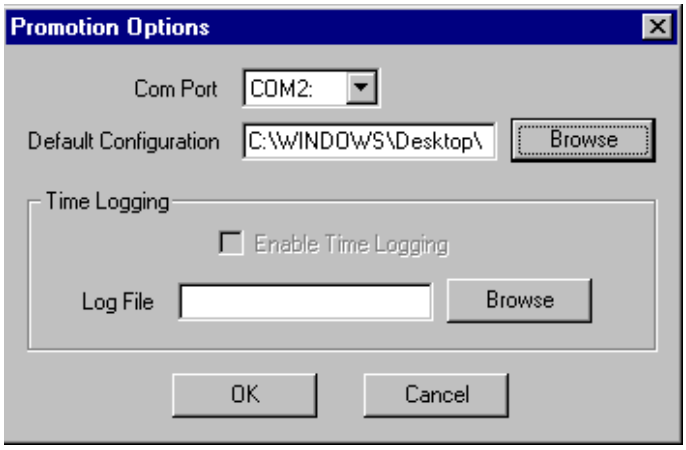
Starting Promotion.

Start Promotion by double clicking on its icon. It will start, and an error message "Unable to open default configuration file. The file could not be found." will pop up. Click "Ok".

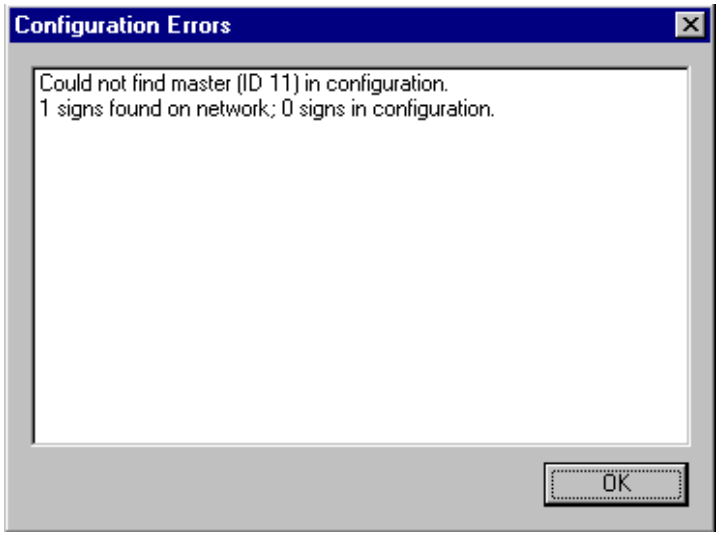
Next, a "Connect to Sign Network?" dialog box will pop up. Click on "Yes." You will now see either a box that says "Initialize network," and prints out a blue bar graph, or if there is a problem, a "communications error while contacting network."



If you saw the bar graph, skip this section. If you saw "Communication error while contacting network", this means that the software could not find the serial connection to the sign. Either there is a problem with the signs or the cable, or the default configuration that was automatically created guessed wrong about which communications port to use. To set the port, click on "Edit" from the tool bar at the top of the Promotion screen, and chose "Options...". The "Promotion Options" dialog box will come up. The first entry is "Com Port". Click on the arrow button, and select the correct communications port, then click "OK". Next, pick "File" and then "Connect". If you don't see the "Initializing network" box with the graph, then there is some other problem relating to cables, power, or the single board computer in the sign. Check your cables again, and retry. If you have another serial port on your sign system, try connecting the PC there.

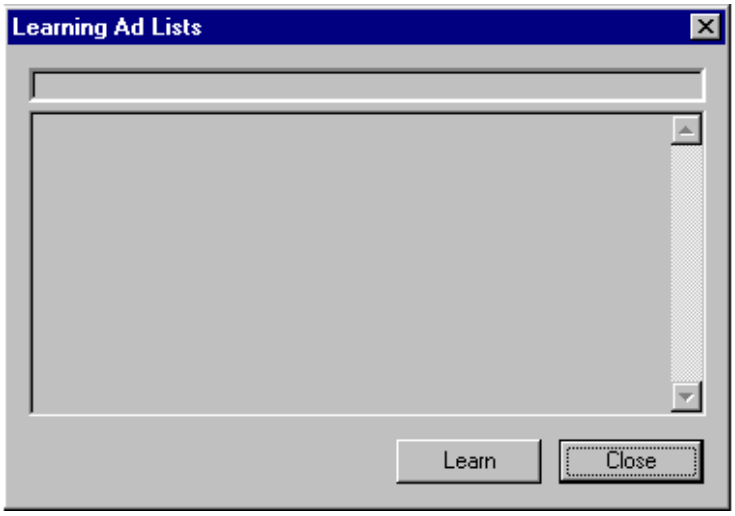


After network initialization, a dialog box pops up announcing that there are errors in the configuration. This is because we don't have one yet! Click the "Ok" button. As a side note; this dialog box will come up anytime that the software's configuration does not match what the network of signs is reporting. This may mean that there is a hardware problem of some sort, network cables between signs are not plugged in, signs are not all powered, etc.



