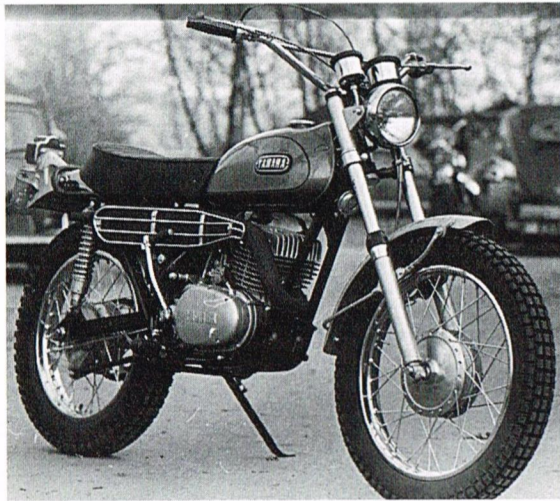


2 A touch of the DTs



The DT1-B of 1969 was primarily a cosmetic update and the first DT to appear in Europe in any numbers

With the DT1 selling like the proverbial hot cakes, Yamaha realized they had struck gold and rushed to extend the range to other capacity classes. The first machine development to reach fruition was the 125 and by the beginning of 1969, the first AT1s were arriving in the US and Australia.

It was immediately christened the kid brother of the DT1, and indeed the design was almost identical. The single-cylinder engine, with vertically split crankcases, had the time-honoured dimensions of a 56 x 50 mm bore and stroke, exactly as found on the cylinders of the YDS 250 cc street twins and the TD road-racers. The five-port cylinder design was common to almost the entire range of Yamaha machines by the end of the 1960s. In contrast to the DT1, the spark plug was located in the centre of the cylinder head, which provided a conservative compression ratio. A 24 mm Mikuni performed the carburation, with the air cleaner nestling behind the oil tank under the sidecover on the left-hand side of the bike. The upswept exhaust looked like a scaled-down version of the DT1 pipe.

The engine layout was identical to that of the DT1, with magneto on the left-hand end of the crankshaft and the primary transmission and Autolube drive on the other. The ten-plate clutch borrowed many components from other machines, but did not use the spring-based cush drive of the DT1. Instead the pins connecting the transmission primary gear to the clutch housing

were rubber mounted. A five-speed transmission was fitted with a very low first gear and a large jump to second, the rest of the ratios being fairly equally spaced, with top gear offering overdrive for street use. The shift mechanism differed slightly from the DT1, in that the fork which was mounted on the drum on the DT1, now ran along its own rail.

Although appearing to use the same chassis design as its bigger brother, there were a few subtle differences between the two. On the frame of the AT1, the main backbone member extended down behind the engine to join a pressed-steel box that connected the single backbone tube to the twin rails of the engine cradle and provided the mounting point for the swinging-arm. In fact it was a very similar frame to the YAS1 125 street twin, except this used a single downtube and the engine as a stressed member of the frame. The rake of the AT1 was a fairly steep 29.5 degrees. The other unusual feature of the bike was the use of a half-width rear hub. Yamaha's intention was to reduce the amount of unsprung weight on the rear end by using a narrower width drum brake to stop the lighter machine. The performance of the brake did not suffer as a consequence, proving in fact to be rather too powerful and locking the wheel.

This was to be a curse that dogged many of the dirtbikes in Yamaha's range for the next ten years. It was not, however, a floating design as on the DT1, since the tie rod for the brake backing plate was attached to the swinging-arm and not the frame. In theory this would result in extra compression of the spring under rear wheel braking, and, if travelling over rough ground while braking, the rear wheel would have a tendency to hop under the torque reaction forces. In practice, other deficiencies of the AT1 prevented it from being ridden on the kind of terrain where this would be a problem. Except for the addition of traffic indicators, the rest of the machine was almost a mini-clone of the DT1, with the same equipment coming as standard.



High plains drifter—the CT1-C of 1970

Much as the DT1 before it, the AT1 performed quite well in both environments, although the 145 mm of front and 110 mm of rear wheel travel meant that the rider had to take it easy on the rough stuff. The rear dampers had the usual three-position spring preload adjustment but whenever the suspension worked up a sweat, the poor rebound damping characteristics became very noticeable. First gear was low enough to get the 11 bhp bike up almost any incline, but the gap between first and second was too wide. Weighing in at 94 kg dry, the AT1 was significantly lighter than the DT1 and so would appeal to those looking for a light machine. The AT1 was competent for its time, and if anybody needed a last attraction to convince them to buy one,

it must surely have been the price tag. At US\$480, it was a bargain.

