

Tubbutec KAC TM62100

Midi and more for Yamaha SK synthesizers

User Manual

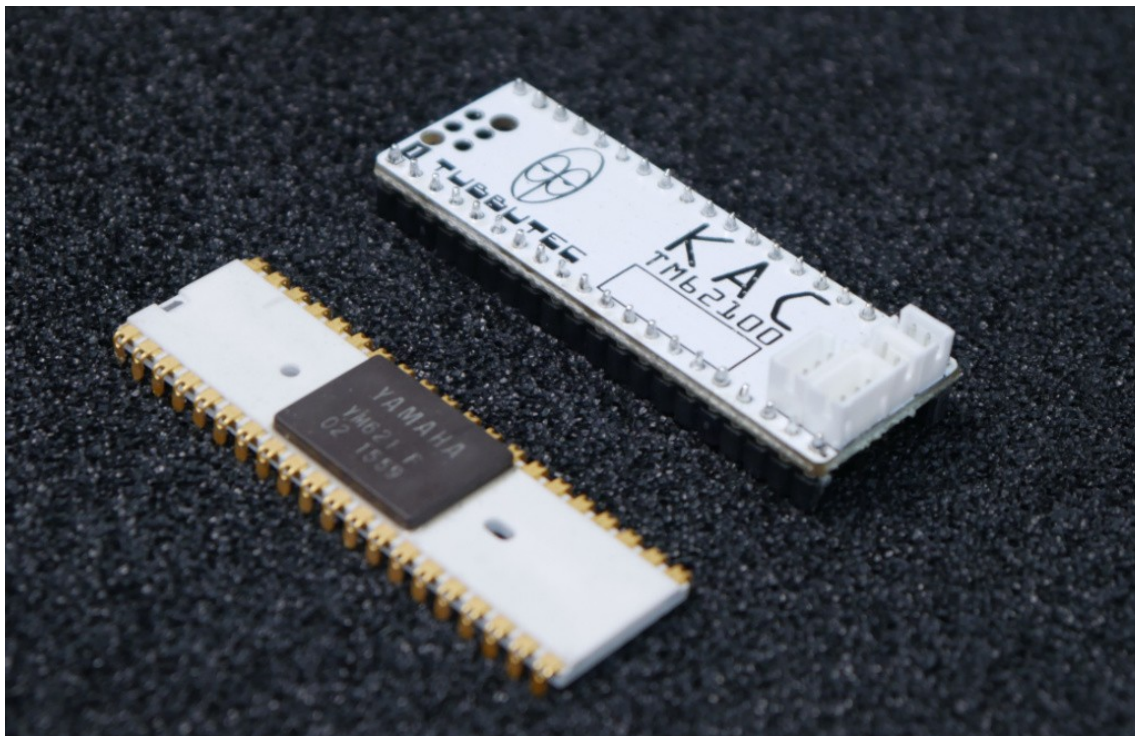
firmware 1.03

Introduction

TM62100 adds MIDI and additional features to SK-15, SK-20, SK-30 and SK-50 synthesizers. It is a direct replacement for the Yamaha YM62100 / YM621 key assigner and can also be used to replace defective original ICs – even when midi is not required. The original behaviour is fully maintained.

MIDI input and output on several channels with optional soft-through

- **Independent** midi control of upper keyboard, lower keyboard and pedal sections
- **Full tonal range** in split mode
- Midi filter **cutoff** and **resonance** control
- Additional **filter LFO**
- Midi **sustain** control
- Midi **portamento** control
- Midi **aftertouch**
- Note priority for the pedal/BASS section: Lowest/Last/Highest note
- Built in **configuration menu** can set midi channels and other parameters.
- Non-destructive installation can be reverted to original. Installation guides for various synthesizers are available



Comparison of the original YM62100 key assigner and the Tubbutec TM62100

MIDI input

Midi note control

Synthesizers with a YM62100 key assigner chip feature several instruments, such as Organ, Poly-Synth, Strings, Mono-Synth, ...

