

MTH Organ

Mixtures

including tabulation of the
Total Number of Pipes as at the 2001 rebuild

Mixtures Tables present some details more than once in differing formats
for verification of differing publications, and for ‘universal’ use.

Appendix (pp 15–18)

Explanatory notes intended for musicians who are not organ experts,
including some of the differing nomenclatures used for:
keyboard and pipes ranges, harmonic pitches,
tonal design in general, and especially of mixtures;
this being a background to some of the tabled details – not a thorough history or ‘design manual’.

Details are presented in separate tables for ease of comprehension.

Tables 1:

The 'Basic Listing' tabulates the pitches (& hence the number of ranks) of every pipe for every part of the compass.

These have a **USA row/column style** (as used by Schantz); and for easy universal use include **both** the '**white-note** Pitch Numbers' (eg, 8 12 15 19) as used by Schantz and also by some English; and the '**Footage pitches**' (where the above is 4' 2²/₃' 2' 1¹/₃') as preferred by designers elsewhere.

Note-key names are added for more immediate comprehension by musicians.

Tables 2:

Chest Locations: most mixture chests are divided into 'C-side' and C#-side' .

Details of locations & 'note-counting' on each side are separately listed to assist the novice in observing/verifying breaks and counting at the chest (noting that this counting detail is not required by professionals).

Tables 3:

The first tables lead to the **Pipe-Counting Tabulations**.

Tabulations 4:

For use in **future publication**, the basic listing is then repeated in a **more universal row/column arrangement** and, with the pitches listed in **both** forms of pitch notation.

(All pitches are in ascending order, regardless of the wind-chest layout.)

A simple 'left-aligned' format of the pitches is common (being easiest to print), but presented here is the 'angled' format for the pitches as may be used by analysts of organ tone, in order to most easily comprehend both the breaks, and the continuity in any other ranks.

(Placing same pitches in vertical columns usually takes too much space within typical Specifications formats.)

Other Tables:

Each **combination** of the three Bombarde mixtures is listed separately in order to fully understand the design and tonal results, and to ensure an accurate count of pipes.

All seven 'combinations' are listed: 1 2 3 1+2 1+3 2+3 1+2+3

The **Table 1** format most easily relates to the layout of the pipes on the chest.

Pipes are usually arranged in order of size; which matches 'musical' order.

Some of the pipes in a few mixtures are not in order of size on the chest, and this may be indicated in these tables (as in the Schantz List).

However, Schantz do not list, for example, the physical layout of the Great **Grand Fourniture**; which has been arranged in the rebuild to allow a borrow of the octave & quint ranks (only) to the Pedals.

Following confirmation in the organ chamber, this layout is provided here in order to illustrate the composition of the borrow to the Pedals.

GREAT Unenclosed Mixture IV ranks

Footage Pitch	rank 1	1 ^{1/3} '	2'	2 ^{2/3} '	4'	8'
	rank 2	1'	1 ^{1/3} '	2'	2 ^{2/3} '	4'
	rank 3	2 ^{2/3} '	1'	1 ^{1/3} '	2'	2 ^{2/3} '
	rank 4	1 ^{1/2} '	2 ^{2/3} '	1'	1 ^{1/3} '	2'
'white'-note Pitch Numbers	rank 1	19	15	12	8	1
	rank 2	22	19	15	12	8
	rank 3	26	22	19	15	12
	rank 4	29	26	22	19	15
number of Notes		10	10	10	15	16
note-key numbers		1 – 10	11 – 20	21 – 30	31 – 45	46 – 61
Note-key names		C – A	A# – g ⁰	g# ⁰ – f ¹	f# ¹ – g# ²	a ² – c ⁴

Chest Location 'counting' numbers (for a 'novice' observer):

C-side note numbers (odd numbers only)	1 – 9	11 – 19	21 – 29	31 – 45	47 – 61
names	C – G#	A# – f# ⁰	g# ⁰ – e ¹	f# ¹ – g# ²	a# ² – c ⁴
Chest counting	1 – 5	6 – 10	11 – 15	16 – 23	24 – 31
C#-side note numbers (even numbers only)	2 – 10	12 – 20	22 – 30	32 – 44	46 – 60
names	C# – A	B – g ⁰	a ⁰ – f ¹	g ¹ – g ²	a ² – b ³
Chest counting	1 – 5	6 – 10	11 – 15	16 – 22	23 – 30

Calculate number of Pipes:

number of Ranks	4
number of Notes	61
Number of Pipes (R × N)	244 Total Pipes

A more universal listing format (and listing both footages and note-pitches):

C – A	10 notes	1 ^{1/3} '	1'	2 ^{2/3} '	1 ^{1/2} '	19	22	26	29
A# – g ⁰	10 notes	2'	1 ^{1/3} '	1'	2 ^{2/3} '	15	19	22	26
g# ⁰ – f ¹	10 notes	2 ^{2/3} '	2'	1 ^{1/3} '	1'	12	15	19	22
f# ¹ – g# ²	15 notes	4'	2 ^{2/3} '	2'	1 ^{1/3} '	8	12	15	19
a ² – c ⁴	16 notes	8'	4'	2 ^{2/3} '	2'	1	8	12	15

GREAT Enclosed Chorus Mixture V ranks

Footage Pitch	rank 1	2'	2 ² / ₃ '	4'	5 ¹ / ₃ '	8'
	rank 2	1 ¹ / ₃ '	2'	2 ² / ₃ '	4'	5 ¹ / ₃ '
	rank 3	1'	1 ¹ / ₃ '	2'	2 ² / ₃ '	4'
	rank 4	2 ² / ₃ '	1'	1 ¹ / ₃ '	2'	2 ² / ₃ '
	rank 5	1 ¹ / ₂ '	2 ² / ₃ '	1'	1 ¹ / ₃ '	2'
'white'-note Pitch Numbers	rank 1	15	12	8	5	1
	rank 2	19	15	12	8	5
	rank 3	22	19	15	12	8
	rank 4	26	22	19	15	12
	rank 5	29	26	22	19	15
number of Notes		17	11	14	7	12
note-key numbers		1 – 17	18 – 28	29 – 42	43 – 49	50 – 61
Note-key names		C – e ⁰	f ⁰ – d ^{#1}	e ¹ – f ²	f ^{#2} – c ³	c ^{#3} – c ⁴

