Streetly Mellotron M4000

Tape-based Keyboard

- Keyboards

By Gordon Reid

It's over 40 years since its inception, but the Mellotron has proved to be surprisingly enduring. We meet the men who resurrected the original sampler and review the most technologically sophisticated Mellotron ever, the brand-new M4000.

Photo: Richard Ecclestone

In 1986, Streetly Electronics went out of business, bringing to an end one of the most important chapters in modern music. Streetly were the manufacturers of the Mellotron, the invention of which ushered in the eras of psychedelia, art rock and progressive rock, all of which are, in one form or another, still with us today. Depending on your age and taste, you may wish to dismiss the Beatles, the Moody Blues, Genesis and Yes, but you can't ignore the fact that Mellotrons are still among the most highly regarded of electronic keyboards, sought after by almost every band that wants to step a little beyond the basics.

As a consequence, even the smallest Mellotrons, the Model 400s, now command prices in the region of £3000. As for the larger models — the Mk1, Mk2 and M300 — don't ask; if you need to know the price, you probably can't afford one. But all have one thing in common: rarity. If you don't own a vintage Mellotron already, the chances are that you never will. But does this mean that the Mellotron is destined to disappear, remembered only on old LPs and in bastardised form in sample libraries? Happily, no. A new generation of Mellotrons is alive and well and, just as before, its parents live near Birmingham. This is its story.

The Rebirth Of Streetly Electronics

The men behind the rebirth of the Mellotron are Martin Smith, John Bradley (the son of Les Bradley, who helped to develop the original) and Norm Leete.

Recognising the resurgence of interest in the Mellotron in the early 1990s, Smith was the force behind the 1993 Mellotron tribute album, *Rime Of The Ancient Sampler*, which featured tracks from luminaries such as Mike Pinder (the Moody Blues), Woolly Wolstenholme (Barclay James Harvest), David Cross (King Crimson), Nick Magnus (the Steve Hackett Band), Ken Freeman and, umm... yours truly. The following year, he and Bradley set up Mellotron Archives UK on a part-time basis to provide service and support to Mellotron owners, and to supply new tape frames for existing machines.

In 1997, Les Bradley died, whereupon Smith and John Bradley decided to ditch their day jobs, readopt the Streetly Electronics name and, in their own words, "give it a go". For 10 years, they survived by refurbishing machines for existing owners, refurbishing machines to sell to new owners, and by making tapes and tape frames.

In 2002, Swedish enthusiast Markus Resch brought out a modified reproduction of the Model 400, which he called the Mk6 (see *SOS*, August 2002), and he sells a small number worldwide. Similarly, in 2005, Streetly manufactured a one-off glass M400 'Skellotron' and another, less transparent, M400 on legs. But Smith and Bradley realised that this was not where the market lay; bespoke instruments were too time-consuming to build and therefore too expensive to appeal to a wide market. At this point, I'll let Martin Smith take up the story...

"About three years ago I looked at the order book and at the diminishing availability of machines that we could obtain to restore, and I realised that if we didn't do something quickly, we may have had a business on paper, but we wouldn't have had any stock, and we couldn't survive on servicing and building tape frames. What's more, I don't think that we've ever made a profit out of restoring Mk2s because they always take too long. It's wonderful to rebuild the Mellotron that George Harrison left in his shed for 30 years, or Paul McCartney's Abbey Road machine, but they take so much time. And then, when you think you've finished one, you fire it up, listen, and hear more faults, so you have to take it apart and start again. So we thought about putting Model 400s back into production. Unfortunately, Markus had already brought out his Mk6, which, despite its incompatibility with existing Mellotrons and Novatrons, is a fairly accomplished machine.

"We then thought about building Mk2s, but this would have been horrendously expensive and, as John and I discussed things, the concept turned into a single-manual machine with the Mk2's cycling mechanism. Then we realised that this would make the new instrument incompatible with M400s and Novatrons. This was an important point; we wanted it to be compatible so that the old and the new could share frames and spare parts. But, at the same time, the new instrument had to put the 'wow!' factor back into Mellotrons."

How Does A Mellotron Work?

All Mellotrons and Novatrons are fundamentally the same, and use a sound generation system first conceived by Harry Chamberlin in the 1950s. They are electronic keyboards that — instead of using digital processors or electrical circuits such as oscillators and filters to create sounds — replay existing sounds recorded on strips of tape located underneath the keys.

