LS7315K ADD A RANK SYSTEM

THIS MANUAL COVERS THE BASIC INSTRUCTIONS FOR AN LS7315K ADD A RANK BOARD

Control System Installed By _____ Date Installed _____
Installer Telephone _____ Fax _____ Email _____

Control System Maintained By _____
Maintenance Telephone _____ Email_____ Fax _____

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SYSTEM OVERVIEW

LIMITED WARRANTY

Syndyne warrants, to the original purchaser, the equipment that it manufactures for use in the organ industry to be free from material defects and defects of workmanship under normal use and service, for a period of TEN (10) years from the date the product was shipped to the customer or from the date of the original Syndyne Corporation invoice, whichever is earlier. Syndyne's sole obligation under this warranty shall be to, at its option, repair or replace any Syndyne products which have been deemed by Syndyne to contain material defects and/or defects of workmanship. Transportation charges for return of the products must be prepaid by the buyer. Syndyne has the sole right under this warranty agreement to inspect any product or part thereof, to determine whether or not the defect is covered by the terms of this warranty. Written notice of all claimed defect(s) must be given within thirty (30) days after such defect is first discovered.

This warranty does not cover parts which have been repaired by anyone other than Syndyne when such repairs are inconsistent with Syndyne's decided level of quality and/or workmanship. This warranty does not apply to products which have been used improperly, abused, altered, damaged, subjected to accident, flood, fire, acts of God, and/or used with components made by another company in a manner unauthorized by Syndyne. Products on which serial numbers or part numbers have been altered, defaced, removed, or tampered with, shall not be covered by this warranty. Syndyne will not be responsible for any charges from dismantling, reassembly, reinstallation, and/or travel time.

Products which are manufactured by another company and distributed by Syndyne are not covered by this warranty. Contact the manufacturer directly for issues regarding warranty of these products.

This warranty is in lieu of all other warranties expressed or implied, including, but not limited to, warranty for merchantability and fitness for a particular purpose as well as all other representations made to the purchaser. Syndyne does not authorize and will not be held responsible for warranties given by persons or companies outside of Syndyne Corporation except when such warranty is agreed to by Syndyne Corporation in writing. Syndyne will not be liable for any special, indirect, incidental, or consequential damages, including, but not limited to, damages claimed in connection with any rescission of this agreement by the buyer.

This warranty embodies the entire warranty agreement between Syndyne and the product's original purchaser. Syndyne's warranty, as described in this agreement, shall not be diminished, enlarged, or changed by, and no obligations or liability shall arise or grow out of, any technical advice or service rendered by Syndyne Corporation. This warranty provides certain legal rights and additional rights may exist in an individual's state and may vary on a state to state basis.

UNPACKING AND HANDLING

STATIC WARNING

The Syndyne LS5600K System containts electrical components that are suseptible to damage by static discharge. To avoid damage, use antistatic handling materials and make sure you are well grounded at all times. It is recommended that all electrical components be kept in their original packaging until installed.

BENDING OR ROUGH HANDLING

Use care when handling the products. Dropping or other rough handling can result in the products becoming damaged. Electrical components may also break if excessive bending occurs.

BOARD IDENTIFICATION

For Identification Purposes each component is labeled with a part number, a serial number, and a name/description.

This shows a sample of a board identification

Part Number:
Serial Number:
Description:

LS7315K System Components

LS7315K ADD A RANK BOARD

FEATURES

- Add a rank (or multiple ranks) of pipes to an existing organ without changes to any existing electronics.
- Inputs for 73 notes and 15 stops.
- Will accept either positive or negative signals from keyboard note.
- Will accept either positive or negative signals from stops
- All stop inputs are programmable as couplers (see coupler list).
- Transmits serial data compatible with all of our 49, 73 & 97 note driver boards.

DESIGN INTENT

In many instances it is difficult and/or costly to add a rank or ranks of pipes to an existing organ. The LS7315 Add-A-Rank board was designed for many of those applications where you want to add a unit rank to an existing instrument. The LS7315K is designed to be compatible with all existing organ controls.

Here are just a few applications where an LS7315K is invaluable:

1. You have an existing straight division and you want to add a trumpet to play at 16', 8' and 4'. An LS7315K is connected between the existing chest lines and CS2473-7K driver board is added for the new trumpet wind chest. The driver board will be programmed to play at three different pitches according to which stop input of the LS7315K is on, Unison, Octave and Fifteenth. An additional LS7315K could be added to play the same trumpet from the pedal.

2. On many organs built in the first half of the 20th century, the swell consisted of several straight stops with a flute unit playing at 16', 8', 4', 2-2/3' and 2'. The flute unit relay can be replaced with one LS7315K board and a CS2473-7K driver board. Additional unit stops, such as 1-1/3', 1-3/5' and 1' can be added by simply adding stop keys. It was quite common to have the flute unit unified to the pedal with switches in the console. These switches can be left as they are, wired to the chest directly or replaced with a second LS7315K.

3. Many small unit organs have stop switching in the console at the key action. On these organs it is very difficult to add ranks without replacing the whole stop switching system or tediously rewiring the stop switches. By using a row of key contacts (which are often left as spares) any number of ranks can be added with several units per rank.

4. Small unit organs without couplers can be economically built by using LS7315K boards as the keying system.

MECHANICAL

Length	13"
Width	5"
Height	1-1/4"

MOUNTING

Mounting: There are 6 built-in standoffs for screw mounting.

ELECTRICAL

Power Supply: Operates on standard organ rectifier power 12-28VDC. Fused power supply is provided to operate on-board electronics.

CONNECTIONS

All connections via plug-in connectors on the board for ease of installation.

LS24/49/73/97-7K PIPE DRIVER BOARDS

FEATURES:

- 5 year warranty
- Firmware is not custom and is easily upgradeable for future enhancements
- No battery back-ups
- Installer configurable
- Serial data cable daisy chains between driver boards
- Three board sizes: 49 note, 73 note and 97 note
- Standard outputs can drive a 20 ohm magnet from a 15VDC power supply
- Negative or Positive Output Drivers available as standard on each board
- 7 programmable Stop, Trap Line or Expression outputs on each board
- 35 different programmable pitches per stop
- 12 different programmable mixtures per stop
- Resultants
- Thunder
- Can drive Multiple 12/24 Note Offset Chests
- Dichromatic Scale Outputs
- Power Indicator
- Serial Data Indicator
- Built-in Fuse protection for circuitry
- 12-24VDC operation
- Multiple outputs can drive the same magnet
- Each Output has fly-back protection

DESIGN INTENT:

The LS24/49/73/97-7K driver boards are designed to drive pipe valve magnets and are typically mounted in the organ chamber. For magnets requiring more current than the standard output is capable of delivering an LS2404K Boost Board is available. All console controls information is sent from the LS5600K into the organ via a 4-wire data cable. The data cable is daisy chained from driver board to driver board. Driver boards are programmed with DIP switches to play any stop from any division at any of the available pitches. Programs can be easily changed added and removed using this method, see page 4-4 to 4-9 in the Chamber Overview Section for programming instructions. Only one driver board is needed for each set of primary magnets. However, if wiring two boards to the same magnets is necessary for added flexibility, the boards will not interact or damage each other.

MECHANICAL:

LS2449-7K
Length 15-1/4”
Width 3-1/2”
Height 1-1/4”

LS2473-7K
Length 19-3/8”
Width 3-1/2”
Height 1-1/4”

LS2497-7K
Length 23-3/8”
Width 3-1/2”
Height 1-1/4”

MOUNTING:

1/4” longPCB standoffs are provided for screw mounting using a #6 screw.