Some of these instruments are connected in “synth-groups” in a fixed manner, others can be played independently in split keyboard modes, or with multiple keyboards. An example for a fixed grouping is the Poly-Synth and String sections. These are always connected and will play the same notes.

TM62100 allows independent control of the several synths groups via midi. Each group has its own midi channel configurable using the built in config menu. Groups 1 and 2 - corresponding to the lower and upper keyboards - have a range of 61 notes and are 7-voice polyphonic (or paraphonic, depending on the instrument). Group 3, the “pedal” group is monophonic with a range of 3 octaves, an extended range of 4 octaves is available for the BASS sound.

Here is how the instruments are connected to the various groups in several synthesizers:

- **SK15**: All sounds on Group 2 ¹
- **SK20**: No split mode: Group 1 plays organ, poly-synth and strings. In split mode: Group 1 plays Organ (all 61 notes), Group 2 plays String and Polysynth (All 61 notes)
- **SK30**: Same as SK20, but SOLO-Synth plays on channel 2 in NORMAL mode and channel 3 in BASS mode.
- **SK50D**: Group 1 plays the lower keyboard, Group 2 plays the upper keyboard. BASS Plays on Group 3. Depending on settings, SOLO SYNTH plays on Group 2 (NORMAL) or Group 3 (BASS)

The midi note range of group 1 and 2 is C1 (note 24) – C6 (note 84). The range group 3 is C#1 (note 25) – C5 (note 72). The range C#1 – B1 is an extension to the original range and only available for the BASS sound.

¹ In case of the SK15, it might be possible to re-route the organ section to Group 1 by modifying the circuit. This has not been tested yet.

Additional midi control

If applicable, the following parameters can be controlled additionally:

- Poly-synth filter cutoff. A bipolar control. (All SK-Synths)
- Poly-synth filter resonance (All SK-Synths) ²
- Sustain ON/OFF (SK20, SK30, SK50)
- Solo synth filter cutoff (SK30, SK50) ²
- Solo-synth Portamento ON/OFF (SK30, SK50)
- Solo synth Aftertouch (SK30, SK50)

The midi controller numbers for these parameters can be found in the MIDI CC chart below.

The sustain control acts analogous to the external sustain input. In order to use it, activate the SUSTAIN function of the organ or Poly-synth instrument. You can then *turn off* the sustain via midi.

Similarly, the portamento can only be turned off via midi. Set a non-zero portamento time in the SOLO section, then use midi to turn portamento on or off.

| Parameter | Midi CC | Range |
|---------------------------------------|---------|--------------------------------|
| Poly-synth filter cutoff | 74 | Bipolar 64 = middle, no change |
| Poly-synth resonance ² | 71 | 0 - 127 |
| Sustain | 64 | 0-63: no change, 64 – 127: OFF |
| Solo synth filter cutoff ² | 71 | 0 - 127 |
| Solo-synth Portamento | 65 | 0-63: no change, 64 – 127: OFF |
| Solo-synth Aftertouch | | 0 - 127 aftertouch amount |

² For the synths with built in SOLO section, it is possible to control Poly-Synth resonance OR Solo-Synth cutoff, but not both. This is a choice you need to make during installation.

Additional Filter LFO

An additional filter LFO is accessible via midi CC controls.

- Frequency range: 0.1 Hz – 1000 Hz
- Free running or midi sync with adjustable divider
- Triangle, Saw, Inverted Saw, Square and Random waveforms

Audio frequency modulation is possible and can create novel sounds usually not possible with the SK-series synths.