Chest Location numbers:

C-side note numbers (odd numbers only)	1 – 17	19 – 27	29 – 41	43 – 49	51 – 61
names	C – e ⁰	f ^{#0} – d ¹	e ¹ – e ²	f ^{#2} – c ³	d ³ – c ⁴
Chest counting	1 – 9	10 – 14	15 – 21	22 – 25	26 – 31
C#-side note numbers (even numbers only)	2 – 16	18 – 28	30 – 42	44 – 48	50 – 60
names	C# – d ^{#0}	f ⁰ – d ^{#1}	f ¹ – f ²	g ² – b ²	c ^{#3} – b ³
Chest counting	1 – 8	9 – 14	15 – 21	22 – 24	25 – 30

Calculate number of Pipes:

number of Ranks	5
number of Notes	61
Number of Pipes (R × N)	305 Total Pipes

A more universal listing format (listing both footages and note-pitches):

C – e ⁰	17 notes	2'	1 ¹ / ₃ '	1'	2 ² / ₃ '	1 ¹ / ₂ '	15	19	22	26	29
f ⁰ – d ^{#1}	11 notes	2 ² / ₃ '	2'	1 ¹ / ₃ '	1'	2 ² / ₃ '	12	15	19	22	26
e ¹ – f ²	14 notes	4'	2 ² / ₃ '	2'	1 ¹ / ₃ '	1'	8	12	15	19	22
f ^{#2} – c ³	7 notes	5 ¹ / ₃ '	4'	2 ² / ₃ '	2'	1 ¹ / ₃ '	5	8	12	15	19
c ^{#3} – c ⁴	12 notes	8'	5 ¹ / ₃ '	4'	2 ² / ₃ '	2'	1	5	8	12	15

GREAT Enclosed Grand Fourniture VI–VII ranks

Footage Pitch	rank 1	$2\frac{2}{3}'$	4'	$5\frac{1}{3}'$	8'	8'
	rank 2	2'	$2\frac{2}{3}'$	4'	$5\frac{1}{3}'$	$5\frac{1}{3}'$
	rank 3	$1\frac{3}{5}'$	2'	$3\frac{1}{5}'$	4'	4'
	rank 4	$1\frac{1}{3}'$	$1\frac{3}{5}'$	$2\frac{2}{3}'$	$3\frac{1}{5}'$	$3\frac{1}{5}'$
	rank 5	$1\frac{1}{7}'$	$1\frac{1}{3}'$	2'	$2\frac{2}{3}'$	$2\frac{2}{3}'$
	rank 6	1'	$1\frac{1}{7}'$	$1\frac{1}{3}'$	2'	2'
	rank 7	∅	1'	1'	1'	2' wide
'white'-note Pitch Numbers	rank 1	12	8	5	1	1
	rank 2	15	12	8	5	5
	rank 3	17	15	10	8	8
	rank 4	19	17	12	10	10
	rank 5	21	19	15	12	12
	rank 6	22	21	19	15	15
	rank 7	∅	22	22	22	15 wide
number of Notes	20	12	4	13	12	
note-key numbers	1 – 20	21 – 32	33 – 36	37 – 49	50 – 61	
Note-key names	C – g ⁰	g ^{#0} – g ¹	g ^{#1} – b ¹	c ² – c ³	c ^{#3} – c ⁴	

C-side note numbers	1 – 19	21 – 31	33 – 35	37 – 49	51 – 61
names	C – f ^{#0}	g ^{#0} – f ^{#1}	g ^{#1} – a ^{#1}	c ² – c ³	d ³ – c ⁴
Chest counting	1 – 10	11 – 16	17 – 18	19 – 25	26 – 31
C#-side note numbers	2 – 20	22 – 32	34 – 36	38 – 48	50 – 60
names	C# – g ⁰	a ⁰ – g ¹	a ¹ – b ¹	c ^{#2} – b ²	c ^{#3} – b ³
Chest counting	1 – 10	11 – 16	17 – 18	19 – 24	25 – 30

number of Ranks	6	7	Total Pipes 407
number of Notes	20	12 + 4 + 13 + 12 = 41	
Number of Pipes (R × N)	120	287	

C – g ⁰	20 notes	$2\frac{2}{3}'$	2'	$1\frac{3}{5}'$	$1\frac{1}{3}'$	$1\frac{1}{7}'$	1'	12	15	17	19	21	22		
g ^{#0} – g ¹	12 notes	4'	$2\frac{2}{3}'$	2'	$1\frac{3}{5}'$	$1\frac{1}{3}'$	$1\frac{1}{7}'$	1'	8	12	15	17	19	21	22
g ^{#1} – b ¹	4 notes	$5\frac{1}{3}'$	4'	$3\frac{1}{5}'$	$2\frac{2}{3}'$	2'	$1\frac{1}{3}'$	1'	5	8	10	12	15	19	22
c ² – c ³	13 notes	8'	$5\frac{1}{3}'$	4'	$3\frac{1}{5}'$	$2\frac{2}{3}'$	2'	1'	1	5	8	10	12	15	22
c ^{#3} – c ⁴	12 notes	8'	$5\frac{1}{3}'$	4'	$3\frac{1}{5}'$	$2\frac{2}{3}'$	2'	2'	1	5	8	10	12	15	15

Grand Fourniture Pedal borrow: **Fourniture IV ranks** this also being the pipes arrangement on the chest

$2\frac{2}{3}'$	$2\frac{2}{3}'$	$5\frac{1}{3}'$	8'	8'	
2'	2'	4'	$5\frac{1}{3}'$	$5\frac{1}{3}'$	
$1\frac{1}{3}'$	$1\frac{1}{3}'$	$3\frac{1}{5}'$	4'	4'	
1'	1'	$2\frac{2}{3}'$	$3\frac{1}{5}'$	$3\frac{1}{5}'$	
$1\frac{1}{7}'$	$1\frac{1}{7}'$	2'	$2\frac{2}{3}'$	$2\frac{2}{3}'$	
$1\frac{3}{5}'$	$1\frac{3}{5}'$	$1\frac{1}{3}'$	2'	2'	
∅	4'	1'	1'	2'	
number of Notes	20	12	4	13	12