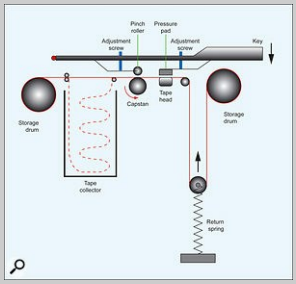

Photo: Richard Ecclestone

When you press a key, a pinch roller presses the individual tape beneath it against a continuously rotating capstan, and the tape is then pulled across a playback head that replays a sound. There are three sounds running in parallel along each tape, and you move the head from left to right to select which is played at any given time.

The played tape falls into a collector box and, when you release the key, this is pulled back by a return spring, ready for the note to be played again. The limitation is that, if you reach the end of the tape, playback stops. Consequently, many people have asked why strips of tape are used rather than loops that would offer infinite sustain. The answer is simple: if you know the start position of the tape when you press the key, you can include the attack portion and natural decay of each sound.

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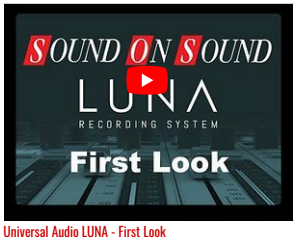

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On a non-cycling Mellotron, each tape is about five feet long. On a cycling machine, the tape is in excess of 30 feet long, but is divided into multiple sections, each of which offers a different selection of sounds. The portions of the tape that are unused at any given time are wrapped around drums at either end of the mechanism.

The Cycling System

To understand the difficulties that Smith and Bradley faced in marrying a cycling mechanism to an M400 chassis, you have to appreciate that there were two distinct families of Mellotrons: the M400, its 'Novatron' successors and the Mk5 (on one hand) and the much larger Mk1, Mk2 and M300 (on the other).

The larger models had much longer tapes, with multiple sets of recordings positioned at precise intervals along them. The start of each set of sounds was known as a 'station' and, for example, a Mk2 might have strings, flutes and brass under the A, B and C selectors at Station 1, but when you then pressed the '2' button, the large drums holding the tapes would rotate until station 2 was reached, whereupon the three playable sounds might have been flugelhorn, tuned farts, and the massed choirs of the Selly Oak Philharmonic. You could even blend sounds on these 'cycling' machines by placing the tape heads between parallel tracks, thus mixing A+B or B+C for even greater flexibility. Consequently, the six stations on a Mk2 manual offered a total of 18 sounds and 12 blends. In contrast, the M400s and Novatrons had just one set of sounds (again called A, B and C), and if you wanted to change these you had to whip out the tape frame and install a replacement. This was not something that many were brave (or daft) enough to attempt on stage!

Given the problems of building a cycling machine in the much smaller M400 format, the new Mellotron could have been stillborn. However, a turning point arrived when Leete suggested that a smaller and more reliable cycling system could be designed using digital control rather than the antique sync-tape-and-stepper-motor system designed in the early 1960s. An expert in writing efficient code for robot arms, Leete then made the mistake of suggesting that he could write the program in about six weeks.

The M4000's control panel: identical to the M400's, aside from the addition of four buttons and an LED display to operate the cycling mechanism.

Photo: Richard Ecclestone

"Norm knows a great deal about Mellotrons," John Bradley explains. "He has a lot of knowledge of motor control systems and servo motors, so this felt like familiar ground to him. But a cycling Mellotron presents problems that he had never encountered before, and it wasn't until he started developing the software that he appreciated everything that it involved.

"He knew that the motors had to work with pinpoint accuracy, but he hadn't considered things such as how the customer could reset it, and how the program could check the physical fail-safes to stop the tapes being destroyed if keys were pressed while the stations were cycling. On original Mellotrons, there was a flap that physically locked the keys while cycling was taking place. Unfortunately, this was unreliable, and many tapes suffered fatal consequences. In the new machine, this was to be replaced by a pair of optical sensors that would stop the cycling motor dead in its tracks if a key is brushed by as little as an eighth of an inch. In theory, this needs no maintenance and no adjustment and, component failures notwithstanding, should last forever.