ELECTRICAL:

- A standard regulated DC power supply between 12-24 volts is required.
- Current draw with all outputs off is approximately 0.100Amps.
- Each output is capable of switching 0.600Amps at a maximum voltage of 28VDC.
- optional “H” outputs are capable of switching 2Amps at a maximum voltage of 28VDC.

CONNECTIONS:

Connectors, Jacks or Terminal Blocks are provided for all connections.

NOTE OUTPUTS:

Each Note output has a built in fly-back diode to suppress reverse voltage spikes that are generated when a magnet is de-energized. See pages 3-5 and 3-6 in the Chamber Wiring Section for wiring instructions. See page 4-6 in the Chamber Programming Section for programming instructions.

STOP LINE OUTPUTS:

Each Stop output has a built in fly-back diode to suppress reverse voltage spikes that are generated when a magnet is de-energized. See pages 3-5 and 3-6 in the Chamber Wiring Section for wiring instructions. See page 4-5 in the Chamber Programming Section for programming instructions.

SERIAL DATA CABLE CONNECTIONS:

The data cable is a 4-wire twisted pair category-5 cable and can extend to lengths of hundreds of feet. Data from the console is continuously refreshed 140 times/Second. Each stream of data is tested for integrity and if data is interrupted or looses integrity for more than 0.05 seconds all chamber outputs will turn off to prevent cyphers. No special device connection is required at the end of the data cable.

LS2425-7K AC CHIME DRIVER BOARD

FEATURES:

- 5 year warranty
- Firmware is not custom and is upgradeable for future enhancements
- No battery back-ups
- Installer configurable
- Serial data cable daisy chains to each driver board
- Built-in Fuse protection for DC circuitry
- 25 fused AC note outputs will switch 1-5 amps each
- 7 programmable Stop, Trap Line or Expression outputs - DC
- Power Indicator
- Serial Data Indicator
- Up to 36VAC operation of outputs
- 12-24VDC operation

DESIGN INTENT:

The LS2425-7K driver board is designed to drive AC chime magnets and is typically mounted in the organ chamber. All organ controls are sent from the LS5600K into the organ via a 4-wire data cable. The data cable is daisy chained from driver board to driver board. The LS2425-7K driver boards can be programmed with DIP switches to play chimes from any division. See page 4-4 to 4-9 in the Programming Section.

MECHANICAL:

Length 14-1/4”

Width 4-1/4”

Height 1-1/4”

MOUNTING:

1/4” long PCB standoffs are provided for screw mounting using #6 screws.

ELECTRICAL:

- A standard regulated DC power supply between 12-24 volts is required to power the board.
- Current draw with all outputs off is approximately 0.100Amps.
- The fused AC outputs are capable of switching 1.5 Amps at up to 36VAC.
- Each DC Stop output is capable of switching 0.600Amps at a maximum voltage of 28VDC.

CONNECTIONS:

Connectors, Jacks or Terminal Blocks are provided for all connections.

CHIME OUTPUTS:

Chime outputs are fused in 6 groups of 4 and 1 group of 5. There is a separate terminal block for the AC common connection.

STOP OUTPUTS:

Each Stop output has a fly-back diode to suppress reverse voltage spikes that are generated when an energized magnet is released.

SERIAL DATA CABLE CONNECTIONS:

The data cable is a 4-wire twisted pair category-5 cable and can extend to lengths of hundreds of feet. Data from the console is continuously refreshed 140 times/ Second. Each stream of data is tested for integrity and if data is interrupted or looses integrity for more than 0.05 seconds all chamber outputs will turn off to prevent cyphering. See figure 3.1 “Data Cable Connections,” in the Chamber Wiring Section for a connection diagram.

SYSTEM WIRING

OVERVIEW

Syndyne strongly recommends reading Section 1: “System Overview,” completely and the operation of each board be understood before proceeding with this section. After mounting the boards in suitable locations route power and feeds then wire the inputs and outputs per design requirements. Compliance with local codes and NEC (National Electric Code) guidelines in determining wire sizes is strongly recommended. Additional consideration maybe necessary to eliminate excessive voltage drops in wiring. See Appendix A “Soldering Tips” for soldering techniques.

POWER

Only clean regulated 12-24VDC power supplies should be used. If it is permissible with local codes we recommend not connecting any negative terminals to earth ground; this is to minimize the risk of damage due to a direct lightning strike. Daisy chaining of power connections is not recommended. Each board’s power should be routed individually to a common buss.

Due to risk of accidental shorting, wires should never be routed beneath boards.

FUSING

The use of fuses to protect all electrical circuits from accidental shorting and compliance with local NEC (National Electric Code) guide lines is highly recommended.

BOARD LAYOUT SUGGESTIONS

Syndyne system boards can be mounted in many different locations, with different spacings and layouts. Syndyne offers wiring solutions that prewire boards to customer specifications. The majority of these installations follow similar specifications. The syndyne wiring team studied these similarities to offer suggestions on board layout. Syndyne suggests that all boards be spaced at least 1/2” on edges without connectors and at least 2” for edges with connectors. This will leave sufficient room for wiring to exist between boards. It also provides enough room in the event that additional wires must be added after original wiring has been completed. Providing enough room prevents mistakes such as routing wires underneath boards.

DATA CABLE

Data Cable is used to transfer note, stop, expression and other information from the console to the organ chamber. It can travel 500 feet or more without loosing integrity. All Data cables greater than 2' in length should made from a shielded CAT-5 AWG 26 cable. See figure 4.1 "Data Cable Connections" for a connection diagram of syndyne data cable. If an LS2406K Remote Start Board is being used, the data cable must first be plugged into the LS2406K and can then daisy chain through the driver boards. The order of daisy chaining the driver boards does not matter. For more information on the LS2406K see page 1-11 in the System Overview Section

DATA CABLE AND MULTIPLE CONSOLES

The Serial-In connection on the LS5600K board is available for the operation of two separate consoles on the same organ. The Serial-Out from the LS5600K in the first console is connected to the Serial-In of the LS5600K in the second console. The Serial-Out from the second console is then connected to the Chamber. Organ stops, shade and tremolo controls that are shared between the consoles must be connected identically to each LS5600K board.

DATA CABLE AND "T" CONNECTIONS

Never create a "T" connection when making a data cable. Instead, use two data cables, see figure 4.2 "T Connection," or use wall jacks at both ends of the chamber data cable so that the console can be plugged into two different locations, see figure 4.3 "Multiple Connections." If using two wall jacks at either end of data cable, and an LS2406K Remote Start Board is being used, one LS2406K should be placed right after each wall jack. For more information on the LS2406K see page 1-11 in the System Overview Section. If a third wall jack is required an LS2410K repeater board can be used to create the three jacks without creating a T connection, see figure 4.4 "LS2410K Serial Repeater" and page 1-12 on the LS2410K in the System Overview Section for further detail.

