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ELECTRIC DREAMS

WE Type 91E – the ultimate 300B SET amplifier?

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Triode tube amplifier with BT input. Rated at 14W/8ohm
Made by: Western Electric, Rossville, GA, USA
Supplied by: Absolute Sounds Ltd, UK
Telephone: 0208 971 3909
Web: www.westernelectric.com; www.absolutesounds.com
Price: £16,998 (£18,500 in nickel)

AUDIO
FILE

INTEGRATED AMPLIFIER

Western Electric Type 91E

If you're a fan of the legendary 300B triode, who better to produce an application for that valve? Western Electric's 91E integrated amplifier may be your dream come true
Review: Ken Kessler & Paul Miller Lab: Paul Miller

Pedigree? You want pedigree? How about the inventor of the 300B triode? Western Electric's provenance beats all comers, the company dating back to 1869, which kinda trumps any other manufacturer's claims for longevity. Here it is 154 years on with the Type 91E integrated amplifier to dazzle those wedded to single-ended triodes (SETs), yet with enough modern details, both sonic and functional, to ensure it is regarded as a 21st century tube amplifier. Priced in black or gold for £16,998 or £18,500 for the nickel (silver) finish, the Type 91E's model name exemplifies its descent from the original Western Electric 91A of 1936. It is the antithesis of traditional SETs: instead of minimalism or hair-shirt self-abnegation, the 91E is as contemporary as an integrated amp can be in the post-streaming era. While SET amplifiers date back some 90 years and the 300B itself was introduced in 1938 to amplify telephone signals, everything else about the 91E (bar the lack of a balanced XLR input) is up-to-the-minute.

GOLDEN BOY
It starts with the slick LCD display, which, from switch on, reveals a 10-second view of Western Electric's 'Spirit Of Communication' (or Golden Boy) logo of 1914. After that, it changes to a 30-second countdown for warm-up and then the same time-lapse for the automatic tube biasing. This stage in itself eliminates all manner of insecurities for those too nervous to embrace tech that predates WWII, particularly as the owner's manual states that the 300Bs' behaviour changes over time. After the warm-up stages, the display then turns into vertical meters indicating power output, with the source identified alongside. A cute touch is an aerial logo when using Bluetooth which is included

RIGHT: Large toroidal transformer [top] feeds linear PSU for the ECC81 and 300B HT plates while a switchmode PSU [black, top left] feeds the triode filaments. Large display is governed by a Raspberry Pi computer module [centre]

alongside MM/MC phono and line sources including CD, tuner, Aux 1 and Aux 2. The press buttons to access these reside in an indent to the left of the LCD display, while on its right are a large rotary volume control, power-on button and headphone socket. All functions, by the way, are accessible via the alloy remote control [pictured, p45], along with balance, mute and display dimming, as well as level matching between inputs. The ECC81 and 300B valves – two of each – are proudly displayed, the latter encased within glass sleeves. Between the ECC81s resides a block containing the output/speaker coupling transformers (ours was fitted with 8ohm taps) to be swapped by the retailer should the owner change to speakers with a different load [see pic, p43]. The 91E also comes with a set of tools for removing the protective 'cages' when it's time to replace