BOMBARDE Fourniture IV–V ranks

Footage Pitch	rank 1	∅	2 ² / ₃ '	4'	4'	8'	8'
	rank 2	2'	2'	2 ² / ₃ '	2 ² / ₃ '	4'	4'
	rank 3	1 ¹ / ₃ '	1 ¹ / ₃ '	2'	2'	2 ² / ₃ '	2 ² / ₃ '
	rank 4	1'	1'	1 ¹ / ₃ '	1 ¹ / ₃ '	2'	2'
	rank 5	2 ² / ₃ '	2 ² / ₃ '	1'	1'	1 ¹ / ₃ '	∅
'white'-note Pitch Numbers	rank 1	∅	12	8	8	1	1
	rank 2	15	15	12	12	8	8
	rank 3	19	19	15	15	12	12
	rank 4	22	22	19	19	15	15
	rank 5	26	26	22	22	19	∅
number of Notes		8	8	8	16	9	12
note-key numbers		1 – 8	9 – 16	17 – 24	25 – 40	41 – 49	50 – 61
Note-key names		C – G	G# – d# ⁰	e ⁰ – b ⁰	c ¹ – d# ²	e ² – c ³	c# ³ – c ⁴

C-side	note numbers	1 – 7	9 – 15	17 – 23	25 – 39	41 – 49	51 – 61
	names	C – F#	G# – d ⁰	e ⁰ – a# ⁰	c ¹ – d ²	e ² – c ³	d ³ – c ⁴
	Chest counting	1 – 4	5 – 8	9 – 12	13 – 20	21 – 25	26 – 31
C#-side	note numbers	2 – 8	10 – 16	18 – 24	26 – 40	42 – 48	50 – 60
	names	C# – G	A – d# ⁰	f ⁰ – b ⁰	c# ¹ – d# ²	f ² – b ²	c# ³ – b ³
	Chest counting	1 – 4	5 – 8	9 – 12	13 – 20	21 – 24	25 – 30

number of Ranks	4	5	4	Total Pipes
number of Notes	8	8 + 8 + 16 + 9 = 41	12	
Number of Pipes (R × N)	32	205	48	

C – G	8 notes	4 ranks	2' 1 ¹ / ₃ ' 1' 2 ² / ₃ '	15 19 22 26
G# – d# ⁰	8 notes	5 ranks	2 ² / ₃ ' 2' 1 ¹ / ₃ ' 1' 2 ² / ₃ '	12 15 19 22 26
e ⁰ – b ⁰	8 notes	5 ranks	4' 2 ² / ₃ ' 2' 1 ¹ / ₃ ' 1'	8 12 15 19 22
c ¹ – d# ²	16 notes	same	4' 2 ² / ₃ ' 2' 1 ¹ / ₃ ' 1'	8 12 15 19 22
e ² – c ³	9 notes	5 ranks	8' 4' 2 ² / ₃ ' 2' 1 ¹ / ₃ '	1 8 12 15 19
c# ³ – c ⁴	12 notes	4 ranks	8' 4' 2 ² / ₃ ' 2'	1 8 12 15

BOMBARDE Grave Mixture I–II ranks (sounds with Fourniture as V–VI ranks)

Footage Pitch	rank 1	$2^{2/3}$ '	∅	∅	$5^{1/3}$ '	∅	$10^{2/3}$ '
	rank 2	∅	∅	∅	∅	$5^{1/3}$ '	$5^{1/3}$ '
'white'-note	rank 1	12	∅	∅	5	∅	s5
Pitch Numbers	rank 2	∅	∅	∅	∅	5	5
number of Notes		8	8	8	16	9	12
note-key numbers		1 – 8	9 – 16	17 – 24	25 – 40	41 – 49	50 – 61
Note-key names		C – G	G# – d# ⁰	e ⁰ – b ⁰	c ¹ – d# ²	e ² – c ³	c# ³ – c ⁴

number of Ranks	1	0	1	2	Total Pipes
number of Notes	8	8 + 8	16 + 9 = 25	12	
Number of Pipes (R × N)	8	0	25	24	57

Fourniture + Grave Mixture = V–VI ranks

C – G	8 notes	5 ranks	$2^{2/3}$ ' 2' $1^{1/3}$ ' 1' $2^{2/3}$ '	12 15 19 22 26
G# – d# ⁰	8 notes	same	$2^{2/3}$ ' 2' $1^{1/3}$ ' 1' $2^{2/3}$ '	12 15 19 22 26
e ⁰ – b ⁰	8 notes	5 ranks	4' $2^{2/3}$ ' 2' $1^{1/3}$ ' 1'	8 12 15 19 22
c ¹ – d# ²	16 notes	6 ranks	$5^{1/3}$ ' 4' $2^{2/3}$ ' 2' $1^{1/3}$ ' 1'	5 8 12 15 19 22
e ² – c ³	9 notes	6 ranks	8' $5^{1/3}$ ' 4' $2^{2/3}$ ' 2' $1^{1/3}$ '	1 5 8 12 15 19
c# ³ – c ⁴	12 notes	6 ranks	$10^{2/3}$ ' 8' $5^{1/3}$ ' 4' $2^{2/3}$ ' 2'	s5 1 5 8 12 15

BOMBARDE Grand Chorus I–III ranks (sounds with Fourniture as VI–VIII ranks)

Footage Pitch	rank 1	$1^{3/5}'$	$1^{3/5}'$	$1^{3/5}'$	$1^{3/5}'$	$1^{3/5}'$	$3^{1/5}'$
	rank 2	$4^{4/5}'$	$4^{4/5}'$	$4^{4/5}'$	$4^{4/5}'$	∅	∅
	rank 3	∅	∅	$2^{2/3}'$	∅	∅	∅
'white'-note Pitch Numbers	rank 1	17	17	17	17	17	10
	rank 2	24	24	24	24	∅	∅
	rank 3	∅	∅	26	∅	∅	∅
number of Notes		8	8	8	16	9	12
note-key numbers		1 – 8	9 – 16	17 – 24	25 – 40	41 – 49	50 – 61
Note-key names		C – G	G# – d# ⁰	e ⁰ – b ⁰	c ¹ – d# ²	e ² – c ³	c# ³ – c ⁴

number of Ranks	2	3	2	1	Total Pipes
number of Notes	8 + 8 = 16	8	16	9 + 12 = 21	
Number of Pipes (R × N)	32	24	32	21	