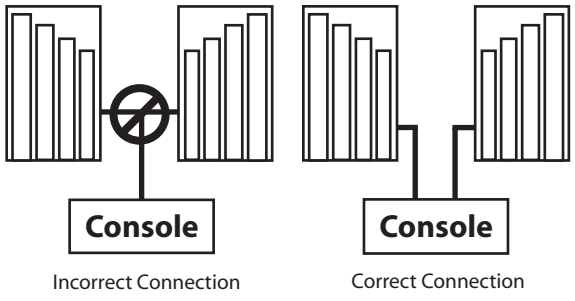


FIGURE 3.2 "T CONNECTION"

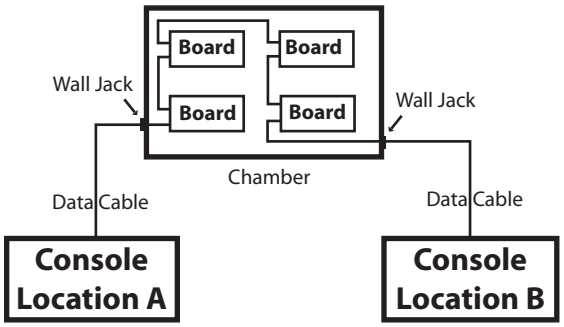


FIGURE 3.3 "MULTIPLE CONNECTIONS"

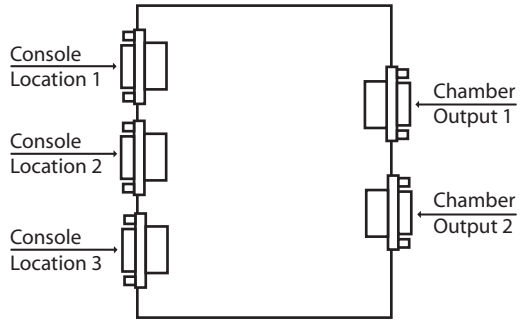


FIGURE 3.4 "LS2410K SERIAL REPEATER"

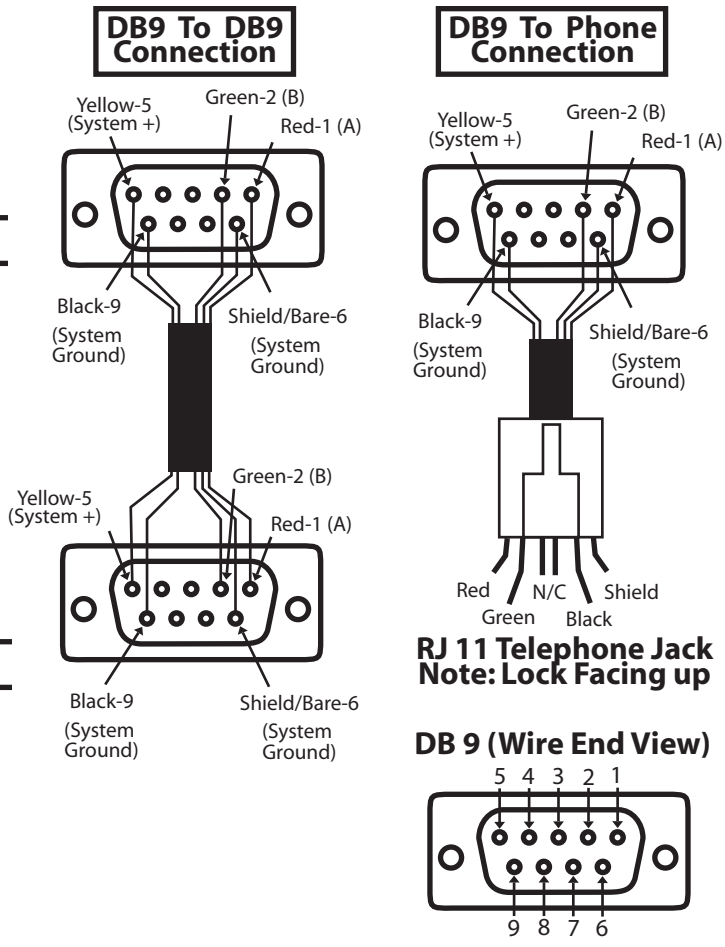


FIGURE 3.1 "DATA CABLE CONNECTIONS"

LS7315K Add A Rank Board

ELECTRICAL INSTALLATION

1. Connect organ power to the large terminal block on the LS7315K.

2. Set the Key Feed Shunt (jumper) to match the key feed polarity. Connect keying inputs from keying contacts.

3. Set the Stop Feed Shunt (jumper) to match the stop feed polarity. Connect sense inputs from stops.

4. Route Serial Data cable from Serial-Out to next LS7315K board or to the first chamber driver board.. Follow driver board instructions to configure it for desired operation.

Wiring Driver Boards

WIRING STANDARD RANKS AND CHESTS

When wiring Ranks and Chests, there are three pipe driver boards offered by Syndyne. The LS2449K is for ranks of 49 notes or less. The LS2473K is for ranks from 50 notes to 73 notes. The LS2497K is for ranks from 74 notes to 97 notes. Syndyne also offers an LS2425K specifically for driving AC chimes. See page 4-6 for more information on wiring chimes.

The wiring is the same for each of these boards when using basic ranks or chests. Wire the lowest note to pin 1 on the driver board and the second lowest note to pin 2. Continue wiring in this fashion until all pipes are wired into the driver board. Seven stop line drivers labeled S1-S7 are available on each driver board to turn on various devices such as stop lines. Borrowing, unifying, and coupling are usually accomplished in system programming. This means that each rank will have its own individual driver board, eliminating the need to wire ranks to multiple driver boards. For more information on programming see the Chamber Programming Section.

WIRING RANKS AND CHEST FOR SPECIFIC USES

Syndyne has developed these boards to support an easy and less expensive installation for many different types of ranks and chests. The following information explains wiring to these different types of chests.

WIRING OFFSET CHESTS

When wiring an Offset Chest, Syndyne driver boards can be programmed to partition outputs into one and/or two octave sections. See section labeled “Chamber Programming” for Offset Chest Programming Information. Each section of outputs can be used to drive a different offset chest, using different stops and division keying. Wire each offset chest to their respective section of outputs starting with the lowest pitch from the chest on the first output in that section and end with the highest pitch wired to the last used output in that chests section. If the offset has fewer pipes then outputs in that section, the higher outputs from that section are left unconnected.

WIRING PRIMARIES ON A MAIN CHEST

A main chest has multiple ranks of pipes with one primary note magnet for each pitch and a stop line driver for each rank. Syndyne systems can drive Main chests that are pitman, slider or other actions. The LS2473-7K has seven programmable outputs, labeled S1 - S7 that can be used to operate stop line magnets, see figure 4.5 “Main Chests” for a diagram. See section Chamber Programming for programming information. See also page 1-8 in the System Overview Section for more information on Syndyne driver boards.

WIRING UNIT RANKS AS A MAIN CHEST

It is possible to use an LS2473-7KH to drive up to 6 unit ranks of note magnets when all ranks are only used as straight ranks (no borrowing or unification). This lowers equipment cost. The LS2473-7KH driver board is capable of driving 2 Amps per output (instead of our standard 0.6 Amp outputs) which equates to 6 each 40 ohm magnets on a 15VDC supply. In addition to one LS2473-7KH board you will need 4 of our LS2408K diode isolator boards (2 required for each 3 ranks). The LS2408K boards are plugged onto the outputs of the LS2473-7KH board. Controlling an LS2404K Output Boost Board with 6 of the 7 stop outputs on the LS2473-7HK board provides a way to switch chest returns to operate as stop line drivers, see figure 4.6 “Straight Ranks” for a diagram. Each of the LS2404K outputs are capable of switching 4Amps and can be paralleled together to further increase their current switching capacity. For more information on the LS2404K see page 1-10 in the System Overview Section. For more information on the LS2408K see page 1-11 in the System Overview Section.

