PROTOTYPE STOP JAMBS

WITH

ELECTRONIC LABELLING

for

HAUPTWERK VIRTUAL PIPE ORGANS

ADVICE TO PROSPECTIVE PURCHASERS

This document describes two prototype designs of Stop Jamb which are being offered for sale for use with Hauptwerk Virtual Pipe Organ Consoles

These Stop Jambs feature illuminated Stop Switches, and automatic Electronic Stop Labelling.

They are offered without MIDI Encoders or Decoders, but in most cases the Switches and their LEDs are wired so that suitable connection arrangements to such MIDI devices may be made by the purchaser.

Prospective purchasers should note that a degree of experience and knowledge of how to connect switches to MIDI Encoders, and LEDs to MIDI Decoders will be necessary to complete the installation. The processes are briefly explained in this document.

Prototype Mark IV Stop Jambs
for the Hauptwerk Virtual Pipe Organ

Kenneth A. Spencer

A. SINGLES: MARK VI
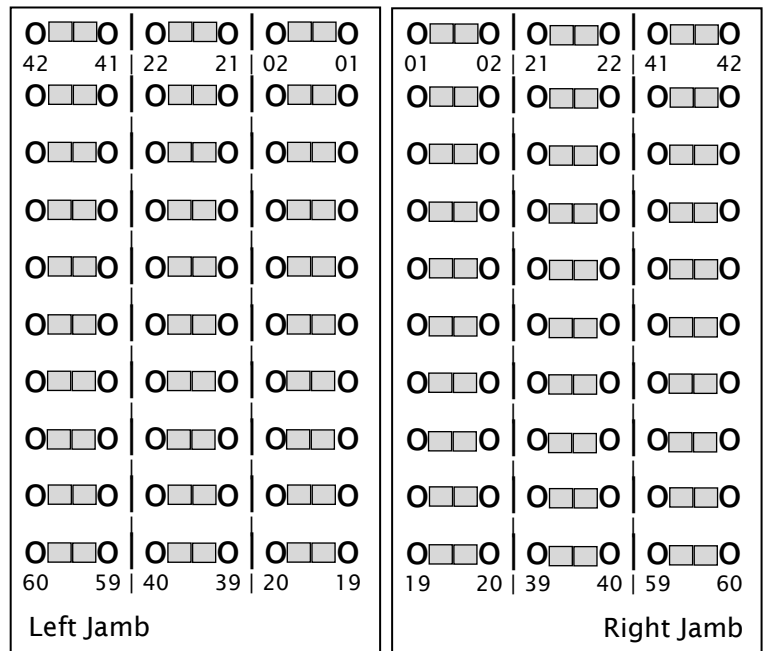## ELECTRONICALLY LABELLED ILLUMINATED SWITCH STOP PLATES

These Mark IV Prototype Stop Plates which we are making available, were in use in the console for a very short time. However, the MIDI encoders & decoders have been removed and are no longer available. The Purchaser must accept full responsibility for connecting the Stop Switches and their LEDs to the MIDI devices. Some advice on this is given below, if needed, more may be available by email or via Zoom.

This offer is for a <u>single</u> Stop Plate of either of two designs available, a Left or Right.

A1. Switch & LED Numbers

Switches/LEDs of the stop jambs are considered to be numbered with Switch/LED 01 being at the top of the jamb, and nearest to the keyboard stack. Number 02 is at the top on the next column in the first column pair. Thus number 21 is at the top of the centre column pair, and number 41 at the top of the outer column pair.

The diagram on the right shows the arrangement on the two Jambs. On the Left Jamb, Switch/LED 01 & OLED label 01 are at the top of the jamb, and also <u>nearest the keyboard stack</u>. In other words, Stop Switch 01 and the corresponding OLED label are always towards the centre of the console, and towards the Top of the Jamb.

Left Jamb — top row: 42 41 | 22 21 | 02 01; bottom row: 60 59 | 40 39 | 20 19

Right Jamb — top row: 01 02 | 21 22 | 41 42; bottom row: 19 20 | 39 40 | 59 60

A2. Components Used

Sixty 1.3" round (in one design) or rectangular (in the other design) illuminated stop switches are mounted on a stop plate in six columns, the columns being in three pairs.

A2.1 Switch Contacts

The round switches carry a micro-switch which includes a normally open (N/O) contact - some may also include a normally closed contacts (N/C) too) - and a common contact. The rectangular switches have similar N/O terminals but no microswitches.

<u>The commons</u> of all switches are already connected together, and terminate in a single wire to connect to the common input of a MIDI Encoder (not supplied).

<u>The Switch N/O contacts</u> are already connected to the cores of ribbon cables some of which may have connectors fitted. The connectors should be removed as they are unlikely to match the current requirements. Each ribbon cable core must be connected to the input of a MIDI Encoder corresponding to the Switch number connected via the core.