Learning Ad List

The next task is for the signs to discover their ad lists and timing constants. From the tool bar pick "Commands", and select "Learn Ad Lists". A confirmation check box will pop up. If it is safe to move your signs, i.e, all persons are clear of moving parts, there is no loose artwork, etc, click "Yes". The "Learning Ad Lists" dialog box will come up. The signs will all move to the top of the scrolls, then down to the bottom, and back to the top. Lots of information will scroll on dialog box. Most of it can be disregarded. Wait for all of the signs to stop moving at the top of the scroll. If all went well, a "Commit ad lists" dialog box should pop up. Pick "Ok" if it does. Otherwise, look at the information in the dialog box near the bottom for any messages that start with "Error:". They can tell us what may have gone wrong. If there are no errors, click on the "Close" button on the "Learn ad lists" box.



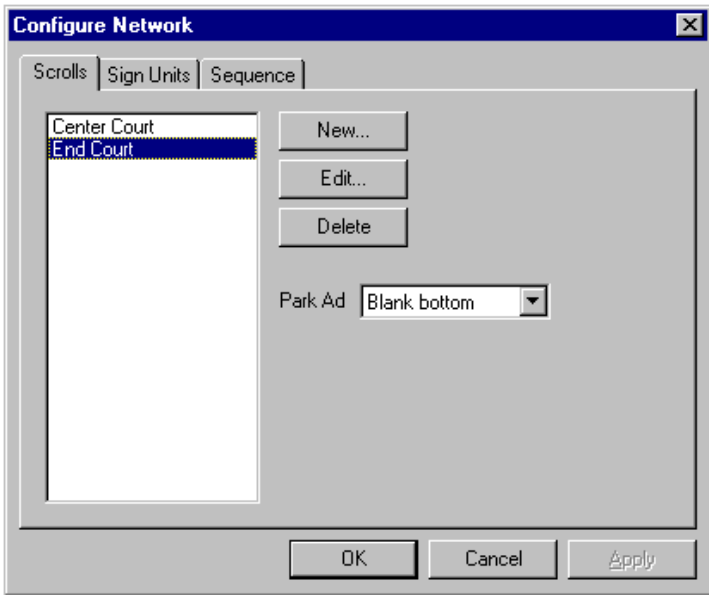
Auto Configure

From the "File" menu pick "Auto Configure". This will cause the software to ask the sign network about its configuration. The "Configure Network" dialog box that pops up will have whatever information the network provided.

The first tab menu item is a list of scrolls that were found. There should be an entry for each of your signs. If you don't have the right number of entries i.e.; you see "Scroll1" thru "Scroll3, but you have four signs, you should power off, check cables, and restart this process.

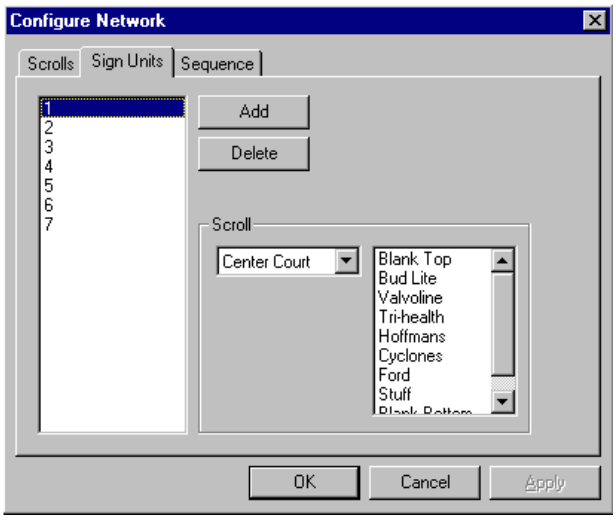
Scrolls Menu

The first tab menu item is a list of scrolls that were found. There should be an entry for each of your signs. If you don't have the right number of entries i.e.; you see "Scroll1" thru "Scroll3, but you have four signs, you should power off, check cables, and restart this process.