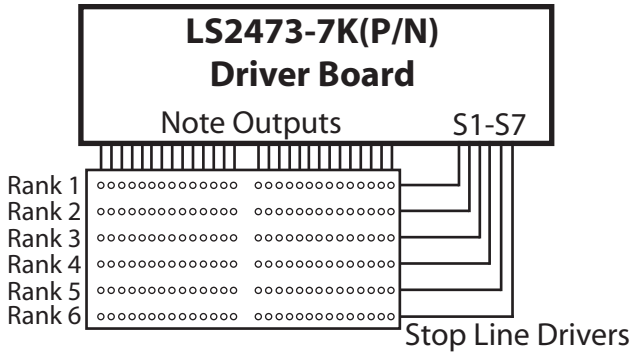


FIGURE 3.5 “MAIN CHESTS”

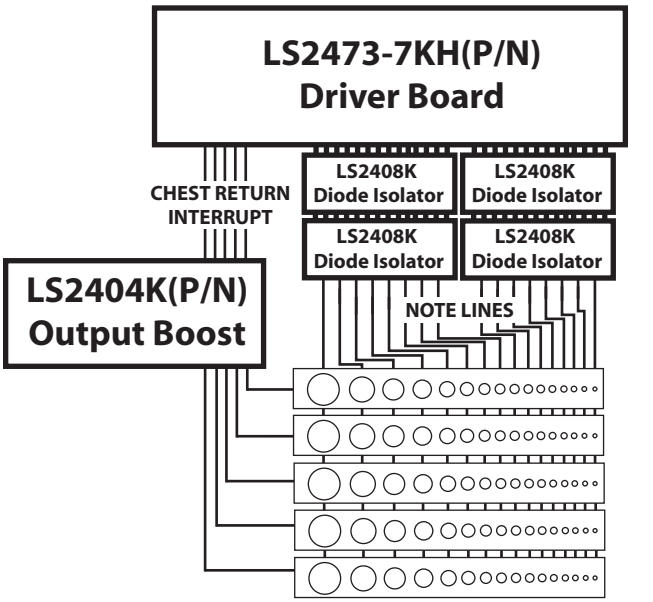


FIGURE 3.6 “STRAIGHT RANKS”

WIRING A DICHROMATIC CHEST

Customers requested an easier method for wiring a dichromatic rank. Now syndyne driver boards support wiring dichromatic in two ways. The driver board can be wired just as with any other rank, with the lowest pitch wired to the first output and the highest pitch wired to the highest used output. The driver board can also be wired using Auxiliary Programming Unit # 13. See page 4-9 in the Chamber Programming Section for more information on Auxilary programming Unit 13.

Auxiliary Programming Unit-13 reassigns the driver board output order into two sections, even notes and odd notes. The lower half of outputs plays the even numbered notes and the upper half plays the odd numbered notes. See example and figure 3.7 “Dichromatic” for a diagram showing individual note assignments. Note that this Auxiliary unit does not select the pitch to be played. It only rearranges the outputs to simplify wiring to a dichromatic rank. Every stop programmed to play on this rank will have to be programmed twice, once for the pitch and then once in Auxilliary Mode #13.

- LS2449-7K even notes on outputs 1-24 & Odd notes on outputs 25-49
- LS2473-7K even notes on outputs 1-36 & Odd notes on outputs 37-73
- LS2497-7K even notes on outputs 1-48 & Odd notes on outputs 49-97

Example-1 LS2449-7K (49 note driver) at Unison pitch.

Output-25 - CCC
Output-1 - CCC#
Output-26 - DDD
Output-2 - EEEb
Output-27 - FFF
Output-3 - FFF#
Output-28 - GGG
Output-4 - AAA
Output-29 - BBBb
Output-5 - BBB
Output-30 - CC . . .

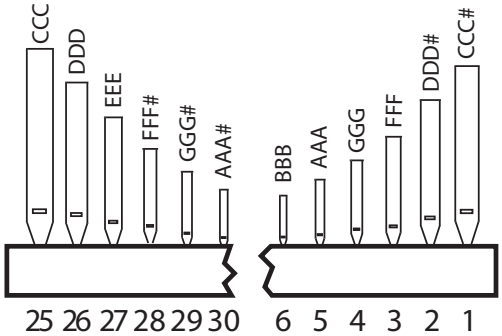
Example-2 LS2473-7K (73 note driver) at Unison pitch.

Output-37 - CCC
Output-1 - CCC#
Output-38 - DDD
Output-2 - EEEb
Output-39 - FFF
Output-3 - FFF#
Output-40 - GGG
Output-4 - AAA
Output-41 - BBBb
Output-5 - BBB
Output-42 - CC . . .

Example-3 LS2497-7K (97 note driver) at Unison pitch.

Output-49 - CCC
Output-1 - CCC#
Output-50 - DDD
Output-2 - EEEb
Output-51 - FFF
Output-3 - FFF#
Output-52 - GGG
Output-4 - AAA
Output-53 - BBBb
Output-5 - BBB
Output-42 - CC . . .

Auxillary Function 13 Wiring of Dichromatic Rank on an LS2449-7K



Standard Wiring of Dichromatic Rank on an LS2449-7K

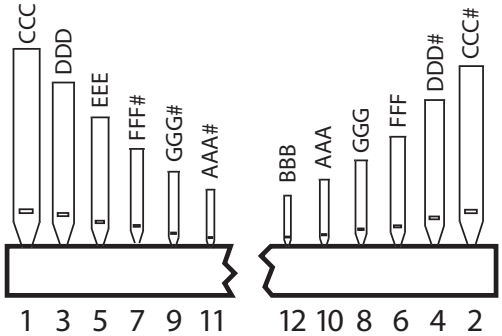


FIGURE 3.7 “DICHROMATIC”

SYSTEM PROGRAMMING

PROGRAMMING THE LS7315K

PROGRAMMING

Each LS7315K board has to be assigned a division number from 1-8 using the DIVISION NUMBER switch.

Stop inputs can be programmed as couplers. To program a coupler Close the PGM COUPLER switch set the division number, set the stop number to be programmed, set the COUPLER NUMBER switch based upon coupler table and press the PROGRAM SET button. To clear all couplers closer the PGM RESET, PGM COUPLER switches and press the PROGRAM SET button.