MIDI Encoders usually have Pin Header sockets onboard. If yours are thus, you will need to source and fix matching 20-way 2x10 DIL IDC plugs to the Switch Cables.

A2.2 LED Contacts

Each Round Switch contains an LED and a ballast resistor, usually for 12V. The LEDs are polarised – hence the input polarities matter. The LEDs are in white plastic holders which are easily removed from the switch body, in case of a problem.

The rectangular switches contain LEDs and ballast resistors with +ve & -ve contacts on the back of the switches. The LEDs are not designed to be removed.

The connections to the LEDs depend upon the polarity of the MIDI Decoder used: some are *Common Positive* and others *Common Negative*. They are already connected but should be tested as they must match your decoder polarisation.

If you are in doubt about the orientation of the LED positive and negative connections, remove an LED holder from the switch body. Use a battery (3-5V) and check which way round the +ve & –ve poles of the battery must be connected to light the LED. Then orientate all LED holders similarly in their switch bodies. LEDs have one thin and one thicker wire, use those to orientate each LED the same way in its holder.

The LED Commons Connect the appropriate terminal of each LED, +ve or –ve, to a common line which must in turn connect to the Decoder common according to whether the Decoder is of common +ve or common –ve specification.

The LED "live" contacts each of these is connected either to a core of 8-way CAT5 cable, or 0.5" 20-way ribbon cable. At the other end, each core must connect to an output of the MIDI Decoder corresponding to the position of the LED-Switch on the stop plate.

Power Supplies The Encoders & Decoders require a 9v-12v DC power supply. You may safely supply the En/De/coders in each stop jamb from one supply. Each Decoder also requires a 5v DC supply to power the LEDs. Connect these to the Decoders according the polarisation indicated in the Decoder documentation.

A3. Dimensions and Fixing (Stop Jambs only)

Viewed from above
(back)

(front)
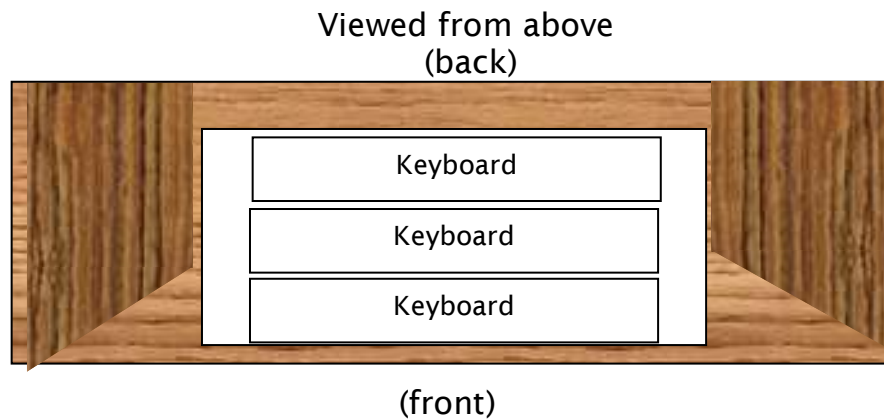
The arrangement for the jambs are shown above Measurements are overleaf. You must complete the stop jamb enclosures, as this offer is for the stop plates only. Suggested measurements are given in the diagrams shown in the image on the following page: the height (Ht), outside depth (od), inside depth (id), and width (w) of the stop jambs. They are not quite identical because, when a 30-note pedalboard is used, the keyboard stack is not exactly central in console.

Assuming that your console has a keyboard stack platform, the stop jambs will sit on top of that. You may drill a hole through the platform on each side under the cover of the stop jambs, and feed the MIDI cables from the Encoder and Decoder down into the console. If you do not already have a MIDI Hub (at least 2IN, 2OUT, so-called 2x2) you will need one. Connect the Right Jamb MIDI Enc. to IN1 and Dec. to OUT1, and the Left Jamb MIDI Enc. to IN2 and Dec. OUT2.

A4. Cost and Logistics

I am offering either of these plates for **£400**. This is actually less than the total value of the 60 illuminated switches plus the 60 OLED displays, and the Arduino Due and associated *kas*LABS software.

I would advise that the buyer collects, if possible, as packing and sending these large objects would be expensive and not risk-free. Collecting in person also presents the opportunity to ask any technical questions.

B. MARK IV STOP JAMBS (Two different designs)
### ELECTRONICALLY LABELLED ILLUMINATED SWITCH STOP JAMBS

There are two prototype Electronically Labelled Stop Jamb designs available. They were not pursued, because, once constructed, it was decided to make the jambs more compact by halving the number of OLED displays, but accommodating the same number of label texts by using a somewhat larger OLED component.