Warning: Due to the filter IC suffering from some amount of CV bleed-through, the LFO signal may be audible directly. This is especially the case with high LFO frequencies and/or waveforms with discontinuities (all except triangle).

| Parameter | Midi CC | Range |
|-------------------|---------|--------------------------------|
| LFO amount | 20 | 0 - 127 |
| LFO frequency | 21 | 0 - 127 |
| LFO shape | 22 | 0 - 127 |
| LFO free / synced | 24 | 0 – 63: FREE, 64 – 127: Synced |
| LFO clock divider | 23 | 0 - 127 |

| 0 - 25 | 26 - 51 | 52 – 77 | 78 - 103 | 104 - 127 |
|------------|---------|--------------|----------|-----------|
| Triangular | Saw | Inverted Saw | Square | Random |

Midi CC values for the various LFO shapes

| 0 – 6 | 7 – 13 | 14 – 20 | 21 – 27 | 28 – 34 | 35 - 41 | 42 - 48 | 49 - 55 | 56 - 62 |
|---------|---------|----------|---------|----------|----------|-----------|-----------|-----------|
| 4 Bars | 3 Bars | 2.5 Bars | 2 Bars | 1.5 Bars | 1 Bar | 3 / 4 | 1 T | 1 / 2 |
| 63 – 69 | 70 – 76 | 77 – 83 | 84 – 90 | 91 – 97 | 98 – 104 | 105 – 111 | 112 – 118 | 119 - 125 |
| 3 / 8 | 1 / 2 T | 1 / 4 | 3 / 16 | 1 / 4 T | 1 / 8 | 3 / 32 | 1 / 8 T | 1 / 16 |

Midi CC values for the LFO clock divider in synced mode

| VAL | Period | VAL | f[Hz] | VAL | f[Hz] | VAL | f[Hz] | VAL | f[Hz] | VAL | f[Hz] | VAL | f[Hz] | VAL | f[Hz] |
|-----|--------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| 0 | 20 s | 16 | 0.25 | 32 | 4.25 | 48 | 8.25 | 64 | 32.5 | 80 | 72.5 | 96 | 225 | 112 | 625 |
| 1 | 19 s | 17 | 0.33 | 33 | 4.5 | 49 | 8.5 | 65 | 35 | 81 | 75 | 97 | 250 | 113 | 650 |
| 2 | 18 s | 18 | 0.5 | 34 | 4.75 | 50 | 8.75 | 66 | 37.5 | 82 | 77.5 | 98 | 275 | 114 | 675 |
| 3 | 17 s | 19 | 1 | 35 | 5 | 51 | 9 | 67 | 40 | 83 | 80 | 99 | 300 | 115 | 700 |
| 4 | 16 s | 20 | 1.25 | 36 | 5.25 | 52 | 9.25 | 68 | 42.5 | 84 | 82.5 | 100 | 325 | 116 | 725 |
| 5 | 15 s | 21 | 1.5 | 37 | 5.5 | 53 | 9.5 | 69 | 45 | 85 | 85 | 101 | 350 | 117 | 750 |
| 6 | 14 s | 22 | 1.75 | 38 | 5.75 | 54 | 9.75 | 70 | 47.5 | 86 | 87.5 | 102 | 375 | 118 | 775 |
| 7 | 13 s | 23 | 2 | 39 | 6 | 55 | 10 | 71 | 50 | 87 | 90 | 103 | 400 | 119 | 800 |
| 8 | 12 s | 24 | 2.25 | 40 | 6.25 | 56 | 12.5 | 72 | 52.5 | 88 | 92.5 | 104 | 425 | 120 | 825 |
| 9 | 11 s | 25 | 2.5 | 41 | 6.5 | 57 | 15 | 73 | 55 | 89 | 95 | 105 | 450 | 121 | 850 |
| 10 | 10 s | 26 | 2.75 | 42 | 6.75 | 58 | 17.5 | 74 | 57.5 | 90 | 97.5 | 106 | 475 | 122 | 875 |
| 11 | 9 s | 27 | 3 | 43 | 7 | 59 | 20 | 75 | 60 | 91 | 100 | 107 | 500 | 123 | 900 |
| 12 | 8 s | 28 | 3.25 | 44 | 7.25 | 60 | 22.5 | 76 | 62.5 | 92 | 125 | 108 | 525 | 124 | 925 |
| 13 | 7 s | 29 | 3.5 | 45 | 7.5 | 61 | 25 | 77 | 65 | 93 | 150 | 109 | 550 | 125 | 950 |
| 14 | 6 s | 30 | 3.75 | 46 | 7.75 | 62 | 27.5 | 78 | 67.5 | 94 | 175 | 110 | 575 | 126 | 975 |
| 15 | 5 s | 31 | 4 | 47 | 8 | 63 | 30 | 79 | 70 | 95 | 200 | 111 | 600 | 127 | 1000 |

Midi output

TM62100 features midi output on several midi channels. The various synth-groups (see MIDI input) also apply here. This means the upper, lower and pedal keyboards can send on different midi channels. In split mode the two parts send on different midi channels as well. The midi channel numbers can be set in the config menu, as well as individual output channels turned off.