CPL #	DESCRIPTION	CPL #	DESCRIPTION	CPL #	DESCRIPTION	CPL #	DESCRIPTION
0	Clear Coupler	64	Div.-7 to Choir 4’	128	Swap 2 & 4	192	Undefined
1	Pedal to Pedal 4’	65	Div.-8 to Choir 16’	129	D1 Stops 25-32 Off	193	Undefined
2	Great to Pedal 8’	66	Div.-8 to Choir 8’	130	D2 Stops 25-32 Off	194	Undefined
3	Great to Pedal 4’	67	Div.-8 to Choir 4’	131	D3 Stops 25-32 Off	195	Undefined
4	Swell to Pedal 8’	68	Div.-5 to Div.-5 16’	132	D4 Stops 25-32 Off	196	Undefined
5	Swell to Pedal 4’	69	Div.-5 Unison Off	133	Exp3 to Exp4	197	Undefined
6	Choir to Pedal 8’	70	Div.-5 to Div.-5 4’	134	Exp4 to Exp3	198	Undefined
7	Choir to Pedal 4’	71	Swell to Div.-5 8’	135	Melody Swell to Gt	199	Undefined
8	Div.-5 to Pedal 8’	72	Choir to Div.-5 8’	136	Melody Choir to Gt	200	Undefined
9	Div.-5 to Pedal 4’	73	Div.-6 to Div.-5 8’	137	Sustain Pedal	201	Undefined
10	Div.-6 to Pedal 8’	74	Div.-7 to Div.-5 8’	138	Sustain Gt	202	Undefined
11	Div.-6 to Pedal 4’	75	Div.-8 to Div.-5 8’	139	Sustain Swell	203	Undefined
12	Div.-7 to Pedal 8’	76	Div.-6 to Div.-6 16’	140	Sustain Choir	204	Undefined
13	Div.-7 to Pedal 4’	77	Div.-6 Unison Off	141	Sustain D5	205	Undefined
14	Div.-8 to Pedal 8’	78	Div.-6 to Div.-6 4’	142	Sustain D6	206	Undefined
15	Div.-8 to Pedal 4’	79	Swell to Div.-6 8’	143	Sustain D7	207	Undefined
16	Great to Great 16’	80	Coir to Div.-6 8’	144	Sustain D8	208	Undefined
17	Great Unison Off	81	Div.-5 to Div.-6 8’	145	Mel Sw to Gt on D7	209	Undefined
18	Great to Great 4’	82	Div.-7 to Div.-6 8’	146	Autopedal - Melody	210	Undefined
19	Swell to Great 16’	83	Div.-8 to Div.-6 8’	147	Undefined	211	Undefined
20	Swell to Great 8’	84	Div.-7 to Div.-7 16’	148	Undefined	212	Undefined
21	Swell to Great 4’	85	Div.-7 Unison Off	149	Undefined	213	Undefined
22	Choir to Great 16’	86	Div.-7 to Div.-7 4’	150	Undefined	214	Undefined
23	Choir to Great 8’	87	Swell to Div.-7 8’	151	Undefined	215	Undefined
24	Choir to Great 4’	88	Choir to Div.-7 8’	152	Undefined	216	Undefined
25	Div.-5 to Great 16’	89	Div.-5 to Div.-7 8’	153	Undefined	217	Undefined
26	Div.-5 to Great 8’	90	Div.-6 to Div.-7 8’	154	Undefined	218	Undefined
27	Div.-5 to Great 4’	91	Div.-8 to Div.-7 8’	155	Undefined	219	Undefined
28	Div.-6 to Great 16’	92	Div.-8 to Div.-8 16’	156	Undefined	220	Undefined

CPL #	DESCRIPTION	CPL #	DESCRIPTION	CPL #	DESCRIPTION	CPL #	DESCRIPTION
29	Div.-6 to Great 8’	93	Div.-8 Unison Off	157	Undefined	221	Undefined
30	Div.-6 to Great 4’	94	Div.-8 to Div.-8 4’	158	Undefined	222	Undefined
31	Div.-7 to Great 16’	95	Swell to Div.-8 8’	159	Undefined	223	Undefined
32	Div.-7 to Great 8’	96	Choir to Div.-8 8’	160	Undefined	224	Undefined
33	Div.-7 to Great 4’	97	Div.-5 to Div.-8 8’	161	Undefined	225	Undefined
34	Div.-8 to Great 16’	98	Div.-6 to Div.-8 8’	162	Undefined	226	Undefined
35	Div.-8 to Great 8’	99	Div.-7 to Div.-8 8’	163	Undefined	227	Undefined
36	Div.-8 to Great 4’	100	Great to Div.-5 8’	164	Undefined	228	Undefined
37	Pedal to Great 8’	101	Great to Div.-6 8’	165	Undefined	229	Undefined
38	Swell to Swell 16’	102	Great to Div.-7 8’	166	Undefined	230	Undefined
39	Swell Unison Off	103	Great to Div.-8 8’	167	Undefined	231	Undefined
40	Swell to Swell 4’	104	Choir to Swell 4’	168	Undefined	232	Undefined
41	Great to Swell 8’	105	Gt to Swell 16’	169	Undefined	233	Undefined
42	Choir to Swell 8’	106	Gt to Swell 4’	170	Undefined	234	Undefined
43	Div.-5 to Swell 8’	107	Choir to Swell 16’	171	Undefined	235	Undefined
44	Div.-6 to Swell 8’	108	Undefined	172	Undefined	236	Undefined
45	Div.-7 to Swell 8’	109	Undefined	173	Undefined	237	Undefined
46	Div.-8 to Swell 16’	110	Undefined	174	Undefined	238	Undefined
47	Div.-8 to Swell 8’	111	Undefined	175	Undefined	239	Undefined
48	Div.-8 to Swell 4’	112	Undefined	176	Undefined	240	Undefined
49	Choir to Choir 16’	113	Undefined	177	Undefined	241	Undefined
50	Choir Unison Off	114	Undefined	178	Undefined	242	Undefined
51	Choir to Choir 4’	115	Undefined	179	Undefined	243	Undefined
52	Great to Choir 8’	116	Undefined	180	Undefined	244	Undefined
53	Swell to Choir 16’	117	Undefined	181	Undefined	245	Undefined
54	Swell to Choir 8’	118	Undefined	182	Undefined	246	Undefined
55	Swell to Choir 4’	119	Undefined	183	Undefined	247	Undefined
56	Div.-5 to Choir 16’	120	Undefined	184	Undefined	248	Undefined
57	Div.-5 to Choir 8’	121	Undefined	185	Undefined	249	Undefined
58	Div.-5 to Choir 4’	122	Undefined	186	Undefined	250	Undefined
59	Div.-6 to Choir 16’	123	Undefined	187	Undefined	251	Undefined
60	Div.-6 to Choir 8’	124	Undefined	188	Undefined	252	Undefined
61	Div.-6 to Choir 4’	125	Undefined	189	Undefined	253	Undefined
62	Div.-7 to Choir 16’	126	Undefined	190	Undefined	254	Undefined
63	Div.-7 to Choir 8’	127	Undefined	191	Undefined	255	Undefined

Note: Pedal is Division-1, Great is Division-2, Swell is Division-3, Choir is Division-4

PROGRAMWMING WITH BINARY NUMBERS

The LS5600K System uses DIP Switches to perform programming with binary numbers. Binary is the basic language used by computers. The world we know generally uses the decimal system which uses numbers 0-9 while binary uses only 1 and 0. In a decimal system each place in a number is ten times greater then the place to the right. In the binary system each place is two times greater then the place to the right. Two hundred thirty one in decimal is a 2 in the hundreds place, 3 in the tens place, and 1 in the single place, or 231. In binary, two hundred thirty would be 11100111, or 1 + 2 + 4 + 32 + 64 + 128 = 231. In order to make conversion from decimal to binary numbers two examples are given below.

EXAMPLE 1

An easy method of binary programming is the subtraction method. When programming 218 in binary, turn on the largest binary switch that is less then 218. This means turning on 128. Next subtract 128 from 218, which leaves 90. Next, turn on the largest binary switch that is less then the remainder 90, which is 64. Subtract 64 from 90, which leaves 26. Continuing the process, select the largest binary switch that is less then the remainder 26, which is 16. Subtract 16 from 26, which leaves 10. Turn on the largest binary number that is less then the remainder 10, which is 8. Subtract 8 from 10, which leaves 2. The process is ended by turning on the binary switch which equals the remainder, which in this case is turning on switch 2. Subtract 2 from 2, which leaves no remainder. In summary, the binary switches turned on to equal 218 are: 128 + 64 + 16 + 8 + 2 = 218. Figure 5.1 “Binary Switches 218” shows a set of DIP Switches set to 218.