It will be seem from the images that two OLEDs (component types SSH1306, 0.96") are mounted side-by-side in this design. However, these prototypes are NOT laser cut, unlike the production Stop Plates which are also on offer from time to time. Furthermore, these plates are built around Stripboards rather than PCBs – PCBs are available only in production models.

Both models are supplied with no MIDI Encoder or Decoder, and thus the requirements of the purchaser apply as described in the introductory notes.

Prototype Model IV.1

The first model, shown on the right, is a Left Jamb with rectangular illuminated stop switches. However, in tests this type of switch had slightly lower acceptability by organists, compared to the round switches, as the switches are a little smaller. There may be a small reliability issue, but this was not significant and was not investigated.
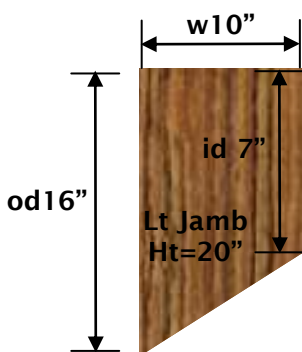
Prototype Model IV.2

The second model, shown below on the right is a Right Jamb. It uses round illuminated stop switches. Testing of this type of switch revealed slightly higher acceptability by organists, compared to the rectangular switches, as these switches are a little larger.

Exactly the same principles apply in this model as described above, except for their different sizes.

Both models can be supplied with a prototype matching stop plate for a Right/Left Jamb, subject to availability.
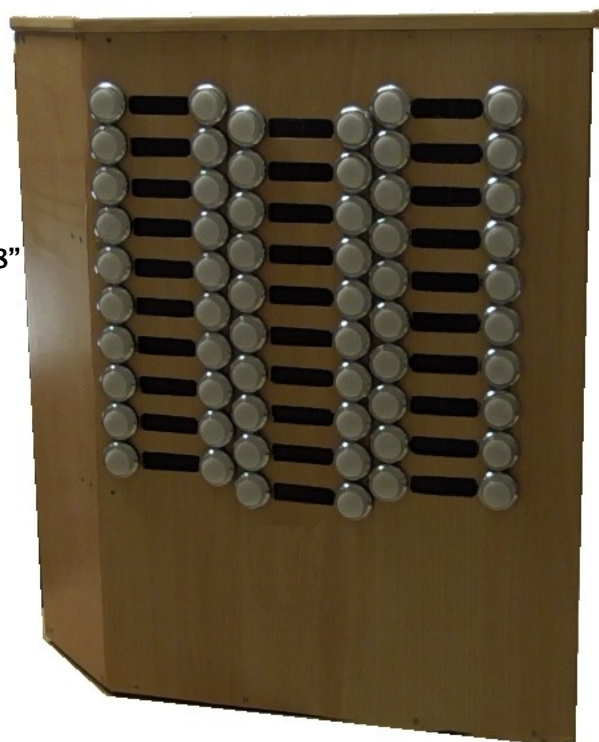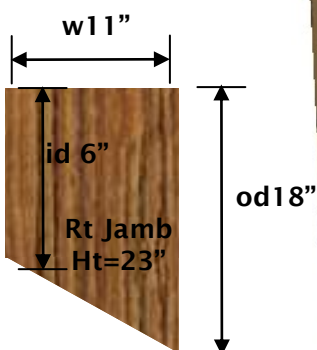
B.1 Connecting to the MIDI Encoder

The arrangements of the Switches and LEDs in the stop jambs IV.1 and IV.2 are described in section A.2 above.

The N/O Switch contacts & commons, and the LED lives & commons, are wired. Connect them,, to an Encoder & Decoder respectively, also as described in sections A.2.1 and A.2.2 above.

C. CONFIGURATION

C .1 Configuring the Stop Switches and LEDs

You do not need to plug a USB cable into the Arduino for this part of the configuration.

This process is quite simple and is as described in my book "*All about Hauptwerk*" and in the Hauptwerk User Guide.

First, you may wish to use the configuration software of your MIDI Encoders and Decoders to set the *MIDI Channel* and *Note Numbers* - we use Channel 01 and Notes 01-60 in accordance with the Switch/LED numbers in section A.1. (However, those two adjustments are not essential – just much tidier and easier to debug).
Note numbers 01– 60 match the Switch & OLED Label text arrangement (01=top inner and 60=bottom outer). The MIDI Decoders will have different MIDI Ports, as they must use different MIDI Hub sockets – this avoids all conflicts with MIDI Channel numbers.

If you have installed MIDI-OX (a downloadable free utility) you may start it, and press each button in turn to demonstrate that your connections are all correct. If you have configured the MIDI Encoder correctly, you should be able to confirm the expected MIDI Port device, MIDI Channel, and Note number.

Start Hauptwerk, and be sure to set up the ports of your MIDI Hub for MIDI Input <u>and</u> MIDI Output, in the "*General Settings => MIDI Ports*" dialogue.