As with the DT1, a GYT kit was available for aspiring motocross or serious enduro riders. The kit contained the same components as for the DT1, including a chromed cylinder, single-ring piston, a 26 mm carburettor and a racing magneto. The increase in performance was just as impressive with a claimed 18 bhp output at the higher engine speed of 8500 rpm. The accuracy of these figures is now unknown, but if they were, and it is considered that the early YZ 125s were only producing around 20 bhp, the AT1-M was a pretty potent machine. Unfortunately, there was no feasible means of bringing the suspension up to the same standard as the engine.

The next of the T series to be announced was produced with zero development costs. The CT1 arrived on the market towards the end of 1969, with a total of about 30 original components. It was quite simply an AT1 bored out from 56 mm

to 66 mm, with the same stroke, giving a capacity of 171 cc. The rest of the engine and transmission were AT1 items. Even the exhaust pipe was borrowed from the new version of the AT1 with an electric starter, the AT1-B. The chassis was identical. The increased capacity of the engine added 4 bhp to the power output, and, since the weight had only increased slightly, produced a noticeably quicker machine. No GYT kit was available for the CT1, although it was possible to make use of some of the components of GYT kits for other models if extra power was required.

Towards the end of 1969, came the first reports of the machine everyone had been waiting for since the DT1's introduction in 1968. At the beginning of 1970, production started of the 351 cc RT1 machine, a DT1 with more power. The similarity between the DT1 and RT1 was very apparent but there were more differences than the AT/CT comparison. Rather than simply bore out the 250, Yamaha developed a new engine

based on the design used for all the T series. The new cylinder dimensions were an 80 x 70 mm bore and stroke, once again a slightly short-stroke engine, but with a 6000 rpm maximum engine speed, no attempt had been made to get the engine to rev. Where possible, components from the DT1 were used, differences only occurring when it was felt safer to strengthen a component. A slight change was made to the way the cylinder head was fastened. A total of eight studs were used, four short studs bolting the head to the cylinder and another four long-reach studs extending from the crankcase halves up to the cylinder head. This was a rather unnecessary modification, since the compression ratio was scarcely altered from the DT1, and four bolts had been adequate then. Clutch and transmission were carried over from the 250, although a heftier kickstart lever was provided. The carburettor grew to a 32 mm throat diameter and a different exhaust pipe was used.

The chassis remained largely untouched, varying in only a few minor details. An extra bracing tube was added to the frame behind the engine. The swinging-arm was of conventional circular-section tubing and not box-section. The front forks were of the same design, but with thicker, stronger stanchions and secured to the steering stem with double pinch bolts. The rear wheel was a mixture of AT and DT designs, with a half-width hub as on the AT, but the rear brake was fully floating. In contrast to the white DT1, the RT1 was offered with a jet-black colour scheme, that was equally attractive.

Claimed output of the RT1 was 30 bhp, which was eight more than the DT1. The powerband extended from about 3000 rpm up to the maximum 6000 rpm engine speed, and under this range the engine was a little too docile. On steep inclines this could be a problem, since the engine would either stall or the rear wheel would spin. On the tarmac, the machine was good for 80 mph, and the handling was reasonable, in the dry at least. The semi-knobbly tyres were not so

effective on a wet road surface, as could be expected. One problem the early RT1s suffered from was quite serious pre-ignition, which manifested itself with kickbacks when being started and 'pinging' once under way. The starting problem was solved on the RT1-B which appeared in 1971, by the provision of a compression release mechanism linked to a lever on the handlebars. As the lever turned, a cable linked to it pulled out a small valve located above the exhaust port in the cylinder, thus reducing the cylinder compression. The standard cure for the pre-ignition when under way was to add a second copper cylinder head gasket. A redesigned head on the RT1-B solved the problem for good.