Fourniture + Grand Chorus = VI–VIII ranks

C – G	8 notes	6 ranks	2' $1^{3/5}'$ $1^{1/3}'$ 1' $4^{4/5}'$ $2^{2/3}'$	15 17 19 22 24 26
G# – d# ⁰	8 notes	7 ranks	$2^{2/3}'$ 2' $1^{3/5}'$ $1^{1/3}'$ 1' $4^{4/5}'$ $2^{2/3}'$	12 15 17 19 22 24 26
e ⁰ – b ⁰	8 notes	8 ranks	4' $2^{2/3}'$ 2' $1^{3/5}'$ $1^{1/3}'$ 1' $4^{4/5}'$ $2^{2/3}'$	8 12 15 17 19 22 24 26
c ¹ – d# ²	16 notes	7 ranks	4' $2^{2/3}'$ 2' $1^{3/5}'$ $1^{1/3}'$ 1' $4^{4/5}'$	8 12 15 17 19 22 24
e ² – c ³	9 notes	6 ranks	8' 4' $2^{2/3}'$ 2' $1^{3/5}'$ $1^{1/3}'$	1 8 12 15 17 19
c# ³ – c ⁴	12 notes	5 ranks	8' 4' $3^{1/5}'$ $2^{2/3}'$ 2'	1 8 10 12 15

Grave + Grand Chorus (independent ranks without Fourniture) = II–III ranks

Footage Pitch	rank 1	$2^{2/3}'$	$1^{3/5}'$	$1^{3/5}'$	$5^{1/3}'$	$5^{1/3}'$	$10^{2/3}'$
	rank 2	$1^{3/5}'$	$4^{4/5}'$	$4^{4/5}'$	$1^{3/5}'$	$1^{3/5}'$	$5^{1/3}'$
	rank 3	$4^{4/5}'$	∅	$2^{2/3}'$	$4^{4/5}'$	∅	$3^{1/5}'$
'white'-note Pitch Numbers	rank 1	12	17	17	5	5	s5
	rank 2	17	24	24	17	17	5
	rank 3	24	∅	26	24	∅	10
number of Notes		8	8	8	16	9	12
number of Ranks		3	2	3	3	2	3

Bombarde

(note: Use of red & green to differentiate the pitches of the three parts of the mixture applies to this table only, and has nothing to do with the same colours used in the Counting Spreadsheet.)

Furniture + Grand Chorus + Grave Mixture = VII–VIII ranks

Footage Pitch	rank 1	$2^{2/3}'$	$2^{2/3}'$	4'	$5^{1/3}'$	8'	$10^{2/3}'$	
	rank 2	2'	2'	$2^{2/3}'$	4'	$5^{1/3}'$	8'	
	rank 3	$1^{3/5}'$	$1^{3/5}'$	2'	$2^{2/3}'$	4'	$5^{1/3}'$	
	rank 4	$1^{1/3}'$	$1^{1/3}'$	$1^{3/5}'$	2'	$2^{2/3}'$	4'	
	rank 5	1'	1'	$1^{1/3}'$	$1^{3/5}'$	2'	$3^{1/5}'$	
	rank 6	$4/5'$	$4/5'$	1'	$1^{1/3}'$	$1^{3/5}'$	$2^{2/3}'$	
	rank 7	$2/3'$	$2/3'$	$4/5'$	1'	$1^{1/3}'$	2'	
	rank 8	∅	∅	$2/3'$	$4/5'$	∅	∅	
'white'-note Pitch Numbers	rank 1	12	12	8	5	1	s5	
	rank 2	15	15	12	8	5	1	
	rank 3	17	17	15	12	8	5	
	rank 4	19	19	17	15	12	8	
	rank 5	22	22	19	17	15	10	
	rank 6	24	24	22	19	17	12	
	rank 7	26	26	24	22	19	15	
	rank 8	∅	∅	26	24	∅	∅	
number of Notes	8	8	8	16	9	12		
number of Ranks	7	7	8	8	7	7		
check Sum Total pipes	56	56	64	128	63	84	451	

$$285 + 57 + 109 = 451$$

Note that the top 21 notes (9+12) are 7 ranks only.

This could be taken into account in deciding whether to include the doubled ranks in the top 12 notes only of Tubas & Gt Clarion in the overall count of Ranks.

However, the 'normal' rules would simply total **all** the maximum rank numbers.

Furniture + Grand Chorus + Grave Mixture = VII–VIII ranks

C – G	8 notes	7 r	$2^{2/3}'$	2'	$1^{3/5}'$	$1^{1/3}'$	1'	$4/5'$	$2/3'$	12	15	17	19	22	24	26		
G# – d# ⁰	8 notes	same	$2^{2/3}'$	2'	$1^{3/5}'$	$1^{1/3}'$	1'	$4/5'$	$2/3'$	12	15	17	19	22	24	26		
e ⁰ – b ⁰	8 notes	8 r	4'	$2^{2/3}'$	2'	$1^{3/5}'$	$1^{1/3}'$	1'	$4/5'$	$2/3'$	8	12	15	17	19	22	24	26
c ¹ – d# ²	16 notes	8 r	$5^{1/3}'$	4'	$2^{2/3}'$	2'	$1^{3/5}'$	$1^{1/3}'$	1'	$4/5'$	5	8	12	15	17	19	22	24
e ² – c ³	9 notes	7 r	8'	$5^{1/3}'$	4'	$2^{2/3}'$	2'	$1^{3/5}'$	$1^{1/3}'$	1	5	8	12	15	17	19		
c# ³ – c ⁴	12 notes	7 r	$10^{2/3}'$	8'	$5^{1/3}'$	4'	$3^{1/5}'$	$2^{2/3}'$	2'	s5	1	5	8	10	12	15		