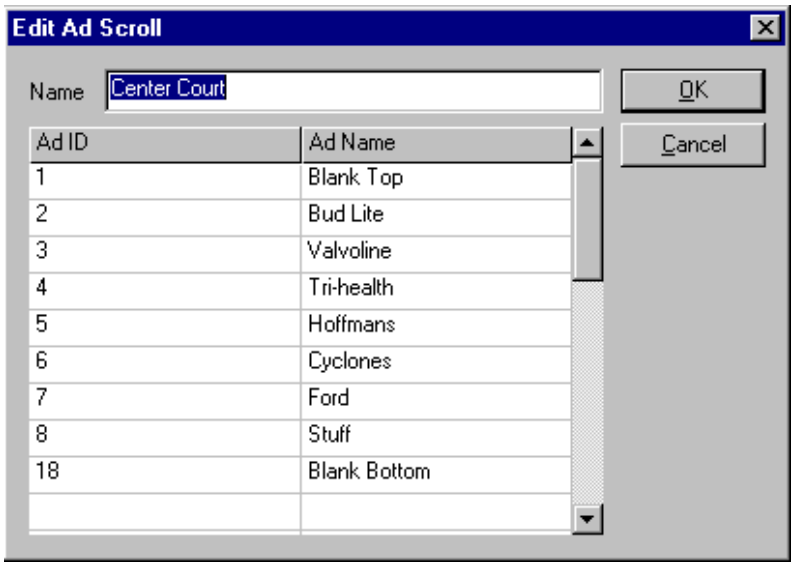
The Sign Units Menu

The second item in the tab menu is "Sign Units". Click it, and a list of sign numbers should be displayed in the leftmost box. Clicking on a sign number will show what the network reported about that sign's scroll. The scrolls will be named Scroll1, Scroll2, etc. The ads on the scroll will have names like Scroll1-1, Scroll1-5, etc. These are the default names, the number in the scroll name reflects which sign that scroll was found on. The second number in the ad names reflect the number that is displayed by the control when that ad is displayed. They don't mean much now, and we will change them a bit latter. Look them over, check that there is the right number of ads on each scroll.

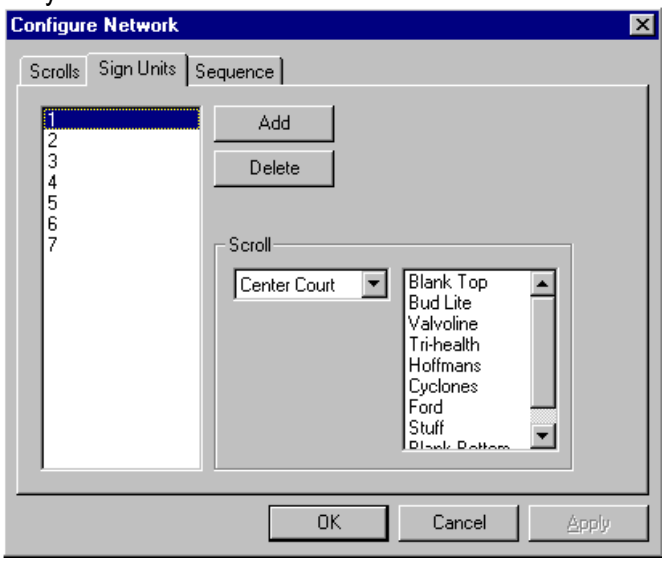


Editing the Scrolls

The names of the scrolls, and ads can be (and should be) customized. All signs that have the same ad lists, should be assigned the same scroll name. This will insure that they will always move together. To customize the set up, choose "Edit Configuration" from the "File" menu. In the "Configure Network" dialog box click on "Scrolls". Select the first scroll name in the left box. Click on "Edit...", and the "Edit Ad Scroll" dialog comes up. From here you can rename the scroll, and ad names. Note that you cannot change the ad number. Edit to your heart's content, then pick "OK". If you have more unique scrolls, edit them too. There is no need to edit redundant scrolls, as we are about to delete them! But, we can't delete them just yet, and if you try, you will see an alert box saying that the scroll is in use.



To assign signs the scroll names that you have customized, Pick "Sign units" from the "Configure Network" window. Chose the first entry in the left most box. The scroll that it is assigned will show up in the center pick box, and the ads on that scroll in the right most box. You should see the names that you entered in the last step. Select the second sign number in the left box, go to the center pick box, and select the scroll that you edited. Try to get the signs and scrolls aligned correctly.