With the introduction of the RT1, Yamaha decided to extend their GYT kit contents to include some alternative transmission components. The new ratios for the first three gears were all higher than those fitted as standard. The effect of this was to close down the gaps between gears and result in a close-ratio gearbox. The alternative ratios were most suitable for the desert type of enduro where the standard lower gears would have been of little use. Heavier clutch springs were also available. Since the transmission of the 350 was common to that of the DT1, these items could also be used by the 250 riders. The rest of the kit was virtually identical to the other GYT kits in the T series. One slight difference was the use of an alloy cylinder with an iron liner instead of the chromed cylinders offered before. While a chromed cylinder wall reduces the piston/cylinder friction somewhat, it is not possible to rebore, so a seizure means that the cylinder is ruined. By using the conventional iron liner, it was possible to perform rebores and the difference in performance was not significant. Brackets were also offered to mount a wider front mudguard to the bottom of the headstock where it would provide more protection to the rider. Highlight of the year for the RT1-M in 1970 was its win of the Mint 400

YAMAHA 360 ENDURO RT1-B

It's a better machine

SPECIFICATIONS

PERFORMANCE

Max. speed (est.) 78 mph (125 km/h)
Climbing ability 38 degrees
Max. towing speed 28.7 mph
Min. braking distance 49 ft. (15 m)

ENGINE

Type 2-stroke, 5-port, single
Displacement 351 cc (21.42 cu. in.)
Bore & Stroke 80 x 70 mm (3.15 x 2.76 in.)
Compression ratio 8.3 : 1
Max. horsepower 30 hp @ 6000 rpm
Max. torque 20.0 ft.-lb. (26.500 rpm)
Lubrication system Automatic
Starting system Primary kick starter
Transmission 6 speed gearbox

DIMENSIONS

Overall length 82.7 in.
Overall width 28.0 in.
Overall height 45.7 in.
Wheelbase 54.3 in.
Min. ground clearance 10.6 in.
Seat height 29.9 in.

WEIGHTS (incl. fuel) 236 lbs.

FUEL TANK CAPACITY 17 qt.

OIL TANK CAPACITY 1.7 qt.

TIRES front 3.25-19.4 PR
rear 4.00-18.4 PR

*Manufacture subject to change without notice.

The RT1-B big-bore black beauty was a better machine

and the base plate bolted to the barrel with the wedge pointing down into the cylinder. The block was cut away underneath the metal strips. As the vacuum grew in the crankcase and assisted by resonances in the inlet tract, the free end of the thin reed of stainless steel would snap open against the curved metal stop, allowing the charge to flow down into the crankcase. As the vacuum dropped, the tension of the reed would cause it to snap back closed, preventing any flow back from the engine. A thin coating of neoprene on the reed stop and base block acted as a cushion for the violent motion of the reed.

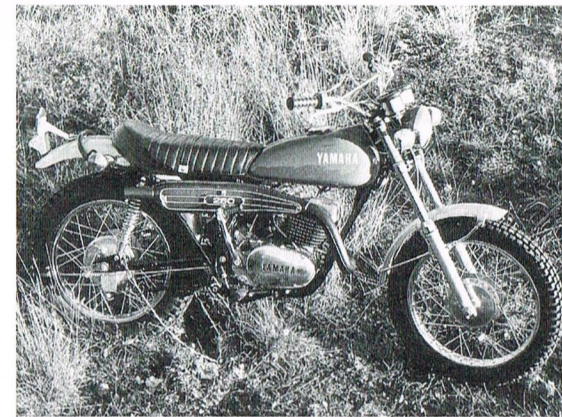
Complementary changes to the inlet side of the engine were necessary. A window was cut in the inlet skirt of the piston. This served two functions. As the piston descended on the downstroke, it uncovered an extra port that had been cut in the cylinder wall above the inlet port. In fact it was not so much a port as a gully, that passed down to the inlet tract between the reed valve and the cylinder. At the moment the port was uncovered the windows in the piston skirt were open to the inlet port and so charge in the crankcase was drawn up through the extra boost port. Yamaha had been searching for a way to make use of the cylinder wall above the inlet port since the days of their disc-valved racing engines. They had claimed that their five-port system in use at the end of the 1960s had achieved a similar effect, but they had clearly not been satisfied. The secondary function of the windows was to expose the reed valve to the crankcase vacuum as soon as possible on the upstroke. The sooner the reeds cracked open the more the charge would be flowed into the crankcase.