CHOIR Dulciana Cornet III ranks

Footage Pitch	rank 1	$2\frac{2}{3}'$	$2\frac{2}{3}'$
	rank 2	2'	2'
	rank 3	$1\frac{3}{5}'$	$3\frac{1}{5}'$
'white'-note Pitch Numbers	rank 1	12	12
	rank 2	15	15
	rank 3	17	10
number of Notes		31	30
note-key numbers		1 – 31	32 – 61
Note-key names		C – f# ¹	g ¹ – c ⁴

Chest Location numbers:

C-side	note numbers (odd numbers only)	1 – 31	33 – 61
	names	C – f# ¹	g# ¹ – c ⁴
	Chest counting	1 – 16	17 – 31
C#-side	note numbers (even numbers only)	2 – 30	32 – 60
	names	C# – f ¹	g ¹ – b ³
	Chest counting	1 – 15	16 – 30

number of Ranks	3	3	Total Pipes
number of Notes	31	30	
Number of Pipes (R × N)	93	90	183

C – f# ¹	31 notes	$2\frac{2}{3}'$	2'	$1\frac{3}{5}'$	12	15	17
g ¹ – c ⁴	30 notes	$3\frac{1}{5}'$	$2\frac{2}{3}'$	2'	10	12	15

SWELL Chorus Mixture V ranks

Footage Pitch	rank 1	2'	2 ² / ₃ '	4'	8'	5 ¹ / ₃ '
	rank 2	1 ¹ / ₃ '	2'	2 ² / ₃ '	4'	8'
	rank 3	1'	1 ¹ / ₃ '	2'	2 ² / ₃ '	4'
	rank 4	2 ² / ₃ '	1'	1 ¹ / ₃ '	2'	2 ² / ₃ '
	rank 5	1 ¹ / ₂ '	2 ² / ₃ '	1'	1 ¹ / ₃ '	2'
'white'-note Pitch Numbers	rank 1	15	12	8	1	5
	rank 2	19	15	12	8	1
	rank 3	22	19	15	12	8
	rank 4	26	22	19	15	12
	rank 5	29	26	22	19	15
number of Notes		15	7	15	4	20
note-key numbers		1 – 15	16 – 22	23 – 37	38 – 41	42 – 61
Note-key names		C – d ⁰	d# ⁰ – a ⁰	a# ⁰ – c ²	c# ² – e ²	f ² – c ⁴

C-side	note numbers	1 – 15	17 – 21	23 – 37	39 – 41	43 – 61
	names	C – d ⁰	e ⁰ – g# ⁰	a# ⁰ – c ²	d ² – e ²	f# ² – c ⁴
	Chest counting	1 – 8	9 – 11	12 – 19	20 – 21	22 – 31
C#-side	note numbers	2 – 14	16 – 22	24 – 36	38 – 40	42 – 60
	names	C# – c# ⁰	d# ⁰ – a ⁰	b ⁰ – b ¹	c# ² – d# ²	f ² – b ³
	Chest counting	1 – 7	8 – 11	12 – 18	19 – 20	21 – 30

number of Ranks	5
number of Notes	61
Number of Pipes (R × N)	305 Total Pipes

C – d ⁰	15 notes	2'	1 ¹ / ₃ '	1'	2 ² / ₃ '	1 ¹ / ₂ '	15	19	22	26	29
d# ⁰ – a ⁰	7 notes	2 ² / ₃ '	2'	1 ¹ / ₃ '	1'	2 ² / ₃ '	12	15	19	22	26
a# ⁰ – c ²	15 notes	4'	2 ² / ₃ '	2'	1 ¹ / ₃ '	1'	8	12	15	19	22
c# ² – e ²	4 notes	8'	4'	2 ² / ₃ '	2'	1 ¹ / ₃ '	1	8	12	15	19
f ² – c ⁴	20 notes	8'	5 ¹ / ₃ '	4'	2 ² / ₃ '	2'	1	5	8	12	15

SWELL Grave Mixture III ranks

The 1929 top octave has been previously recorded (but now beyond my recollection) as: 8' 6²/₅' 4';
 this sounding via the octave coupler as 4' 3¹/₅' 2';
 as below, it now is 4' 6²/₅' 4'; sounding as 2' 3¹/₅' 2' via the octave coupler.

Footage Pitch	rank 1	2'	4'	4'
	rank 2	1 ¹ / ₃ '	3 ¹ / ₅ '	6 ² / ₅ '
	rank 3	1'	2'	4' wide
'white'-note Pitch Numbers	rank 1	15	8	8
	rank 2	19	10	3
	rank 3	22	15	8 wide
number of Notes		30	31	12
note-key numbers		1 – 30	31 – 61	62 – 73
Note-key names		C – f ¹	f# ¹ – c ⁴	c# ⁴ – c ⁵

C-side	note numbers	1 – 29	31 – 61	63 – 73
	names	C – e ¹	f# ¹ – c ⁴	d ⁴ – c ⁵
	Chest counting	1 – 15	16 – 31	32 – 37
C#-side	note numbers	2 – 30	32 – 60	62 – 72
	names	C# – f ¹	g ¹ – b ³	c# ⁴ – b ⁴
	Chest counting	1 – 15	16 – 30	31 – 36

number of Ranks	3
number of Notes	73
Number of Pipes (R × N)	219 Total Pipes

C – f ¹	30 notes	2' 1 ¹ / ₃ ' 1'	15 19 22
f# ¹ – c ⁴	31 notes	4' 3 ¹ / ₅ ' 2'	8 10 15
c# ⁴ – c ⁵	12 notes	6 ² / ₅ ' 4' 4'	3 8 8

SWELL Sharp Mixture III ranks

Footage Pitch	rank 1	1'	1 ^{1/3} '	2'	2 ^{2/3} '	4'
	rank 2	2 ^{2/3} '	1'	1 ^{1/3} '	2'	2 ^{2/3} '
	rank 3	1 ^{1/2} '	2 ^{2/3} '	1'	1 ^{1/3} '	2'
'white'-note	rank 1	22	19	15	12	8
Pitch Numbers	rank 2	26	22	19	15	12
	rank 3	29	26	22	19	15
number of Notes		12	12	12	12	13
note-key numbers		1 – 12	13 – 24	25 – 36	37 – 48	49 – 61
Note-key names		C – B	c ⁰ – b ⁰	c ¹ – b ¹	c ² – b ²	c ³ – c ⁴