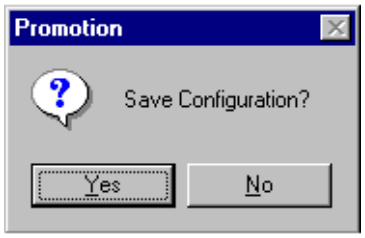


Deleting Scrolls

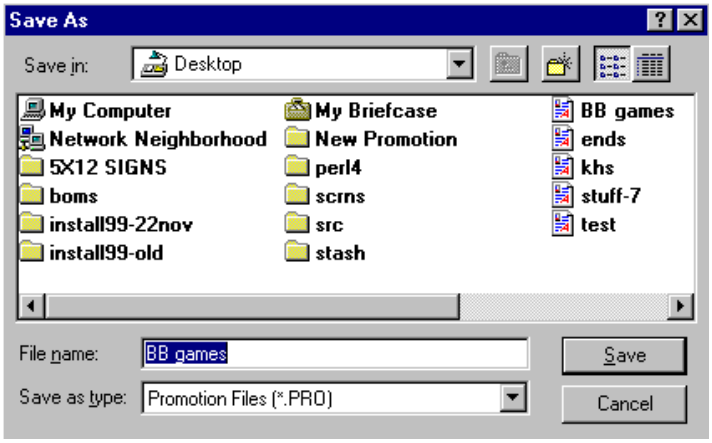
Once signs that have the same ad lists have been assigned to the same scrolls, the unused scroll can be deleted. Click on "Scrolls", select an unused scroll, and click on "Delete".

Configuring Your Sequence

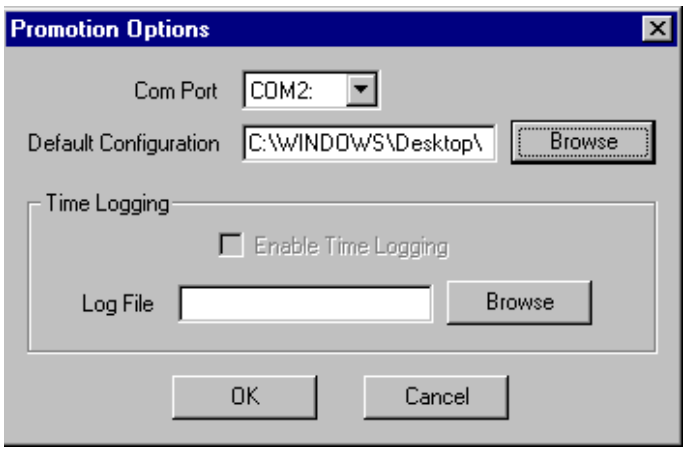
Next the order of the ads, and the length of time that they are displayed needs to be set up. Click on the "Sequence" tab. Double click on a sign number in the left box . By double clicking all signs with the same scroll are selected. The names that you typed in under the "Scrolls" tab will appear in the center box labeled "Ads". The software will default to a display time of 3 minutes. This is a common value for many systems. If you want to display them for a different amount of time, type that value into the top time field in the left box. The format for the time should be either the number of seconds, or (minutes):(second). Now double click on the first ad that you want displayed first. The ad name will appear in the right hand box. Next double click on the second ad you want displayed. It should appear, along with the time also. Continue this process, until you reach the bottom of the list. At the bottom of the list, you have finished the "*ascending order*". Now we go the other way, back towards the top of the list. Don't pick the last entry again, but rather the second to the last. We don't want a double entry for the last ad, nor do we want a double entry for the first ad, so don't pick the first entry. If there is an ad that you wish to have more or less time than the default, you can change is after you have the list finished. Save the list by clicking on "Apply Sequence". Repeat this process with any remaining signs, of groups of signs. When you are satisfied with the sequence(s), click "Ok" at the bottom of the window. Next you will see a confirmation check box, "Save Configuration?", click "Yes".



You will see the "Save As" dialog box. Chose a meaningful name for your configuration, and type it in. Take note of which folder you place it in. The saved location is not important, but we do need to remember where we put it. Note: It is always a good habit to either place the saved configuration on the desktop.



The last step is to make this the default (start-up) configuration. From the "Edit" menu chose "Options". You can either type in the filename that you just saved your configuration as, or you can browse for it.



You should be ready to operate your signs now.

SBC Command Line Interface for sign99 (rel)

The Z-world micro G2 Single Board Computer (SBC) as programmed for ProMotion Rotating Signs is controlled thru its RS232 port (H2). Most commands are simple 7 bit ASCII strings sent at 19200bps, 8 data bits, even parity, and no stop bits. Hardware handshake is (CTS/RTS) used for flow control. Commands can be sent to the SBC from a dumb terminal, a terminal emulation program run on a PC, or specially written software such as Promotion.exe. Commands are case sensitive, and either ^j or ^m can be used the terminating character. White space is largely ignored.