Windows were used rather than pistons with a shorter skirt because the piston would not have been adequately supported by the cylinder wall, and would have failed quickly. There were now a total of seven ports in the cylinder, four conventional transfer ports, inlet and exhaust port, and the extension of the inlet port that aided the scavenging process. Later, Yamaha were to use

the 'seven-port engine' and 'Torque Induction' slogans to the full as more of their two-strokes, both road and race machines, adopted the same configuration.

The first of the T series to undergo conversion to reed-valve operation were the DT and RT entering production in June 1971, followed a month later by the AT. A conversion was exactly what it was, since the machines were left largely untouched except for the addition of the reed valves and the corresponding engine updates. These changes included cylinder, head, piston re-jetted carburettor and pipe, but apart from a strengthened fifth gear in the transmission nothing else was altered. An attempt was made to improve the chassis slightly by providing rear suspension with dual-rate springs. This would improve the damper's compliance over small bumps without increasing the chance of bottoming out on the larger bumps. Also two sets of optional springs were available, softer and harder than standard. The frame design was unaltered, but tube diameter increased and extra gusseting was provided around the steering head in an attempt to eliminate any flex. The maintenance of the swinging-arm was improved by the provision of a grease nipple in the hollow pivot bolt, allowing *in situ* lubrication. The position of the footpegs was raised 50 mm to keep the rider's feet well away from the rough stuff.

The reed valves seemed to do their job very well, with a noticeable increase of power across the entire range of engine speeds. Unfortunately this was negated by the enormous increase in weight as a result of the chassis changes. Consequently street performance was slightly poorer than the last of the T1 models and the extra weight made itself felt on the trail. Realizing that this would be unacceptable on any serious motocross bikes, no GYT kits were produced for the DT2 or RT2. Instead a competition model was offered as a complete machine under the designation M for Motocross. With a lighter frame, wheels and some engine components, the com-



The snake in the grass. The first contemporary reed-valve-equipped road bike was the DT2 of 1972

petition machines were a handy 18 kg lighter than their standard counterparts! This weight reduction coupled with 32 bhp of the DT2 and 39 bhp of the RT2 made them real flyers. One interesting feature of the RT2-M was its use of CDI ignition, marking Yamaha's first use of this superior system on a production dirtbike. Bultaco had been using CDI for several years. Suspension was reasonable, but incredibly unsophisticated in comparison with the units available just a few years later. Rear wheel travel was totally inadequate for serious motocross competition.

The initial changes made to the AT2 in 1971 were limited to the application of the reed valves. As on the other machines this resulted in an increase in power, especially at the low and middle range. An AT2-M was also available with a significant weight reduction and a claimed 20 bhp at 8500 rpm. A year later, with the introduction of the CT2, a number of other improvements were made, such as new front forks, rear swinging-arm, a more efficient air filter and an uprated crankshaft for the combined starter/dynamo that was used on the electric start variant. The CT2 remained simply a bored-out AT2.



Top of the range DT360A at rest at the 1973 Amsterdam Motorcycle Show with an Astro-turf carpet thoughtfully provided to help it feel at home

Not too much changed in the transition from the 1972 DT2/RT2 series to the 1973 models known as both the DT3/RT3 and DT250/DT360. In fact, it was purely the replacement of the 19-inch front wheel for a 21-inch item. The larger front wheel had been fitted to the motocross models in 1972 and it was felt that the extra stability this would produce due to the accompanying increase in rake would be beneficial on the street. Unfortunately it seemed to do more harm than good to the cornering capabilities of the bikes, since the front end felt twitchy and oversensitive.

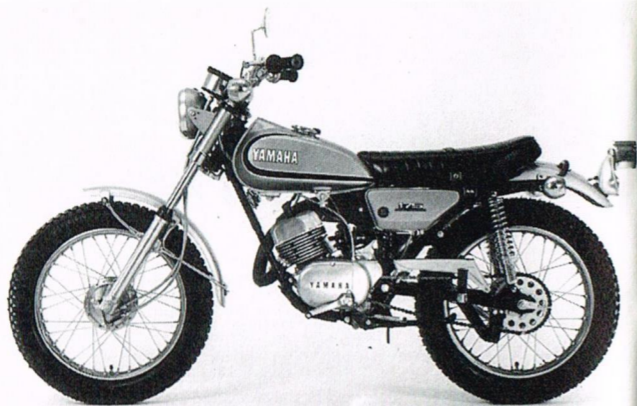
1973 also marked the year of division between the development of the DT series as all the dual-purpose machines were to be designated, and the competition models in the form of the MX and YZ models. Initially the MX models bore a very strong resemblance to the pre-1973 M variants, but they were soon phased out by the top-line YZ series that bore less resemblance to their streetbike cousins. The true enduro riders also moved on to the motocross models before the introduction of the IT series in 1976. Consequently, with more suitable machines available for the serious off-road rider, the DT series became more oriented to the very casual trail

riders. Effectively they were the street scramblers of the 1970s.