C-side	note numbers	1 – 11	13 – 23	25 – 35	37 – 47	49 – 61
	names	C – A#	c ⁰ – a# ⁰	c ¹ – a# ¹	c ² – a# ²	c ³ – c ⁴
	Chest counting	1 – 6	7 – 12	13 – 18	19 – 24	25 – 31
C#-side	note numbers	2 – 12	14 – 24	26 – 36	38 – 48	50 – 60
	names	C# – B	c# ⁰ – b ⁰	c# ¹ – b ¹	c# ² – b ²	c# ³ – b ³
	Chest counting	1 – 6	7 – 12	13 – 18	19 – 24	25 – 30

number of Ranks	3
number of Notes	61
Number of Pipes (R × N)	183 Total Pipes

C – B	12 notes	1' 2 ^{2/3} ' 1 ^{1/2} '	22 26 29
c ⁰ – b ⁰	12 notes	1 ^{1/3} ' 1' 2 ^{2/3} '	19 22 26
c ¹ – b ¹	12 notes	2' 1 ^{1/3} ' 1'	15 19 22
c ² – b ²	12 notes	2 ^{2/3} ' 2' 1 ^{1/3} '	12 15 19
c ³ – c ⁴	13 notes	4' 2 ^{2/3} ' 2'	8 12 15

PEDAL (12-note Bass extension of Great) Grand Fourniture VI ranks

Together with the 20 lowest notes borrowed from this mixture we have the pitches as listed below (including three harmonics belonging only to 16' pitch) continuing unbroken throughout the Pedals 32-note compass.

Footage Pitch	rank 1	$5\frac{1}{3}'$
	rank 2	4'
	rank 3	$3\frac{1}{5}'$
	rank 4	$2\frac{2}{3}'$
	rank 5	$2\frac{2}{7}'$
	rank 6	2'
'white'-note Pitch Numbers	rank 1	12 (5)
	rank 2	15 (8)
	rank 3	17 (10)
	rank 4	19 (12)
	rank 5	21 (14)
	rank 6	22 (15)
number of Ranks		6
number of Notes		12
Number of Pipes (R × N)		72 Total Pipes
note-key numbers		1 – 12
Note-key names		C – B
or maybe 'pipe' names		CC – BB or CCC – BB

C – g¹ 32 notes $5\frac{1}{3}'$ 4' $3\frac{1}{5}'$ $2\frac{2}{3}'$ $2\frac{2}{7}'$ 2' in "pedals" form: 12 15 17 19 b21 22
in "manuals" pitch: 5 8 10 12 b14 15

12 notes + 20 notes from Great Grand Fourniture (Great notes 1–20 sounding on the Pedals from notes 13–32)

Pedal Fourniture IV ranks entirely borrowed from part of the Great Grand Fourniture

Table at pg 5 (Great Grand Fourniture)

C – g¹ 32 notes $2\frac{2}{3}'$ 2' $1\frac{1}{3}'$ 1' (Great notes 1-32 sounding as Pedals notes 1-32)

Some basic information

on Pipe Organ note and pipe Ranges and nomenclature & counting
relating some differences in nomenclature — intended for musicians who are not organ experts.

MTH organ Keyboards have a standard modern compass:

Manuals: 5 octaves = 61 notes (beginning at C, two octaves below middle c);

Some organ divisions have an extra octave of pipes for sounding via an Octave Coupler making 73 notes (ie, a 6th octave of pipes being notes 62–73).

Pedals: 2½ octaves = 32 notes (beginning at bass C, same as for the manuals, to middle g)

Order of Note names and Octave names on the 5-octave keyboards (with a 6th octave of pipes):

1 st octave	2 nd octave	3 rd octave	4 th octave	5 th octave	6 th octave.....
Bass	Tenor	Middle	Treble	High	(Top) (Top/ 7 th octave)
C – B	c ⁰ – b ⁰	c ¹ – b ¹	c ² – b ²	c ³ – b ³	c ⁴ c# ⁴ – c ⁵
c1 – b12	c13 – b24	c25 – b36	c37 – b48	c49 – b60	c61 c#62 – c73 see table below)

There are three c's in the last two octaves, leading to ambiguities in simple naming.

The use of “high” and “top” is **not universal**, and for a five-octave range, “top” may replace “high”.

However the names, bass/tenor/middle/treble, and all the note-names (c¹ etc) are a universal system.

(There is also an English version, different by 1 octave regarding c¹, c² etc, still used by some parochial tradespersons.)

Note the octave ranges are from c to b: for example, the b next to middle c is “tenor b”, not middle b.

The superscript may appear instead as that number of apostrophes (from the days of typewriters which lacked superscript); ie: c⁰ may be written simply as c (noting difference from C); and c¹ = c' c² = c'' c⁴ = c'''' etc.

The same names may be used for the Pedals, where, the 2nd octave **must** be referred to as “**tenor**”, **but** the notes from “middle c” upwards are better described as “top” to avoid ambiguity, because the pedals ‘tenor’ octave is sometimes naively described as “middle” – this not corresponding to music notation.

List of organ keyboard or ‘**semi-tone**’ numbers versus keyboard note **names** in each octave:

	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
Bass C – B	1	2	3	4	5	6	7	8	9	10	11	12
Tenor c ⁰ – b ⁰	13	14	15	16	17	18	19	20	21	22	23	24
Middle c ¹ – b ¹	25	26	27	28	29	30	31	32	33	34	35	36
Treble c ² – b ²	37	38	39	40	41	42	43	44	45	46	47	48
c ³ – b ³	49	50	51	52	53	54	55	56	57	58	59	60
c ⁴	61											
6 th octave c# ⁴ – b ⁴		62	63	64	65	66	67	68	69	70	71	72
c ⁵	73											

Pipes in the octave below C, D etc, may be marked: CC, DD etc; and a further octave: CCC, DDD etc.