"Anyway, returning to Norm," continues Bradley. "His first attempt resulted in the tapes always being a fraction of an inch away from the stations. So he went away, re-thought the maths that determined the positions of the tapes, rewrote the program, and, a year after starting, came back with what we've got now, which brings the tapes back to the right place every time."

Introducing The M5000

Already in the planning stage, the M5000 will be a double-manual version of the M4000, just as the Mk5 was a double-manual version of the M400. It will host 48 sounds, a digital reverb, internal amplifiers and NXT flat-panel monitoring within the cabinet. In many ways, it will be an homage to the Mk2, but much lighter, more playable and more reliable.

The projected price of the M5000 is £8000 plus VAT, which is a lot of money, but not when compared to the cost of a refurbished Mk2. The last such instrument sold by Streetly had a buy-in price of £7000 and took eight weeks to refurbish. The company sold it for £14,000, which was a modest return for so much work.

The Tape Transport & Replay Electronics

It was now time to address the mechanics of the tape transport. The frame was chosen to be a modified Novatron frame, braced to carry the extra weight of the cycling system. This would provide continuity with older models, and enable both generations to use a common list of spare parts.

The most important improvement in the transport was, perhaps, the least visible. To appreciate it, you have to understand that early Mellotrons went flat when you played more than a handful of notes. In part, this was because the motor controller (called the CMC10) was not quite up to the job. On later models, a board called an SMS2 replaced the CMC10, but new problems arose because the motor pulling the tapes through the instrument wasn't powerful enough. The situation wasn't helped by the use of plain bearings, which picked up rubbish, scarred, and became less efficient as the machines got older. At this point, I'll pass the story back to John Bradley...

"The CMC10 was not particularly clever," says Bradley. "It would drift all over the place depending upon temperature, and the pitch would drop after just six or seven notes. Unfortunately, these were used on all the early M400s, and the SMS2 only appeared in 1974 when the original Streetly Electronics decided to build a new, double manual instrument [*the Mk5*] and realised that the CMC10 would be hopeless at driving a double-length capstan. The SMS2 was a proper servo-mechanism; a huge improvement. However, if you replace the CMC10 in an older machine with an SMS2, you get a wowing effect because of the mismatch; if the motor slows down slightly, the SMS2 ramps up the voltage and the motor goes past the correct pitch, so the SMS2 drops the voltage and the motor slows down too much. This behaviour wasn't good enough for our new instrument so, like Markus did for his Mk6, we decided to use a more powerful motor that would complement the SMS2.

Lifting the lid on the M4000 reveals the keyboard mechanism and a glimpse of the tapes themselves.

Photo: Richard Ecclestone

"In the end, we sourced the capstan motor from the manufacturers who had made the motors for the M400s," adds Smith. "Remember, most motors of this sort are designed to do things like drive washing machines, and we needed something that was far more stable, with much more torque. So we used a company that understood our requirements. They came up with a powerful, permanent magnet motor that, for a given load, draws a lot less current from the power supply."

Other proposed improvements for the new instrument included rollers at the bottom of the tape loops (the M400s had non-rotating plastic mouldings), yet more rollers to replace the stainless steel rod over which M400 tapes pass as they go down into the body of the Mellotron, and a seamless drive belt designed to eliminate the faint thump that could be heard on some vintage machines. In addition, the capstan was to be stainless steel, which can't be magnetised. The early Mellotrons used brass capstans, which were later replaced by chrome-plated steel capstans that could become magnetised. You know what happens

when you pass a tape hundreds of times across a magnet, don't you?

Teaching The Old Dog New Tricks

Streetly have introduced several new Mellotron sounds over the past five years, including Bass Clarinet, Ian McDonald's Flute, Russian Choir, 'Watcher', and Sad Strings.

Martin Smith describes the Bass Clarinet as having "a big farty sound that people love from Mellotrons". Apparently, Harry Chamberlin recorded Bass Clarinet tapes for the Chamberlin, but they got lost and thus never reached the Mellotron catalogue.

As an owner and player of many Mellotrons over the years, Ian McDonald of King Crimson understands how the instrument works, so he recorded each note in his flute set with the machine's eight-second limitation in mind. He introduced the note, added vibrato in an appropriate way and then let the note die away in exactly eight seconds, which makes these recordings uniquely appropriate to the Mellotron.