The LT3, AT3 and CT3 were all given the DT designation and offered for sale in Australasia, Europe and the US. The HT1 became the DT90 and remained a domestic model. The A and B model years for the small DTs passed uneventfully, with literally only cosmetic differences indicating the arrival of a new year. For 1976, minor updates were performed, with a slight increase in the compression ratio, revised carburation, steeper rake, the infamous Thermal Flow rear suspension units and a fraction more suspension travel. In 1977, the 125 and 175 once again marked time, without even a cosmetic change, the C models remaining for sale through the year. The DT100 underwent another minor update, giving a slightly higher compression ratio and revised front suspension. It was to remain in this form until withdrawn from the Yamaha range as a mass-production model in 1981. It all seemed like the small-capacity DTs were being allowed to drift away into obscurity. That was until 1978.

The DT125E and DT175E were totally new machines, with a design based very clearly on the YZ125D of the previous year. In 1977, the YZ125 and newly introduced competition enduro IT175 models had also been very close in design and a year later more of the small-capacity two-stroke dirtbikes could be given Yamaha's latest technology. Power output remained approximately the same, although a radial head was used. The main engine change was the addition of an extra gear in the transmission. With the comparatively low power output of these machines, the extra gear enabled the gap between the gears to be closed down and allowed the engine to be kept on the boil. In addition, the 175 was the recipient of a CDI

Right This YZ lookalike was created in 1984 and in 12 bhp restricted form ended up being the best seller in its class



Above Typical of the uniform DT series of 1973 was the DT175A, differing little from the CT3



Above This 1980 DT175-MX is typical of the small range of DT models that survived into the 1980s



ignition, the 125 retaining the old magneto unit. The frame was now of the latest monoshock design with the De Carbon rear damper located within the backbone of the frame. In contrast to the YZ unit, no damping adjustment was possible. The little DTs were extremely competent dual-purpose machines and justifiably received *Cycle World's* vote for the best dual-purpose machines of 1977, despite being 1978 models.

This 1978 redesign was to mark the last big change for the two DT models. As the DT100, they were to remain for sale in the US until 1981, when the Environmental Protection Agency (EPA) anti-pollution regulations forced them out of the market. In Europe they were to remain for sale as the MX models and received one or two new components such as an aluminium box-section swinging-arm. In the UK, the 125 was to be transformed into a YZ replica complete with liquid-cooling, power-valve, YEIS, Mono-cross suspension and a 12 bhp restriction. The machine was intended for youngsters before they obtained their driving licence. Various DT clones continued to be offered in various parts of the world right up to the mid-1980s, but the bloodline was broken in 1981.

The story of the large DT models is much the same. For 1974, the DT250A and DT360A shared many components with the MX motocross models. Most important were the new frame, with a slightly different backbone arrangement, and the front and rear suspension. The increase in wheelbase of 35 mm improved the straight-line stability. In the engine, the reed-valve assembly was widened and a total of six petals used. The increased flow of the inlet tract was accompanied by an increase to a 28 mm diameter carburettor on the 250 while the 360 retained the old 30 mm unit. The gearbox on the European models had different ratios for second, third and fifth, whereas the models for the rest of the world were not altered. CDI ignition made its appearance on the DT360, but the 250 had to make do with the conventional magneto.