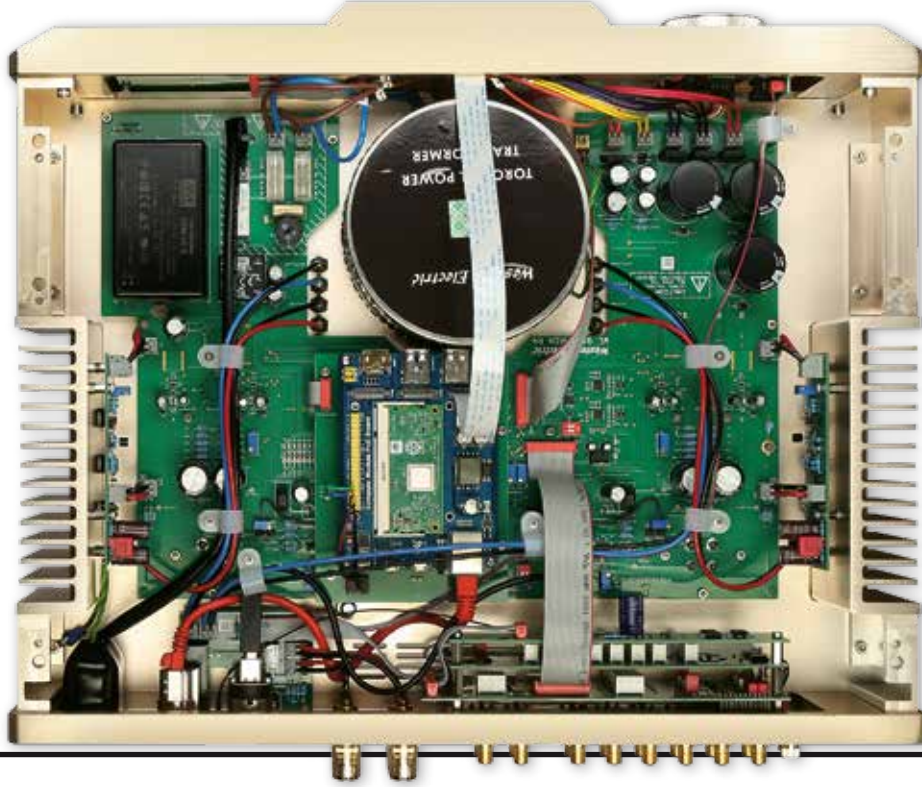
the 300Bs, along with a Bluetooth antenna and clever tube-pin straightener.

NO DRAMA
At the back are the multi-way speaker binding posts, the requisite RCA sockets for the five sources and screw post for the Bluetooth aerial, as well as a pair of sockets

to accept custom plug-in loads for the phono stage, which employs a toggle switch to select between MM and MC. Also provided are line and variable (preamp) outputs, as well as control ports for triggering other components. The USB and Ethernet ports are strictly for diagnostics and servicing.

There's little set up drama with this amplifier. Indeed, its Bluetooth facility revealed how fully developed is the Type 91E – I selected Bluetooth via the remote, whipped out my Android phone, went to

'The 91E throws out the cliché 300B/SET sound'



LEFT: Available in gold, black and nickel finishes, the Type 91E combines historic and modern, its 300B triodes governed by an auto-bias circuit while MM/MC inputs are joined by Bluetooth playback. All this and more is illustrated on a bold display

settings, immediately found 'WE91E' on the list of available matches, tapped it and heard music within – literally – seconds. If only all the other Bluetooth devices in my possession worked as swiftly and securely.

WILD WESTERN
The electronic design of the Type 91E is as radical as its industrial aesthetic, writes editor PM. Extra power is squeezed from those single 300Bs without raising the tube current or dissipation and while also reducing asymmetric magnetic distortions in what are smaller, more compact output transformers. (The plates are capacitor-coupled to the transformer primaries, eliminating DC from the windings). What WE describes as an 'enhanced parallel feed' relies on a patented SCS (a solid-state 'steered current source') for the 300Bs – visible on the heatsinks of our inside picture [p40]. Drilling into the patent, it's been suggested that these

P-type FETs might behave as driven output devices as much as SCS regulators [see www.tubecad.com/2019/05/blog0466.htm] which, arguably, invites a push-pull component to the single-ended party. But there are also solid-state op-amps in the line/preamp output circuit and these are certainly not used in the main 'tube audio' path. In another neat touch, the 300Bs' filament polarity is switched each time the 91E is powered on, enhancing tube life. If all this, and the warm-up/auto-bias regimes suggest some intelligence at work then, yes, these and the input selectors are all micro-controlled, as is the optical-encoder volume knob that addresses a relay-switched resistor network [see Lab Report, p45]. The Type 91E also hosts a Raspberry Pi 3 computer module that manages the display video while a separate Qualcomm-based Bluetooth solution

from Rayson opens the door to wireless streaming. This is BT v4.2, rather than v5.0, and supports BC, MP3, AAC, FastStream and aptX codecs. Although there was some loss of high frequency 'air' and spaciousness, the less dense musical offerings selected by Ken during our listening sounded rather more convincing than we had anticipated. The contention of Western Electric's owner, Charles Whitener, that this BT facility is drawing in a potential new wave of audiophiles seems perfectly plausible.