Command Syntax.

xxx or **mmm**
establishes attached sign as master. (sign number changes to 0).

m
returns "master!"

s
returns verbose status of all SBCs.

S
returns terse version of "s", output status of signs in the format of:

sssnfccmm

where:
sss is the three digit sign number
n is '-' if the network communication is ok
'c' if there was a communication error
(no reply or garbled reply from slave)
'n' if there was a nak
(slave received a garbled packet from the master)
f is '-' if the SCU does not have any faults
'f' if the SCU has faulted (auto recovery already attempted.)
'M' if we missed an ad
'm' if we are marked as 'moving'
cc is the two digit ad num that the SCU is currently displaying
mm is the two digit ad number that the SCU is moving to,
if moving, "--" otherwise

i
initializes all networked slaves

r [sign_num]
reports signs default sign and ad list, including 0 and 31. It also displays various compile time constants and movement timing values that are stored in the EEPROM. Parenthisized time values are the compiled in values, other values are the current values (set with !config). The normal move time can be modified by the firmware, use the "s" command to see the value in use. If sign_num is not given, the master's information is displayed.

R [sign_num]
returns terse version of "r" in the format:
sign_num <cr>
num_units <cr>
num_ads ad_list <cr>

where:
sign_num is the signs' default sign number,
num_units is the number of attached SCUs.
num_as is the number of ads on the sign.
ad_list is a space separated list of ad numbers on the scroll excluding 0 and 31

u
moves all signs up one ad

d
moves all signs down one ad

w
walks through all ads, pausing for nn sec.s, down to the bottom ad. Terminated by "w".

W nn
like "w", only it walks both directions instead of skipping, pausing nn seconds between moves.

a ad_num [ad_num ...]
assigns new ad list. ads are listed in order, and must have a unique ad number. This is also propagated to slaves.

g ad_num
go to ad ad_num on all signs

G ad_num sign_num
go to ad ad_num on just sign_num.

v
display SBC software version information.

!sign sign_num
changes master's default sign number.

!units n
sets the number of SCUs attached to master, valid n's are 0 or 1.

!write
writes config to EEPROM, used after "a", "!units", "!sign" or "!config". This is propagated to the saves.

!reset
resets all SBCs to power-on state, (program restart).

!rscu sign_num
resets the SCU attached to a sign_num (master is 0)

!kill sign_num
disables sign_num. A killed sign is resurrected with "i".

!learn [sign_num]
have sign_num examen it's scroll and timings, determine ad list, normal ad to ad move times, etc. If sign_num is not given, all signs learn.

!config [fault_delay_time max_missed_ad num_auto_reset max_learn_time]
Set the fault handling behavior. Times are in mSec. Without arguments, resets values to a reasonable default. This command is not propagated to slaves, as you may wish it to be different across a network.

FAULT_DELAY_TIME –
Amount of time to wait after a fault is detected before we try to reset the SCU. This lets whatever was causing the fault to clear up. (i.e., the basketball player moves away from the sign, etc...)

MAX_MISSED_AD –
number of times we can miss an ad before we fault. Note: if a stripe can't be read from either direction, an even number will cause it to be skipped over, while an odd number will not let the sign walk past it.

NUM_AUTO_RESET - number of times to automatically reset the SCU before signalling a fault

MAX_LEARN_TIME - The amount of max amount of time that the master will wait for a slave to finish it's !learn cycle. Also the max. time a slave will wait for the master to finish before reseting.

!aux port bit
turn PIO port bit on or off. there are 3 ports: 0,1,2. Port 0 is typically lights. bit can be either 1 (on) or 0 (off). Note that "on" and "off" are the PIO state, the relay may be wired NO or NC, so the lights may go on if the bit is turned off.

!aux1 sign_num port bit
Like !aux, but only acts on sign_num only.

$g<cr> data
binary go used by the GUI. NOT HUMAN READABLE

sent format: (bit field)
<ad><ad> ... <crc-hi><crc-lo>

$s
binary status used by the GUI. NOT HUMAN READABLE

return format:
$<status><ad><status><ad> ...
<crc-hi><crc-lo>
<status><ad> is one byte, 3 bits for status:
bit 1 moving
bit 2 fault
bit 3 comm error
5 bits for <ad>.
All 150 possible signs are reported. If a sign is not on the network, FF is returned. If a sign has been killed, 00 is returned.

^U or @
erases command line

^H or Backspace
erases previous character in command line

h or ?
displays list of commands

!sim num_signs
simulate num_signs on network (for testing)

!wrs
undocumented. (for testing)