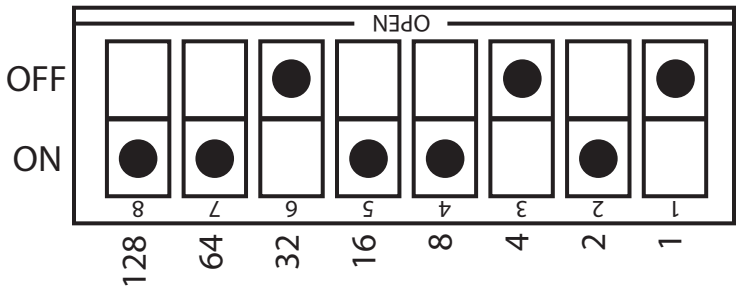
218
− 128 ← ON
90

90
− 64 ← ON
26

26
− 16 ← ON
10

10
− 8 ← ON
2

2
− 2 ← ON
0



● Means that side is pushed down towards circuit board

FIGURE 4.1 “BINARY SWITCHES 218”

EXAMPLE 2

Here is another example of using the subtraction method. When programming the number 62, turn on the largest binary switch that is less then 62, which is 32. Subtract 32 from 62, which leaves 30. Turn on the largest binary switch that is less then the remainder 30, which is 16. Subtract 16 from 30, which leaves 14. Turn on the largest binary switch less then the remainder 14, which is 8. Subtract 8 from 14, which leaves 6. Turn on the largest binary switch less then the remainder 6, which is 4. Subtract 4 from 6, which leaves 2. Turn on the binary switch that is equal to the remainder, which is 2. Subtracting 2 from 2 leaves no remainder. In summary, the binary switches turned on to equal 62 are: 32 + 16 + 8 + 4 + 2 = 62. Figure 5.1 “Binary Switches 62” shows a set of DIP Switches set to 62.

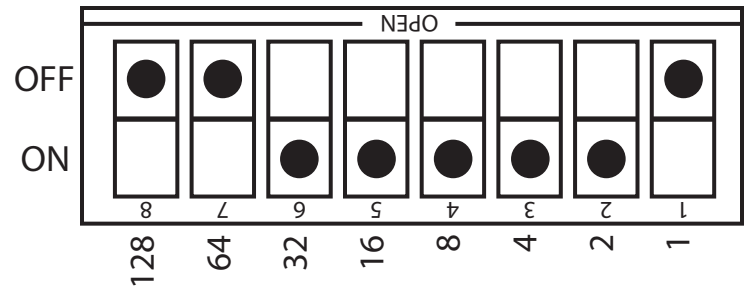
62
− 32 ← ON
30

30
− 16 ← ON
14

14
− 8 ← ON
6

6
− 4 ← ON
2

2
− 2 ← ON
0



● Means that side is pushed down towards circuit board

FIGURE 4.2 “BINARY SWITCHES 62”

PROGRAMMING STOP OUTPUTS ON THE DRIVER BOARDS

Stop Outputs S1-S7 can be programmed to operate in several different modes, see tables 4.1 and 4.2 “Stop Unit Type” for detail.

Each Driver Board’s programming can be documented using the Pipe and Rank Information Form in the Forms Section of this Manual

Things to remember:

- To enter numbers through the DIP switches set the switches ON that will add up to equal the desired number.
- References to Stop Numbers are referring to the numbered Stop Sense inputs of the LS5600K.
- For more information on Binary Programming See page 4-4

PROCEDURE:

1. Turn on the organ.
2. On the Program Mode Dip Switches, see figure 4.3 “Driver-Board-Programming-DIPs,” set the STOPS Switch to ON(closed) The AUX., NOTES and RESET Switches must be OFF (open).
3. (optional) To clear all Stop memory set the RESET switch to ON and press the Program Set Button. Set the PGM RESET switch to OFF, wait approximately 5 seconds for the Stop memory to be erased and then proceed to the next step.
4. Set the Division Number Dip Switches, see figure 4.3 “Driver-Board-Programming-DIPs,” to equal the division number that the Console Stop is in (Pedal/Divison-1; Great/Division-2; Swell/Division-3 and Choir/Division-4 …).
5. Set the Stop Number Dip Switches, see figure 4.3 “Driver-Board-Programming-DIPs,” to desired Stop number.
6. Set the Unit Number Dip Switches, see figure 4.3 “Driver-Board-Programming-DIPs,” to desired Unit number. For a list of Stop Unit Numbers see tables 4.1 and 4.2 “Stop Unit Type.”
7. Press the PROGRAM SET button.
8. Repeat steps 4-7 until all applicable Stops are programmed.
9. On the Program Mode DIP Switches, see figure 4.3 “Driver-Board-Programming-DIPs,” set the STOPS switch to OFF; programming is complete.

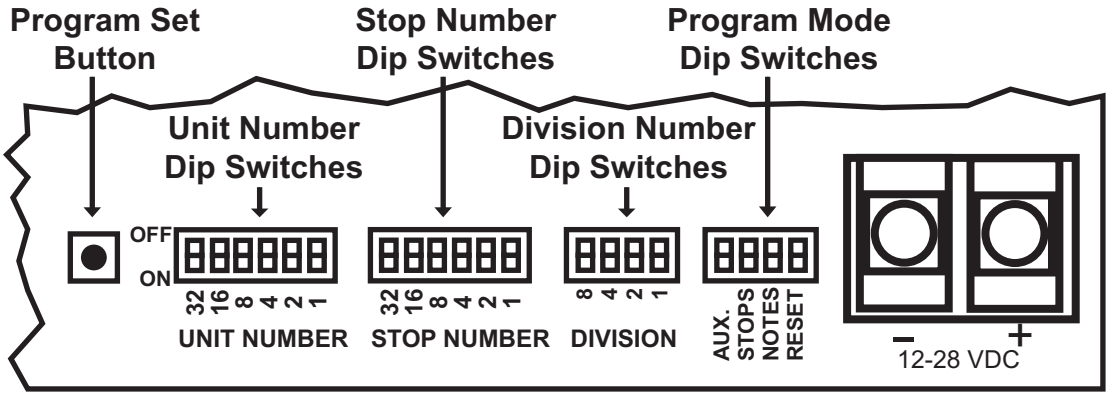


FIGURE 4.3 “DRIVER BOARD PROGRAMMING DIPS”

Stop Unit Type Program Functions Table

Unit	Description	Unit	Description
0	Undefined	9	Trap Output-1 (S1)
1	Stop Output-1 (S1)	10	Trap Output-2 (S2)
2	Stop Output-2 (S2)	11	Trap Output-3 (S3)
3	Stop Output-3 (S3)	12	Trap Output-4 (S4)
4	Stop Output-4 (S4)	13	Trap Output-5 (S5)
5	Stop Output-5 (S5)	14	Trap Output-6 (S6)
6	Stop Output-6 (S6)	15	Trap Output-7 (S7)
7	Stop Output-7 (S7)	16-23	Undefined
8	Undefined		

* Each Output (S#) Assignable to any/all organ stops.
* One Output (S#) per organ Stop

TABLE 4.1 “DRIVER BOARD PROGRAMMING DIPS”

Expression Unit Type Program Functions Table with Division # & Stop # Set To Zero

Unit	Description
8	Undefined
9	Stop Output-1 (S1)
10	Stop Output-2 (S2)
11	Stop Output-3 (S3)
12	Stop Output-4 (S4)

TABLE 4.2 “DRIVER BOARD PROGRAMMING DIPS”

* Stop Outputs Become a 7 bit binary Expression Output

PROGRAMMING NOTE OUTPUTS ON THE DRIVER BOARDS

Each Driver Board can be programmed to play any/every stop in the organ console at any of the specified pitches, see Tables 4.3 and 4.4 “Notes Unit Types A and B” for more details. Each Driver Board’s programming can be documented using the Rank and Stop Information Form in the Forms Section of this manual.