The Russian Choir is not a new recording, but an amalgam of existing vocal tapes, and has an 'orthodox church' feel. Likewise, 'Watcher' is not new, but is an A+B mix of the Mk2 Strings and Mk2 Brass that Tony Banks used on Genesis' seminal track 'Watcher Of The Skies', which remains among the most often-played of all Mellotron licks.

Finally, there are the Sad Strings, which were discovered on a reel of EMI tape that had never been converted into a tape set. Smith thinks that this is because the recordings weren't clean enough — they were full of badly bowed strings, chair scrapes and coughs. But with a little judicious manipulation in the digital world it was possible to create a 'new' set of tapes that were probably recorded in the early 1960s!

The Filtron

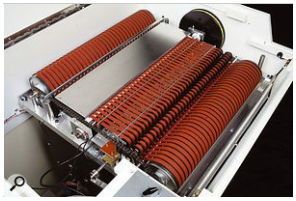
Mellotrons have garnered a deserved reputation for unreliability, and stories abound of instruments with sticky tapes being thrown into orchestra pits (Keith Emerson) or doused in fuel and ignited (Rick Wakeman). But a studio-bound and well-maintained M400 is a reliable machine, so something about the on-stage environment must be inimical to the design.

A couple of years ago, Henry Dagg, the keyboard player in the Genesis tribute band In The Cage, identified the problem and cured it. He found that convection was drawing air through the base of his M400, sucking in a combination of dry ice and stage smoke that was then deposited on the tapes, guides and heads, causing them to become sticky. Cleaning was of only temporary benefit; the problems returned within a gig or two. So he sealed the lower part of his Mellotron's cabinet and installed a fan that sucked air through a filter to pressurise the inside of the instrument. With clean air inside, and air always being forced out, there was no way for the smoke to get in and damage the mechanism. The problems disappeared.

Having cured his own instrument, Dagg spoke to Smith and Bradley, somebody named the fan/filter unit 'the Filtron', and they all agreed that Dagg would build it as part of the new instrument and as a retrofit for existing Mellotrons.

The Sounds

Next, Smith and Bradley had to decide on the sounds that they would install in each of the eight stations in their new machine. Smith explains. "We've got a library of around 100 sounds, and I keep a log of every one that we sell. I went back and looked at what we had sold over the past five years, and selected the 24 that had been ordered most often. So the sound set was not necessarily going to be a 'best of', but a 'most popular of'."



With the keyboard removed we can see the M4000's tape rack, along with the drums and chain of the cycling mechanism.

Photo: Richard Ecclestone

Having selected the sounds, Smith found that it was not trivial to arrange them into eight groups of three with appropriate choices in each of the groups. "We wanted to reintroduce blending in the new machine," he explains. "Some M400s — those that did not use Les Bradley's tapes — did not do this well because the gaps between the tracks were too great, and if you tried to blend by placing the A-B-C selector between two sounds, the volume decreased and the signal-to-noise ratio suffered. But we were determined to put blending back, with a blended sound at the same volume as either of its constituents. This, then, placed significant constraints on which sounds we could put next to each other if players were to get sensible results. Having said that, we'll also supply bespoke tape sets. If people want to choose their own 24 sounds and decide where they sit on the tapes, we'll create a set for them. If they supply their own sounds we can create a set from those, but we'll have to quote for that individually because we've been sent sounds that are almost unusable, and it can take days to get something worthwhile out of them."

Given the constraints imposed by blending, I asked Smith whether Streetly had performed any retuning before creating the masters for the new machines. "Absolutely," he replied. "I know that there are purists who say that we should have left everything as it was, but with blending you can't have sounds that are out of tune with one another. We recently sent out some tuned flute tapes, and everybody said that they were the best tapes that they had heard in ages, so for the new machine we decided to tune the sounds just a little; they're not precise and soulless, but they are much more useable.

With the front cover off we can see the tape return springs and also the Filtron unit at the bottom of the case.

Photo: Richard Ecclestone

"I also cleaned up certain sounds. I have always hated the bias pops, hums, and other unwanted noises on the original Mellotron tapes so I applied some gentle filtering — perhaps just some roll-off to eliminate the 60Hz and 90Hz hums on the Mk2 violins, or a bit of hiss reduction at the top end. Les had always wanted to re-record the master tapes and, if he had done so, the Mellotron might have sounded much cleaner from the start. Nevertheless, if there are any die-hards out there who want the original sounds, warts and all, they can have them.