The range and notes sent are identical to the ones received:

The midi note range of group 1 and 2 is C1 (note 24) – C6 (note 84).

The range group 3 is C2 (note 36) – C5 (note 72).

Only note output is supported. Filter cutoff or other parameters can not be sent.

Pedal note priority

The pedal synth group, usually associated with the BASS and SOLO sections, is monophonic. Usually (and in the original) the note priority is 'highest note', meaning when several keys are pressed, the highest note will play.

With TM62100 you can change the note priority to one of the following modes:

- Highest: The highest note plays
- Lowest: The lowest note plays
- Last: When pressing a new key, it plays in every case. When releasing a key while one or more other keys are still pressed, the most recently played note will play. This continues until all keys are released.

The note priority can be set in the config menu.

Gate dead time

When playing on the keyboard or via midi, there need to be a short pause between two notes. This pause is needed for the envelope (for example of the poly-synth) to retrigger. Without the pause, the envelope will not start the attack phase from the beginning.

While it is almost humanly impossible to **not** include a short pause between notes when playing on a keyboard, it is very common to send a midi note-on command right after a note-off. The result in this case is that the envelope does not retrigger. This is most likely not the intended behaviour.

One way to rectify this is to include a short pause when programming the midi notes. Instead of one full bar, your note might just be a little bit shorter.

Alternatively, TM62100 can automatically insert a pause before the next note is played. This is the "gate dead time" and it can be set in the config menu. The best value needs to

be found experimentally for your synth, as this very much depends on the analogue behaviour of your synths. The default is 0, the original behaviour.

Note that the gate dead time, will inevitably delay the next note slightly, so a values as low as possible should be chosen.

MIDI soft-through

Optionally MIDI soft through can be activated using the config menu. Incoming midi messages will be merged with the internal midi data and forwarded to the MIDI output.

Note: depending on the configuration, this can lead to midi loops. Use with caution !

Voice assign mode

TM62100 now features two voice assign modes:

When playing a specific note multiple times, SINGLE mode will always use the same voice for this note.

MULTI mode however, allows a note to be played by multiple voices. If sustain is on, this can be used to increase the volume of a note by pressing it multiple times.

The mode can be selected in the config menu.

Configuration Menu

The built in configuration menu can be used to set parameters such as midi channels or the pedal note priority.

Accessing the config menu

1. Turn off your synthesizer
2. Press and hold an D-minor chord (D-F-A) anywhere on any keyboard. Note: Playing an E-minor chord starts the bootloader for firmware updates instead.
3. Turn on the synthesizer

The following descriptions refer to the config menu graphic --->

Selecting the MIDI input channels

1. Press the key to select the channel group (PEDAL in, LOWER in or UPPER in).
2. Press the lowest C to turn this channel off, or keys 1 – 16 (C#0 - E1) to select midi channel 1-16

Selecting the MIDI output channels

1. Press the key to select the channel group (PEDAL out, LOWER out or UPPER out).
2. Press the lowest C to turn this channel off, or keys 1 – 16 (C#0 - E1) to select midi channel 1-16

Midi soft through

Press the THROUGH ON or OFF keys to turn midi soft through on or off.

Pedal note priority

Press keys LOWEST, LAST or HIGHEST to set the pedal note priority accordingly

Gate dead time

Press the "Gate dead time" key (B1) and then use the lowest 17 keys to turn the feature OFF (C0) or adjust the dead time between 2 and 24ms.