In an old English system the low octaves may begin on the next higher G (rather than the modern standard C): thus the 8' bass octave becomes CC (rather than C) then DD EE FF GG, but then A B C.

Then the octave below that (the 16' octave) is: CCC DDD EEE FFF GGG AA BB CC giving rise to 32' pipes starting with the label CCCC (rather than the universal CCC) etc.

Some of this labelling system is used on old pipes in the MTH organ. It is now rarely used in Specifications.

The French have an ‘easy’-looking system (noted here just for ‘completeness’):

the five octaves are simply: C1 – B1; C2 – B2; C3 – B3; C4 – B4; C5 – B5; C6 –

but this is NOT used universally; and these days could be confused with the MIDI numbering system:

for standard MIDI, middle c is C4 (or, in a ‘full-compass’ alternative, it may instead be C5; but only rarely C3).

Preamble on organ ‘tone’ and mixtures tonal design

The basic organ pipe – Principal or Diapason – used for the core of organ sound is not tonally brilliant compared to say a string orchestra. The ‘Principal’ pipes have a ‘broader’ tone – a flute-string hybrid sound.

Centuries ago it was discovered that rather than try to make ‘brilliant’ pipes as the basis of organ tone, brilliance in an organ flue chorus (that is, a chorus without reed voices) is best generated from a “chorus” of varied pitches above the ‘fundamental’ pitch sound.

These ‘chorus’ pipes at higher pitches range up to 2 octaves higher in the treble part of the keyboard, and up to 5 octaves higher in the extreme bass. As well as octaves, a limited number of ‘harmonic’ pitches are added into the mix.

While some of these higher pitches are useful individually, many of the highest pitches also are gathered together into one organ stop with the generic name “mixture”. If there is more than one mixture, other specific names will be used.

One voice sounding a single pitch (one pipe for every note) on a keyboard will form a row or RANK of pipes.

Once several ranks are gathered into one ‘mixture’ voice, this allows a natural musical phenomenon to easily be applied:

Normal musical tone is brighter (more harmonics) in the bass, and broader (fewer harmonics) in the treble. So, as the mixture progresses up the keyboard, the **selection of pitches will change** one rank at a time from a higher pitch to a lower pitch – this change being imperceptible when the mixtures are drawn with the other chorus stops. In the extreme treble the mixture simply reinforces the foundation 8' to 2' ranks (and/or even lower pitches).

Where the mixture pitches (or ‘composition’) change from one note to the next, it is called a “**break**”; eg, the first break in the Great Unenclosed Mixture is from A to A#.

Also, it is impractical and usually considered unmusical for high-pitched single ranks above 2' to continue to the top note of the keyboard, so they also may ‘break’ before they imitate dog-whistles (to exactly one octave lower, or to a nearby lower ‘octave’ harmonic).

Pitches nomenclature

Footage indications (eg 2²/₃') are universal but many English & Americans count up the equivalent ‘white notes’ on the keyboard – that is, the notes in a scale: doh, re me (or 1,2,3) to doh (8) and continuing;

these matching the interval numbers as used by music theorists; eg 5th, octave (8^{ve}), 10th, 12th ;

and as may be seen in music score notation (especially piano): 8^{ve}, 15th, 22nd (ie, indicating 1, 2 or 3 octaves higher).

The word “scale” cannot be used alone here for this purpose, as its meaning in this organ context relates to pipe width.

Numbers start from 1 (8' on the manuals); an octave is 8 (= 4'); 2²/₃' is 12; 2' is 15; 1¹/₃' is 19; 1' is 22 etc. and below 1, nomenclature includes: **s5** (sub5 = sub-quint = 10²/₃') and **s8** (sub8 = sub-octave = 16')

A reminder that here we are talking about relative pitch nomenclature, where 8' 4' 2' etc are each related to bass C regardless of which note on the keyboard is being played. And where (1 8 15 22 etc) is equal to (8' 4' 2' 1' etc).

Note also that the “white-note” **Pitch Numbers** do **NOT** equate to the “Semitone” numbers, as used in counting the total **number of notes** per keyboard, or pipes in a single rank ie, the 61 notes in 5 octaves, or 73 notes in 6 octaves).

Footage pitch	16'	10 ² / ₃ '	8'	5 ¹ / ₃ '	4'	3 ¹ / ₅ '	2 ² / ₃ '	2'	1 ³ / ₅ '	1 ¹ / ₃ '	1 ¹ / ₇ '	1'	4 ⁴ / ₅ '	2 ² / ₃ '	1 ¹ / ₂ '	1 ¹ / ₃ '	1 ¹ / ₄ '	1 ¹ / ₆ '
‘white-note’ pitch number	s8	s5	1	5	8	10	12	15	17	19	21	22	24	26	29	33	36	40
keyboard or pipes Semi-tone number from bass C			1		13			25				37			49		61	

Whereas the footage pitch is always unambiguous, the ‘white-notes’ system usually presumes that for the Pedals:

1 = 16' the common Pedals pitch (different from the 8' of the manuals) and thus pedals number 8 = 4' 15 = 2' etc;

Therefore, pedals pitch 15 19 22 usually means, 4' 2²/₃' 2'

(but beware, sometimes a writer may mean: 2' 1¹/₃' 1' – same as for the manuals).

Harmonic Pitches — Comparison of “footage” and “white-note” pitch numbers & names — with indication of place in the **Harmonic Series**

Musicians may use the term ‘harmonic’ casually: For example, the 1st & 2nd overtones of a sound (often loosely called harmonics) are technically, the 2nd & 3rd harmonics. The technical “harmonic series” must begin with the fundamental frequency of a sound, the pure fundamental frequency also being a harmonic – number one.