"Another important point about the sounds is that we are still using EMI tape. Modern tape formulations don't sound as good. This might be a mismatch between the tape and the replay system, but when modern tapes such as BASF or Ampex are pulled across a Mellotron's heads, some notes are unexpectedly shrill. When we discovered the current batch of unused EMI tape, we made a set of tapes, put them in an M400, and the sound was back to where it always should have been. We reckon that our current stock will last for 10 years but, unless we find some more, we have to be realistic and say that it will run out eventually."

Given the improvements to the S/N ratio of the tapes, I asked Bradley whether he had been worried that the extra electronics would undo all their work and make the new instrument noisier than original Mellotrons. "We decided to use the same replay amp as in the later M400s, and a Novatron power pack with additional outputs for the cycling system and the digital electronics. So this was something that we could be specific about: we would not allow the new machine to be noisier than the best vintage Mellotrons. It took a lot of care to achieve this, concentrating on screening and careful wiring, and even arranging parts of the machine so that they don't interfere with each other. If you measure the earliest Mellotrons you'll be lucky to find a S/N ratio of -45dB, but a good Novatron had a S/N ratio closer to -57dB. So that was the target (which, by the way, we achieved)... A maximum output level of +3dB and a S/N ratio of -57dB, in line with the best from the past."

In Use

The new Mellotron — now christened the M4000 — appeared a few weeks ago, and the pictures in this article show unit number two, which Streetly brought to my studio for appraisal.

The first thing I noticed about it was its similarity to the M400. Walk up, switch on, choose tape track A, B or C, set the volume, tone and pitch, and play. Streetly have even sourced the same knobs found on the M400.

The M4000 Standard Tape Set

Station	Track A	Track B	Track C
1	Mk2 Flute	Mk2 Violins	Cello
2	String Section	Eight Choir	Church Organ
3	Mk2 Brass	Mk2 Tenor Sax	Mk2 Trombone
4	Male Choir	Boy's Choir	Female Choir
5	M300A Violins	Russian Choir	Sad Strings
6	Bass Clarinet	McDonald Flute	Mk1 Clarinet
7	Vibes	Watcher Mix	Orchestra
8	Mk2 Church Organ	Cor Anglais/Oboe	Medieval Woodwind

The second thing I noticed was its height. The M400 has a wonderful, iconic shape, but it's too low to play comfortably when you're standing, and if you try to sit at it you're unlikely to get your knees underneath. So, given that the case had to be made deeper to house the cycling mechanism anyway, Streetly took the opportunity to make it five inches higher too, which means that the keyboard is at the same height as a Mk2's, and much more playable.

Ah yes... playability. The keyboard is unlike any vintage Mellotron I have ever played. Only my rebuilt Novatron and Markus Resch's Mk6 come close, and I think that it's fair to say that the M4000 action has some of the 'wow!' factor that Smith wants. Well-adjusted M400s do allow you to play rapidly, provided you have strong fingers, but the M4000 almost feels like a synthesizer keyboard. Remarkably, this has been achieved using standard Mellotron keyboard parts, slightly re-jigged to make the action lighter and more positive than before.

In the centre of the control panel there's a two-character, seven-segment LED display with four buttons (up, down, cycle and inch) flanking it. Operation couldn't be simpler. If you press 'cycle' and use the up/down buttons to select the station you want, the M4000 will take you directly to it. I measured the slowest transit (from station one to station eight) at less than a minute, which isn't bad. I also tested Bradley's assertion that the cycling will stop instantly if you touch a key. He's right; it does.

'Inching' allows you to advance the tapes slightly and select the position at which playback starts. This is like cutting off the start of a digital sample; it makes the attack faster, and eliminates some or all of the atonal chiff of many acoustic sounds. You can decide if you prefer the soft attack that is the default position of each station, or the hardest attack, for faster, more aggressive playing — or anywhere in between.

Proud parents John Bradley (left) and Martin Smith.