Load the organ sample set to be configured, and then right click on any virtual stop and select "*Adjust MIDI trigger …*". The "*Organ/Stop …*" dialogue shown overleaf will open: study it.

Select the first stop from the left hand pane, and then click on the "*Auto-detect*" button. Follow the instructions carefully, after which you will return to "*Organ/Stop …*" dialogue. You will note that the right pane now has settings for the selected stop. These will normally be "*Momentary … MIDI note-On*" and "*Prevent … "*. The *Port* will accord with the socket in your MIDI Hub, and the *Channel* will be as you have set up in the earlier paragraph. If you have also defined the *Note Number* range the *Note Number* will accord with the Stop Switch number, 01-60. To enable the Switch LED, click on the *Primary Output* tab. Select "*Auto MIDI output*" with the *Output Port* corresponding to the MIDI Hub socket used for the MIDI Decoder of the Stop Jamb.

In the image on the right, the Auto-Detect results for the Swell Oboe 8' stop are shown. Press the Switch chosen for the stop, and check that the virtual stop on the screen responds accordingly.
If your Decoder and its power supply is correctly set up, the Switch-LED will illuminate. Note that OrgauMatech MIDI Encoder/Decoder boards may need several presses of each stop to begin functioning correctly.

When you are content with your settings, select the next Stop from the left pane and repeat this process.
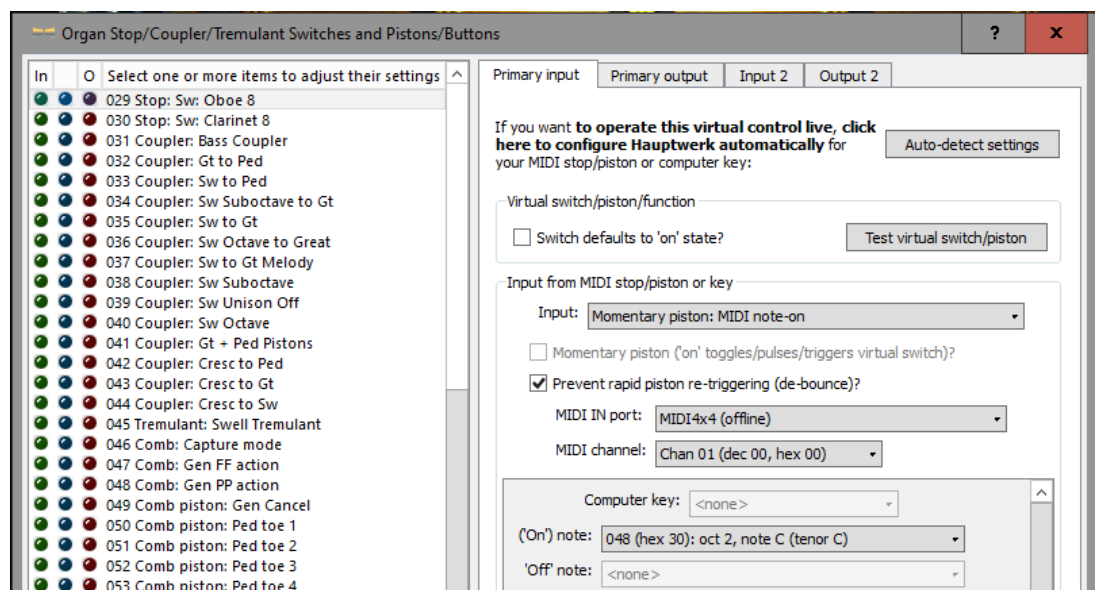
C.2. Configuring the Electronic Labels

The Electronic Labelling in these Stop Jambs is achieved by 60 SSD1306 OLED devices driven by an Arduino Due operating with **kasLABS** software version 1.4. This software version is sensitive to the order of Arduino Due USB Enumeration, thus, if the Left and Right jamb labels are reversed, you must swap over the USB connections and reboot your PC until the Right Jamb's Arduino responds as "*Arduino Due*" and the Left as "*Arduino Due A*". This should not be too difficult.

The OLEDs are mounted into sockets soldered into Stripboard, as these stop jambs are prototypes and preceded the development of the PCBs which are used in the Ready-built Mk V Stop Plates.

Setting up the Stop Texts for each organ is probably the most time-consuming process in commissioning this project. However, the results are worth the time & trouble!

First, carefully plug a micro-B USB cable plug into each Arduino Due **Native Port** (near the RESET button) in each Stop Jamb. Then insert the B-type plug on the other end of each USB cable into a USB socket either in a USB Hub or directly into the PC.

Then start the PC and wait for the devices to be recognised and installed by Windows. A self-test in each jamb will report the S/W version & other details.

Start Hauptwerk and set the two new devices (*Arduino Due*, and *Arduino Due A*) as enabled for both MIDI IN and MIDI OUT. Then load the organ sample set to be configured.