Harmonic Series Number			1			2		3		4	5	6	7	8	9	10	12	16	24	32	48
“white-note” Pitch Number	sub 8	sub 5	1	3	5	8	10	12	b14	15	17	19	b21	22	23	24	26	29	33	36	40
“white-note” names	sub octave	sub quint	unison	3 rd	5 th or quint	octave	10th	12th		15th	17 th	etc:									
Names in relation to nearest Octave						octave	3 rd	5 th or quint	flat seventh	octave	3 rd	5 th or quint	flat seventh	octave	ninth	3 rd	5 th or quint	octave	5 th or quint	octave	5 th or quint
Footage Pitch for 8' manuals	16'	10²/₃'	8'	6²/₅'	5¹/₃'	4'	3¹/₅'	2²/₃'	2²/₇'	2'	1³/₅'	1¹/₃'	1¹/₇'	1'	8⁸/₉'	4⁴/₅'	2²/₃'	1¹/₂'	1¹/₃'	1¹/₄'	1¹/₆'
Footage Pitch for 16' Pedals	32'	21¹/₃'	16'		10²/₃'	8'	6²/₅'	5¹/₃'	4⁴/₇'	4'	3¹/₅'	2²/₃'	2²/₇'	2'	1⁷/₉'	1³/₅'	1¹/₃'	1'	2²/₃'	1¹/₂'	1¹/₃'
Pitches belonging ONLY to the Harmonic Series for a given fundamental pitch	64'					32'		21¹/₃'		16'	12⁴/₅'	10²/₃'	9¹/₇'	8'	7¹/₉'	etc					
	32'					16'		10²/₃'		8'	6²/₅'	5¹/₃'	4⁴/₇'	4'	3⁵/₉'	3¹/₅'	2²/₃'	2'	etc		
	16'					8'		5¹/₃'		4'	3¹/₅'	2²/₃'	2²/₇'	2'	1⁷/₉'	1³/₅'	1¹/₃'	1'	2²/₃'	1¹/₂'	1¹/₃'
	8'					4'		2²/₃'		2'	1³/₅'	1¹/₃'	1¹/₇'	1'	8⁸/₉'	4⁴/₅'	2²/₃'	1¹/₂'	1¹/₃'	1¹/₄'	1¹/₆'
	4'					2'		1¹/₃'		1'	4⁴/₅'	2²/₃'		1¹/₂'		1¹/₃'	1¹/₄'	1¹/₆'			

For a given ‘fundamental’ note: if pitches are added that do not belong in the harmonic series, then they will sound ‘out-of-place’ or imply the lower octave pitch to which they do belong.

Octaves and high **quints** simply add clarity and brilliance. **Thirds** add a reedy effect and are quite common (note that the lowest third belonging to a Harmonic Series is the 17th note).

Thirds of flute tone may take the French name “Tierce” and are also part of a “Cornet” stop;

3rds of principal tone may take the German name, “Terz” and are also part of a “Sesquialtera”.

7ths and 9ths are uncommon (rare in Australia), and become increasingly extreme in colour effect;

(the piquant colour of a fractional length reed would mostly be thought more musical).

The 7th harmonic is “flat” (not a ‘white-note’, nor part of the normal scale), so is properly “Flat 21st” and written b21 or 21b.

However, the ‘flat’ might be omitted because the 7th harmonic can only be flat.

The octave above the 7th harmonic is the 14th harmonic – note-name, **b28**

– this ‘flat’ must be indicated because there is

also a major 7th, this found at the 15th harmonic – note-name 28; ie, not **b28**.

Even more extreme are the 11th and 13th Harmonics which might found only as bizarre “colour” stops in a neo-Baroque instrument.

However, any of these harmonics may be used together with lower harmonics, to help more cheaply imitate with smaller pipes some 32' or 64' tone.

A low Quint (with octaves) will give the more fundamental result; inclusion of higher harmonics leads to string or reed-like tone.

Wind-Chest Pipes Layouts

Many chests are divided with the odd-numbered pipes on one side, and the even-numbered pipes on the other. Since the first note is C, and the second note is C#; the two sides are often called “C-side” & “C#-side”.

Pipes may also be arranged chromatically (ie, 1,2,3,4 etc) or further divided into other number sequences. At the MTH, the pipes will be arranged either Chromatically or divided into just the two ‘Sides’.

With the thought of ‘verification’ of pipes in the chamber, the following may help the novice with identification of mixture breaks, or counting pipes on the chest.

There is no ‘standard’ nomenclature for what are here called “**chest counting numbers**” and are included in the Mixtures Tables.

noting for example that, pipes numbered 1 3 5 7 9 11 in a rank count as 1 through to 6 on one side of a chest. (These counting numbers are **not** used or required by organ-builders.)

Observe that 61 pipes = 31 + 30 per side; and 73 = 37 + 36.

Pipe-rank or note numbers versus counting of position on a normal divided wind-chest:

semi-tone	C-side (odd)	1		3		5		7		9		11		13		15		17		19	
Number	C#-side (even)		2		4		6		8		10		12		14		16		18		20
chest	C-side	1		2		3		4		5		6		7		8		9		10	
counting	C#-side		1		2		3		4		5		6		7		8		9		10

semi-tone	C-side (odd)	21		23		25		27		29		31		33		35		37		39	
Number	C#-side (even)		22		24		26		28		30		32		34		36		38		40
chest	C-side	11		12		13		14		15		16		17		18		19		20	
counting	C#-side		11		12		13		14		15		16		17		18		19		20

semi-tone	C-side (odd)	41		43		45		47		49		51		53		55		57		59		61
Number	C#-side (even)		42		44		46		48		50		52		54		56		58		60	
chest	C-side	21		22		23		24		25		26		27		28		29		30		31
counting	C#-side		21		22		23		24		25		26		27		28		29		30	

semi-tone	C-side (odd)			63		65		67		69		71		73
Number	C#-side (even)		62		64		66		68		70		72	
chest	C-side			32		33		34		35		36		37
counting	C#-side		31		32		33		34		35		36	

mixture ranges

In the MTH organ, many voices in the Swell, Solo & Orchestral have the 6-octave (73 notes) range, as previously described.

The 1929 Swell mixture (now named “Grave” to differentiate from the new mixtures) is the only 73-note mixture in the organ.

New mixtures have a sole purpose to clarify and brighten the overall chorus tone, and so are **not** expected to be used with Octave Couplers, and have the 5-octave (61 note) range.

The mixtures design also addresses to some extent the problem that the 1929 organ is perceived as being too dull in the middle to lower range while hitting musical limits of brightness in the extreme treble (particularly when the extra octaves are in play).