Things to remember:

- To enter numbers through the DIP switches set the switches ON that will add up to equal the desired number.
- References to Stop Numbers are referring to the numbered Stop Sense inputs of the LS5600K.
- For more information on Binary Programming See page 4-4

PROCEDURE:

1. Turn on the organ.
2. On the Program Mode Dip Switches, see figure 4.4 “Driver-Board-Programming-DIPs,” set the NOTES switch to ON (closed). The AUX., STOPS and RESET Switches must be OFF (open).
3. (optional) To clear all Note memory set the RESET switch to ON and press the Program Set Button, see figure 4.4 “Driver-Board-Programming-DIPs.” Set the RESET switch to OFF, wait approximately 5 seconds for the Note memory to be erased and then proceed to the next step.
4. Set the Division Number Dip Switches, see figure 4.4 “Driver-Board-Programming-DIPs,” to equal the division number that the Stop is in (Pedal/Divison-1; Great/Division-2; Swell/Division-3 and Choir/Division-4 …).
5. Set the Stop Number Dip Switches, see figure 4.4 “Driver-Board-Programming-DIPs,” to desired Stop number.
6. Set the Unit Number Dip Switches, see figure 4.4 “Driver-Board-Programming-DIPs,” to the desired Unit number. For a list of Note Unit Numbers see table Tables 4.3 and 4.4 “Notes Unit Types A and B” on pages 4-7 and 4-8.
7. Press the Program Set Button.
8. Repeat steps 4-7 until all applicable Stops are programmed.
9. Set the NOTES switch to OFF; programming is complete.

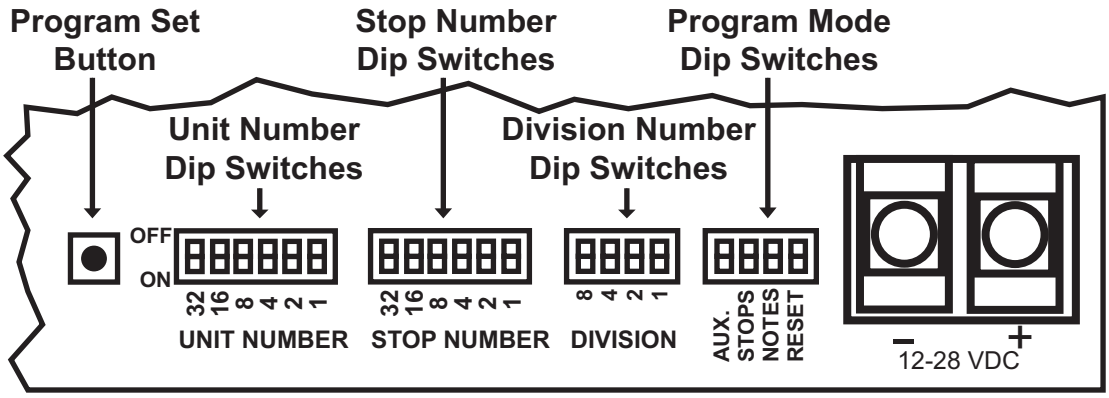


FIGURE 4.4 “DRIVER BOARD PROGRAMMING DIPS”

NOTE UNIT TYPE TABLE

Unit	Description	Unit	Description
0	Erase Unit From Stop Number	34	Sixth & 1/2
1	Sub Unison T.C.	35	Ninth
2	Unison T.C.	36	Third
3	Unison	37	Unison 2nd Octave Only
4	Unison - Bottom Octave Only	38	Mixture for 2-2/3' Rank
5	Fifth	39	Mixture for 2' Rank
6	Fifth - Bottom Octave Only	40	Sub 12th
7	Eighth (Octave)	41	Resultant, Unison & fifth - Bottom Octave & Sub - Unison from T.C.
8	Tenth		
9	Twelfth	42	Resultant, fifth - Bottom Octave & Sub - Unison from T.C.
10	Fifteenth		
11	Seventeenth	43	Resultant, Unison & Bottom Octave & Sub - Unison from T.C.
12	Nineteenth		
13	Twenty First	44	Thunder Bottom 5 Notes
14	Twenty Second	45	15th Bottom Octave Only
15	Twenty Fourth	46	Unison from C# 5
16	Twenty Sixth	47	Sub - Unison from C# 5
17	Twenty Eight	48	Undefined
18	Twenty Ninth	49	Undefined
19	Mixture Unisons from 8' Rank	50	Undefined
20	Mixture Unisons from 8' Rank	51	Undefined
21	Mixture Unisons from 8' Rank	52	Undefined
22	Mixture Unisons from 8' Rank	53	Undefined
23	Synthetic Mixture 5ths from 8' Rank	54	Undefined
24	Synthetic Mixture 5ths from 8' Rank	55	Undefined
25	Synthetic Mixture 5ths from 8' Rank	56	Undefined
26	Synthetic Mixture 5ths from 8' Rank	57	Undefined
27	Mixture 5ths from 2-2/3' Rank	58	Undefined
28	Mixture 5ths from 2-2/3' Rank	59	Undefined
29	Mixture 5ths from 2-2/3' Rank	60	Undefined
30	Mixture 5ths from 2-2/3' Rank	61	Undefined
31	Eighth - Bottom Octave Only	62	Undefined
32	Thirteenth & 1/2	63	Undefined
33	Sixteenth		

*If Stop Number is set to 0, driver will play without a stop

TABLE 4.3 "NOTE UNIT TYPES A"

NOTE UNIT TYPE TABLE CONTINUED

Mixture Unisons Derived From 8’ Rank

Unit	1-12 Notes	13-24 Notes	25-36 Notes	37-48 Notes	49-61 Notes
19	15th	8th & 15th	8th	Unison & 8th	Unison
20	15th & 22nd	15th	8th & 15th	8th	Unison & 8th
21	22nd	15th & 22nd	15th	8th & 15th	8th
22	22nd & 29th	22nd	15th & 22nd	15th	8th & 15th

Synthetic Mixture Fifths Derived From 8’ Rank

Unit	1-12 Notes	13-24 Notes	25-36 Notes	37-48 Notes	49-61 Notes
23	12th & 19th	12th	5th & 12th	5th	Sub 5th & 5th
24	19th	12th & 19th	12th	5th & 12th	5th
25	19th & 26th	19th	12th & 19th	12th	5th & 12th
26	26th	19th & 26th	19th	12th & 19th	12th

Synthetic Mixture Fifths Derived From 2-2/3’ Rank

Unit	1-12 Notes	13-24 Notes	25-36 Notes	37-48 Notes	49-61 Notes
27	Unison & 8th	Unison	Unison & Sub 8th	Sub 8th	Sub 8th & Sub 15th
28	8th	Unison & 8th	Unison	Unison & Sub 8th	Sub 8th
29	8th & 15th	8th	Unison & 8th	Unison	Unison & Sub 8th
30	15th	8th & 15th	8th	Unison & 8th	Unison

Synthetic Mixture Fifths Derived From 2-2/3’ Rank at Uneven Intervals

Unit	1-12 Notes	13-24 Notes	25-36 Notes	37-48 Notes	49-61 Notes
38	Unison	Unison & 8th	8th	Unison	Unison & Sub 8th

TABLE 4.4 “NOTE UNIT TYPES B”

PROGRAMMING AUXILIARY FUNCTIONS ON THE DRIVER BOARDS

Auxiliary Units are special Note Output Units and can be programmed to play any (every) stop in the organ console and in conjunction with regular Note Units, see table 5.4 “Auxillary Unit Type” for more details. Each Driver Board’s programming can be documented using the Rank and Stop Information Form in the Forms Section of this Manual.