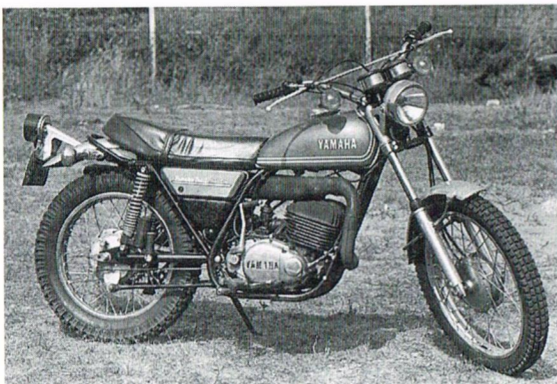
For the following year little changed on either bike. The cylinder head was of a radial design but of the same volume. The gear ratios for the rest of the world were used on the European machines as well. Both machines benefited from the use of a half-width front wheel hub and a slightly larger front brake. Crankcase sidecovers were magnesium alloy replacing the previous aluminium items. The bore of the 360 was enlarged by 5 mm and produced a total capacity of 397 cc resulting in the DT400B. The increased capacity was accompanied by the move to the next size Mikuni, namely 32 mm.

The last year of the MX versions of the 250 and 400 was 1975, so from this time on the DT models were on their own. As if to indicate this, the 1976 versions were identical to the B models. With the introduction of the XT500C that year, the days of the 400 seemed numbered, although it was lighter and more manoeuvrable on the trail. But the DTs were not finished yet.

As if they had been harnessing their strength, Yamaha produced a major update for the 1977 DT250 and 400 by giving them a monoshock-equipped frame. Being the keymark of the YZ motocross models it was logical that the design should be applied to all Yamaha's dirtbikes. The frame design was essentially the same as that found on the YZs, with a massive backbone frame member in which the De Carbon rear shock absorber was mounted. A rather strange feature due to the street-based functionality of the DTs was the provision of a quickly detachable rear wheel as found on the IT series of pukka enduro models. The geometry of the frame was the same with a 30.5-degree rake and the wheelbase was unaltered. A number of engine changes were made to improve the mid-range power, resulting in a lot of new components. Most significant was the move to an eight-petal reed, pre-empting the YZ series by five years. Also the 250 was provided with CDI ignition, bringing it in line with the 400. A very smart styling update was applied to the DTs emphasizing

the substantial upgrade over the previous models. A number of functional changes completed the package with rubber-mounted traffic indicators, plastic mudguards and sidecovers, an oil tank that swung out for refills and a lockable toolkit box.

The 1977 models were the last time that the larger DTs received a significant upgrade. The E series was unchanged and the 400 didn't make it to the F series in the US. On the chassis of the DT250F, the rake of the frame was brought down to a quicker 28.8 degrees after this had been successfully used on the IT series. The engine of the US 1979 DT250F only underwent changes that were essential to allow the engines to meet the increasingly stringent US EPA regulations. The Pulsating Air System, as Yamaha christened it, was a small air filter clamped to the

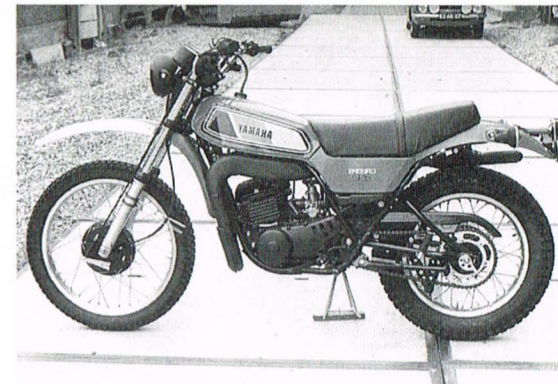


Above The DT250B ready for business. The remote reservoir rear shocks were a spin-off from the motocross development

Below Although more suited to road-riding, the DT250B had enough of everything to provide some fun out on the trail



frame backbone, which was attached to the cylinder just above the exhaust port via a short hose. Inside the air filter was a four-petal reed that allowed air to be drawn into the exhaust manifold, via a drilled passageway, when the exhaust port opened. The fresh air oxidized some of the unburnt hydrocarbons and reduced their percentage in the exhaust gases. The set-up was enough to meet the EPA's regulations for 1979 and 1980 but for no longer. In the rest of the world the DT250 and 400 struggled on into the 1980s, but by 1981 the number of sales, under strong pressure from Yamaha's own XT, TT and IT ranges, were insufficient to justify continued production and the bike, directly related to the machine that had started the off-road revolution, slipped into history.



Above The monoshock rear suspension hit the streets with the DT series of 1977

Below One of the last with one of the first. The writing was on the wall for the DT400D, and the XT500D next to it was due to take its place