Photo: Richard Ecclestone

So what about the sound of the M4000? It's bright, clean, artifact-free, and without any of the 'smear' that results from poor head-block azimuth. Some players wax lyrical about the limited bandwidth, instability, noise and artifacts of early Mellotrons, and there are purists who may feel that the new model has been emasculated. I'm a little torn, myself; I loved my Mk1, problems and all, and while its sounds were far from ideal, it had immense character. But on the other hand, nobody ever made friends with sticking tapes, and when I add together reliability, portability, pitch stability, clean sounds and sensible tuning, I'm forced to admit that the M4000 is in a different league as a musical instrument.

Another nice touch worth mentioning is that the output is muted when the M4000 is cycling, which means that you can use it on stage and switch between stations without strange noises coming through the PA. Unfortunately, and this is my only complaint, there's one thing missing that I would very much have liked to see included: a half-speed switch. Half-speed was a trick that could be achieved by modifying original Mellotrons, and it's a standard feature on the Mk6. It drops the pitch of the instrument by an octave and, with the right tapes installed, produces a sound like senile ogres trying to learn the contrabass. In other words, it's huge, deep, and I love it. Come on Streetly... one more feature, please?

Prices & Distribution

At £5287, an M4000 is not cheap. Nevertheless, its 24 sounds start to look like pretty good value when you compare them with the three sounds in a beaten-up M400 that might cost you around £3000 in the current market. Consequently, Streetly have not been short of enquiries, and even before production began the company had taken a number of orders.

As discussed elsewhere, Streetly will prepare and load bespoke tape sets for M4000 owners (at £293 per set), but I think that the most important addition to any M4000 will be its dedicated flightcase. Given that most instruments will probably be exported from the UK, it would seem ludicrous to spend a few hundred quid on crating that will be destroyed on delivery, when £558 buys you a nice case that is also perfectly suited to gigging.

A worldwide distribution network is being assembled, with agents on the East and West coasts of the USA, and another in Germany soon to be confirmed. Meanwhile, Smith is looking for a distributor in Japan, the addition of which (he feels) will give Streetly coverage over much of the Mellotron-playing world.

Conclusions

If you're hoping to find a second-hand Mellotron for next to nothing in your granny's parlour, and to hand it over to Streetly to have it returned to its former glory, you're going to have to wait. Streetly are still refurbishing occasional M400s, but are not undertaking cycling machines for the foreseeable future. So it seems that, barring miracles, your only opportunity to obtain a cycling machine is going to be to buy an M4000. But apart from availability, what distinguishes the M4000 from other cycling Mellotrons?

Most obviously, there's the playing action. Most cycling Mellotrons are so badly adjusted that pressing the keys is like fighting girders. In contrast, the M4000 has something approaching a 'synth' action, and I hope that this persuades aficionados to look a bit beyond the ubiquitous block chords and the infamous 'tarantula crawling across the keys technique'.

Next, there are the practicalities. The M4000 is light and sturdy — for a cycling Mellotron, that is. The previous cycling machines were neither light, nor sturdy, nor were they reliable; rather, they were backbreakingly heavy, surprisingly fragile, and hideously unreliable.

Finally, there's the sound. You may lust after the thumps, bumps, and pops of sounds that seemed marvellous in 1963, but that's rosy-pink nostalgia. Now you can have the best of both worlds: a wide range of usable sounds, all with the instantly recognisable character of the Mellotron.

But the real crux is that you shouldn't be comparing the M4000 to an original cycling machine because you'll never get your hands on the latter; you should be comparing it to a second- (or tenth-) hand M400 with seven alternative tape frames. Do this and there's no contest. If you're in the market for a Mellotron, I reckon that there's only one game in town.

Pros

- It has 24 sounds; eight times more than an M400 or Novatron.
- It has a remarkably fast, playable keyboard action.
- It is lighter yet more robust than vintage machines.
- It's available; which is more than can be said for original cycling machines.
- It sounds great.

Cons

- There's no half-speed option.
- It's not cheap.

Summary

The M4000 combines the practicality of the smaller Mellotrons with the flexibility of the huge cycling machines, and with the refinements that more than 30 years of further audio development can offer. It won't be the cheapest keyboard you'll ever buy, but it will probably be one of the best. What's more, history suggests that it will still be working decades hence, and might eventually be worth considerably more than you paid for it. What's not to like?

Information

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