Things to remember:

- To enter numbers through the DIP switches set the switches ON that will add up to equal the desired number.
- References to Stop Numbers are referring to the numbered Stop Sense inputs of the LS5600K.
- For more information on Binary Programming See page 4-4

PROCEDURE:

1. Turn on the organ.
2. On the Program Mode DIP Switches, see figure 4.5 “Driver-Board-Programming-DIPs,” set the AUX. switch to ON(closed). The STOPS, NOTES and RESET Switches must be OFF (open).
3. (optional) To clear all Aux. memory set the RESET switch to ON and press the PROGRAM SET button. On the Program Mode DIP Switches, see figure 4.5 “Driver-Board-Programming-DIPs,” set the RESET switch to OFF, wait approximately 5 seconds for the Aux memory to be erased and then proceed to the next step.
4. Set the Division Number Dip Switches, see figure 4.5 “Driver-Board-Programming-DIPs,” to equal the division number that the Console Stop is in (Pedal/Divison-1; Great/Division-2; Swell/Division-3 and Choir/Division-4 …).
5. Set the Stop Number Dip Switches, see figure 4.5 “Driver-Board-Programming-DIPs,” to desired Stop number.
6. Set the Unit Number Dip Switches, see figure 4.5 “Driver-Board-Programming-DIPs,” to desired Unit number. For a list of Auxillary Function Unit Types see table 4.5 “Auxillary Unit Types.”
7. Press the PROGRAM SET button.
8. Repeat steps 4-7 until all applicable Stops are programmed.
9. On the set the AUX switch to OFF; programming is complete.

Unit	Description
0	Erase Unit From Stop Number
1	Unison 1st Octave Only (12 Notes)
2	8th - 2nd Octave Only (12 Notes)
3	15th - 3rd Octave Only (12 Notes)
4	22nd - 4th Octave Only (12 Notes)
5	Unison 1st & 2 Octaves Only (24 Notes)
6	15th - 3rd & 4th Octaves Only (24 Notes)
7	29th - 5th Octave Only (12 Notes)
8	36th - 6th Octave Only (12 Notes)
9	43rd - 7th Octave Only (12 Notes)
10	50th - 8th Octave Only (13 Notes)
11	Foldback notes above 97 - 1 Octave
12	Foldback notes above 97 - 2 Octaves
13	Dichromatic - Even numbered keys play Outputs: (LS2449K)1-24, (LS2473K)1-36, (LS2497K)1-48.
14	Odd Numbered keys play Outputs:
15	(LS2449K)25-49, (LS2473K)37-73, (LS2497K)49-97
16	Foldback Notes above 73 - 1 Octave
17	Foldback Notes above 61 - 1 Octave
18-63	Foldback Notes above 49 - 1 Octave
	36th-1/2 - 6th Octave Only
	Undefined

FIGURE 4.5 “AUXILLARY UNIT TYPE TABLE”

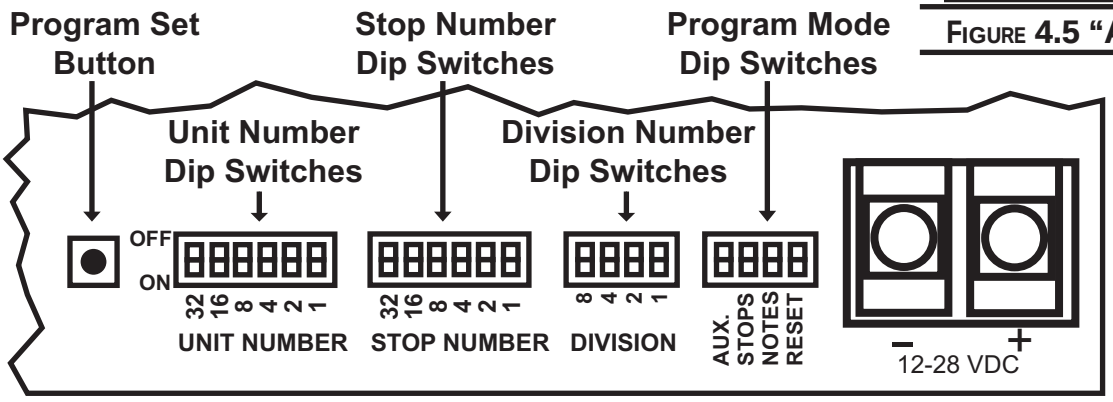


FIGURE 4.5 “DRIVER BOARD PROGRAMMING DIPS”

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APPENDIX A: SOLDERING TIPS

Wiring the LS7315K can be quick and easy if the proper technique becomes familiar. Although there are many ways to make a solder joint, the wiring team at Syndyne has found a simple method that provides a quality connection as quickly as possible. It is important to remember that as with anything else in life, soldering becomes easier with practice, so it is best not to become discouraged if the process seems difficult in the beginning. Here is the syndyne wiring team's suggested soldering method. Also please keep in mind that syndyne offers full wire harnessing services for those who do not want to wire the system themselves.

1. Strip the wire or wires that will be used in the solder joint.
2. Place shrink tube on the wire(s) as far away from the bare end of the wire as possible. When soldering, the wire heats up close to the solder joint, and this heat can shrink the shrink tube before it is ready to cover the joint.
3. Use a damp sponge to clean any old solder from the tip of the soldering iron before tinning.
4. Apply some solder to the tip of the soldering iron and place the solder from the tip of the iron to both the bare end of the wire(s) and the connector terminal. This process is called pretinning and is highly recommended for increased speed, accuracy, and joint integrity.
5. Use a damp sponge to clean any old solder from the tip of the soldering iron.
6. Apply solder to the tip of the soldering iron.
7. If single soldering, hold the pretinned wire on the pretinned connector terminal. If double soldering, hold both pretinned wires parallel with eachother. Hold both wires on the pretinned connector terminal.
8. Place the tip of the iron on the connector end of the bare wire(s).
8. Once the solder flows over the connection, run the iron over the wire up to the shielded end of the stripped wire. Do not touch the wire shielding with the iron or it may melt.
9. Let the solder joint cool and test its integrity by pulling lightly on both the connector and the wire in opposite directions.
10. Do not pull shrink tube over the solder joint at this time. First, complete all wiring to the connector then pull up and heat the shrink tube for each solder joint all at the same time. Otherwise, the shrink tube from one wire can get in the way when soldering the wire next to the shrink tube.