Then, bring up the "*MIDI LCD Panel …*" dialogue, from the Menu: "*Organ Settings*" shown on the right. (In HW v4.2 it is one step further in "*Advanced MIDI settings*").

Place your cursor in the Left Pane and tap "*Insert*" 10 times. Hauptwerk is slow to respond in this dialogue, so proceed slowly and after each 10 or so records, wait for Hauptwerk to catch up with you!

Add 120 records, 1 per stop label per Jamb, perhaps in groups of 10, waiting for Hauptwerk to catch up after each group.

On the lower right, we see an early stage where we have inserted several records …

When they have all appeared tap [Ctrl]+A to select all of them – wait for the response.

Please Note.: if you have other previous entries already present in the Left Pane, be sure to deselect them (use [Ctrl]+Lt click), otherwise they will be unintentionally edited.


We are going to use a method of entry of the Label Text data that saves a considerable amount of time. This means entering all data which is common to more than one label to all the appropriate labels at once.

Once Hauptwerk has selected all of the new Label Records (and you have deselected any previously existing), we will set up the newly created label records as follows:

First: in the Right Pane, with left pane entries still selected, make these selections:

Setting	Select	Comment
MIDI OUT port:	*Arduino Due*	(as shown on the page below)
LCD Panel HW ID:	*LCD_030*	(NB.: *LCD 060* is shown in our image)
Display Info/Format …	*Open Diapason 8' …*	for both Lines, 1 and 2.

Leave other details as they were for now, and wait for Hauptwerk to catch up with you!
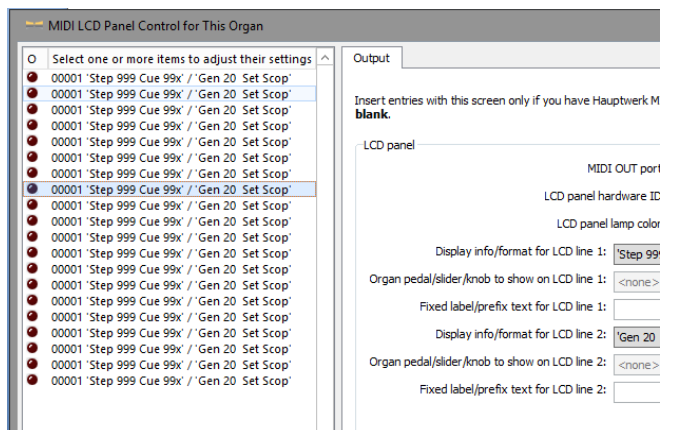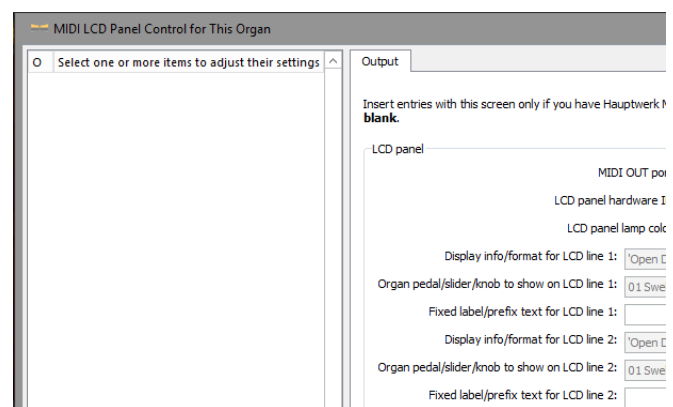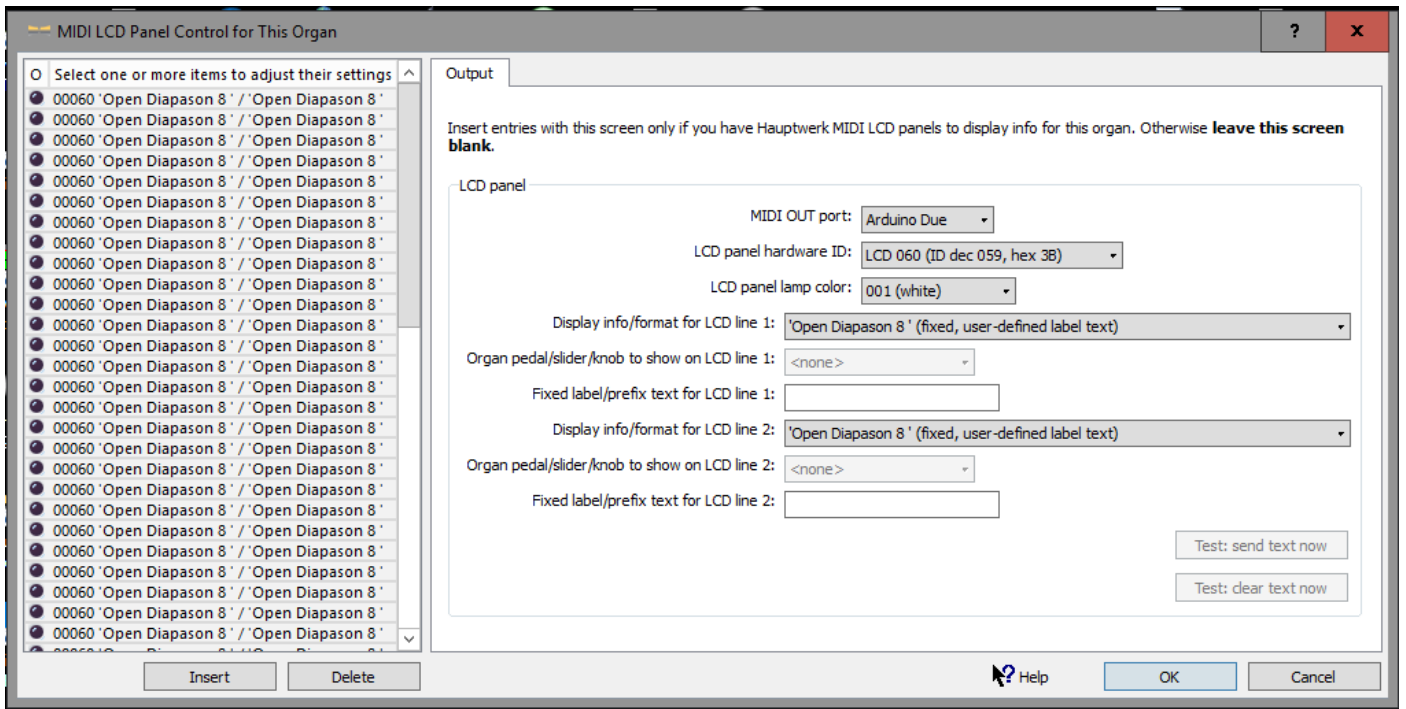
Next: click once in the left pane and wait for Hauptwerk to deselect all records.

Hold down the [Ctrl] key and carefully click once in the <u>second</u> record of each pair. You may prefer to do this in three groups of 20, as Hauptwerk soon slows down as you select more records – 20 records at a time is a good balance.

Then: change the MIDI OUT port to *kasLABS_L* just once, to apply to the selected records. Wait for Hauptwerk to catch up. Select the second record of the next 20 pairs if you are following that strategy, and repeat the MIDI OUT port selection;

You have made all the settings which can be applied to more than two records at a time:

60 alternate left pane entries starting with the <u>first</u>, address the Right Jamb *Arduino Due*. 60 alternate left pane entries starting with the <u>second</u>, address the Left Jamb *Arduino Due A*.

These 120 entries must now be awarded *LCD_ID*s *001 – 060* <u>in pairs</u>.

In the description which follows, in the *MIDI OUT port* option, you will use *Arduino Due* records for the Right Jamb labels and *Arduino Due A* records or the Left Jamb labels.

NB. Please Note If perchance, the labels show on the wrong side Stop Jamb, after saving your data changes (*File -> Save any …*"), close Hauptwerk and shut down the PC, and then swap the USB cables around in the USB Hub or PC USB sockets. Then reboot the PC and restart Hauptwerk.

Now, you are ready for the detailed configuration: refer to the image below.
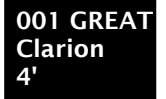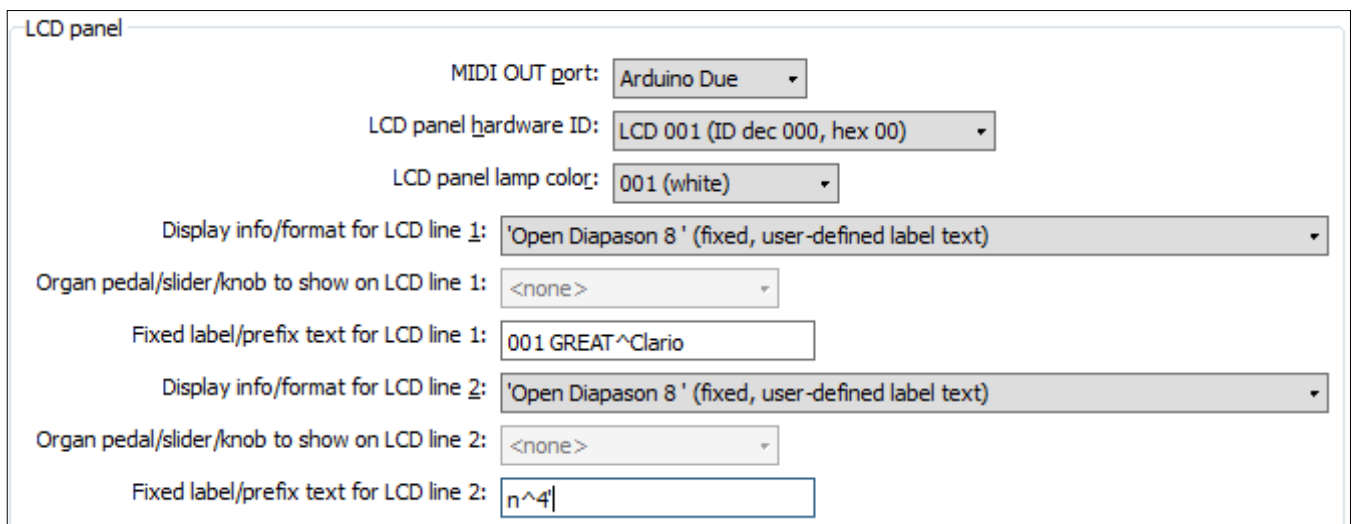
Next: we will make the changes which we can apply simultaneously to pairs of records: this can be done, partially, to initialise each pair of corresponding records across the two stop jambs, and to configure fully all organs with <u>three or fewer divisions</u> (e.g. St. Anne's).

Then For all organs with three or fewer divisions (e.g. St. Anne's):
Select the <u>first pair</u> of records in the left pane – ready for us to label each corresponding stop on the Right & Left jambs simultaneously.

Then enter the THREE text lines which <u>our</u> labels can use, into the TWO lines which <u>Hauptwerk</u>'s labelling supports:
-set *LCD_ID Hardware ID* to: *LCD 001* applies to both records
-set *Fixed Label Text LCD Line 1* to: "001 GREAT^Clario" 001 is the Stop No
-set *Fixed Label Text LCD Line 2* to: "n^4' "

When entering the Stop Names, there are <u>two</u> Hauptwerk lines, but you create <u>three</u> lines in the labelling dialogue by line-breaks at any <u>two</u> points, with a caret (^). If only one caret has been used, put the unused caret at the end of the second line anyway. The entry shown above will be displayed as shown to the right:

> **001 GREAT**
> **Clarion**
> **4'**

Repeat this procedure, selecting each subsequent <u>pair</u> of records in turn, working down the stop jamb columns, for each pair of stops. Remember to increase the *LCD_ID* of each pair! For <u>unused</u> Stop Switch labels with no Stop Name Stop Name, keep the pair selected and enter the Stop Number only, followed by two carets (^).

That completes the labelling of organs with three or fewer divisions.

Next we will consider the process for organs with <u>more than three divisions</u>:
- select the <u>first pair</u> of records in the left pane, ready for us to prepare each pair of stops on the Right & Left jambs first as a pair, and later individually.
- set *LCD_ID Hardware ID* to: *LCD 001* applies to both records

Then as the organ has more than three divisions, we cannot duplicate stop names on both jambs - each stop jamb requires a different stop text:
-select just the <u>first</u> record of the first pair (for the Stop Name on the <u>Right</u> Jamb):
-set *Fixed Label Text LCD Line 1* to: "001+ [DIVISION] + [1st part, Stop Name]+'^'
-set *Fixed Label Text LCD Line 2* to: + [2nd part] +'^' + [3rd part, Stop Name]".

Then -select just the <u>second</u> record of the first pair (for the stop name on the <u>Left</u> Jamb):
-set *Fixed Label Text LCD Line 1* to: "001+ [DIVISION] + [1st part, Stop Name]+'^'
-set *Fixed Label Text LCD Line 2* to: + [2nd part] +'^' + [3rd part, Stop Name]".

When entering the Stop Names, there are <u>two</u> Hauptwerk lines, but you create <u>three</u> lines in the labelling dialogue by line-breaks at any <u>two</u> points, with a caret (^). If only one caret has been used, put the unused caret at the end of the second line anyway.

Repeat this procedure, selecting each subsequent pair of records in turn, working down the stop jamb columns, for each stop. For unused labels with no Stop Name, keep the pair selected and enter the Stop Number only, followed by <u>two</u> carets (^).
Remember: whilst you enter the <u>same</u> LCD_ID for both Left & Right jambs in your selected pair, you then enter the stop label text separately in each of the selected pair.

C.3. <u>Checking your results</u>

Once you have entered all the stop label text, you may load the records into the stop plates by selecting Menu Option: "*File => Save any unsaved …* ". Your data will be loaded into Hauptwerk and displayed after 2-3 seconds. From now on the label texts will be loaded automatically within a second of the completeion of the loading of the configured organ.

As it is very easy to make errors, you should now re-open the "*MIDI LCD* Panel …" dialogue, from the Menu: "*Organ Settings*" dialogue (which was closed on saving) and scroll though to check every record - whether or not you spot any errors.

It is possible for some errors to prevent ant label text from appearing at all. Checking each text entry will help spot any mistakes.

Select the first record in the left pane, and examine its details in the right pane.

Check that the first record (Stop 01, Right Jamb) is thus:

    LCD_ID = 001;

    LCD Lamp Colour= 001 (white);

    MIDI OUT port = Arduino Due;

    Display Info format … = "Open diapason … ";

    Fixed Label … Line 1 "[Label No.] [Stop Text]".

Check the carets (^) and correct any errors.

Check the second record (Stop 01, Left Jamb)

    LCD_ID = 001;

    LCD Lamp Colour= 001 (white);

    MIDI OUT port = Arduino Due A;

    Display Info format … = Open diapason … ;

    Fixed Label … Line 1 "[Label No.] [Stop Text]".

The details in the Right Pane move through LCD_ID numbers in pairs. The first in each pair addresses the Right Jamb (*Arduino Due*) and the second addresses the Left Jamb (*Arduino Due A*).

If you forget a caret (^), it is likely that part of the text in the label may be repeated.

Here is another illustration of what Hauptwerk expects from our implementation of the LCD Labelling System (St. Anne's label 04 as an example:

To split lines 1 & 2 enter a caret (^), and lines 2 & 3 by a second caret, as shown above.

Examine each record in turn, ensuring that they are all in *LCD_ID* order; that in each pair, all records have the correct value for the *MIDI OUT port*. Any errors in these values can cause disruption throughout the display, but rest assured that once all records are correct you will see your stops labelled. Remember that Menu Option: "*File => Save any unsaved …*" will refresh all text: but you may only see all records when they are all free of errors!

In a three manual organ, you might allocate the Great Division to both central columns, and the Pedal Division to both inner columns.

For organs with more than three manuals, the order from far left to right might be Swell, Pedal, Solo, Choir, Great. If there is no sixth division, you may use the rightmost column for recording control and couplers.

D. OTHER PARTS AVAILABLE

Prototype Stripboards with OLEDs and Arduino: we <u>may</u> have three prototype stripboards, each with 20 mounted OLEDs and with connections for Arduino Due controllers. The controllers are loaded with *kas*LABS software **v1.4.** These provide up to 60 electronic stop labels for one stop jamb and will fit either the Mark VI.1 or the Mark IV.2 stop plates. They are sold together, as they function as labelling for 60 Hauptwerk organ stops, 20 per stripboard.

The purchaser would have to accept full responsibility for fitting this item into the enclosure: The three stripboards, plus 60 x SSD1306 OLEDs and an Arduino Due with the software installed may be available for £250.

<u>Prototype Mark IV.1</u>: we <u>may</u> have a second (Left) stop plate fitted with 60 rectangular illuminated switches, completely unwired, available for £120. There may also be some stop jamb enclosure beech ply cut parts available – if so these will be supplied free-of-charge to a purchaser of this second plate.

<u>Protoype Mark IV.2</u>: we <u>may</u> have a second stop plate to match the plate in the Mark IV.2 enclosure. This plate has no components fitted. There may be some enclosure beech ply cut parts also available. This could be supplied free for charge to a purchaser on the Mark IV.2 stop jamb.

<u>Please Note</u>: the **Ready Built Stop Plates** previously made available were not prototypes. The plates for those jambs were cut by a professional laser cutter, and professionally manufactured PCBs were fitted to hold the OLED displays. Furthermore, the Arduino Dues were loaded with ***kas*LABS software** v3.x.

The items described in this document, however, <u>are</u> all prototypes. The stop plates were all hand cut. The OLEDs are mounted on prototype stripboards, not PCBs. The Arduino Dues are loaded with ***kas*LABS software** v1.4. However the boards and other items, including the stripboards and software <u>are fully functional</u>.

If you would rather have a pair of **Ready Built Stop Plates** in the production design, rather than prototypes, these are available for £675 <u>each</u>. These plates are not enclosed, and require the addition of inner and outer boards, a top board, and, optionally a back board. Advice on the dimensions and construction of the enclosures and connection of the En/De/coders are included in the Core Kit Construction Manual. Ask for a leaflet if you are interested.

Finally, a note:

We have not included the Encoder, Decoder, nor their power supplies and cable connections, because their positions and arrangements will depend upon your chosen devices and their layout in the enclosures.

If you are anywhere near the southern half of the UK you would be welcome to visit to see the Stop Jambs working (Mark IV only), and have a little more explanation about any of the prototypes.

We are happy to offer further advice should you need it.

<div align="center">

**Thank you for your interest in the
Prototype Stop Jambs
and
Electronic Stop Labelling System
for Hauptwerk Organs**

Kenneth A. Spencer

For support or questions, email *ESL@KASpencer.com*

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