SENSE AND SENSITIVITY
Carefully partnered with DeVore Fidelity's high sensitivity, high impedance O/93 floorstanders, the Type 91E has forced me to rethink my longstanding antipathy toward 300B/SETs, writes Ken. With the initial five notes from the opening of 'For What It's Worth' from Keb' Mo's *Peace... Back By Popular Demand* [Okeh/Epic EK92687], two of my reservations were eradicated by the bass and the percussion which start that track. Bearing in mind that this, or any other low-powered amp, cannot fairly be assessed without using a high sensitivity speaker, the O/93s' produced levels that were more than satisfactory for what I would deem sane listening. Heard in PM's large room [p39], these were levels that I'd safely and comfortably try to extract from Quad ESL 57s, BBC LS3/5As or any other low-power-handling speakers which a heavy-handed listener could easily eviscerate. But then someone who finds a 100dB+ SPL at 5m to be 'normal' would most likely not even consider an amplifier of limited output such as this. ➔



FOUNDED IN SOUND

Founded in 1869, seven years before Edison set up his laboratory, Western Electric is so long-established that the company predates that other milestone in audio and electronics – the century-old BBC. Many of the company's achievements, beyond the two most relevant here – the development of the 91A single-ended triode amplifier of 1936 [pictured, right] and the 300B triode of 1938 – are at the very least peripheral and at best directly related to our passion. Among the specialised pursuits of the company were telephony and cinema sound and, unsurprisingly, for much of its history it was a subsidiary of American Telephone & Telegraph (AT&T). It was an early globalist, establishing works in Belgium, while entering a joint venture with Japan at the tail-end of the 19th century. A story as long and rich as Western Electric's demands an entire volume, but you should know that, since 1995, the company has belonged to Charles G Whitener [see PM's sidebar, p43], who has committed the brand to the renewal of its vacuum tube manufacturing.



ABOVE: Rather than have multiple secondary windings, and multiple 8ohm, 4ohm, etc, speaker output taps the 91E is has interchangeable output transformers specified at the point of ordering

As for the second reservation which always spoiled 300B/SETs for me, that of soft lower registers and sickly-sweet treble, the control of the bass drum and the extension of the bass guitar on this track – utterly free of *Bake-Off* soggiessness – were enough to baffle anyone with preconceived notions about single-ended triodes. I cannot emphasise enough how much this aspect of the 91E surprised me repeatedly, though I had to keep reminding myself that the amp was fitted with what are arguably the finest-quality 300Bs one can purchase.

SWEET AND SOUR

This is not to discount those listeners who might actually prefer a more sugary, sickly, rose-coloured sound, but prior to the 91E, the rule was to match a 300B/SET amp's weak extremities with brash horns possessing in-your-face treble, hoping they would balance out each other. (I should clarify, by the way, that I am not talking about amps with two or more 300Bs per channel.) With the Western Electric Type 91E, power limitation aside, no such compensatory (mis)matching is required.

What I was hearing, maximum SPLs notwithstanding, was full-range coherence more akin to a 75W amp powered by

multiples of the bigger KT-series tubes. Along with a decidedly modern-sounding bass and extended high frequencies came other delights, the most important in characterising the amplifier – and which for some would be reason enough to buy a 91E – was the sense of openness and 'air'.

This has long been a selling point for SETs (as well as OTLs) and WE's Type 91E retains and delivers this with such grace that the solo piano version of 'The Times They Are A-Changin'' provided one of the most lifelike, in-the-room experiences I can recall. But don't imagine for a moment that this openness was exaggerated: the scale was as realistic and convincing as the actual piano which sits a few feet adjacent to my writing desk.

As mean as this might seem, I couldn't resist listening to Kodō's *Warabe* [Sony SRCL4671], which – aside from massive orchestras – is one of the toughest challenges for any system. This is percussion on steroids, with the upper frequencies supplied by flutes. Track 4, 'Itsuka Mata', is my go-to number for this, as it manages – with no lack of irony – to make most systems sound like brash Teutonic horns of the sort only rendered listenable with old-school SETs. The 91E threw out the topology's cliché sound ↪

BELOW: Every 91E is equipped with a matched set of Western Electric's precision-manufactured 300B 'moderate power, filamentary triodes'



CHARLES WHITENER

Despite its long history of innovation, Western Electric was a casualty of the US government's anti-trust break-up of AT&T in 1982. WE's decline led to its entire IP being acquired by the entrepreneur Charles G. Whitener in 1995. Some 28 years later we pick up the trail with Charles and the remarkable Type 91E amplifier...

That said, many audiophiles may still rue this amplifier's omission of balanced XLR inputs. Ironically, WE itself was party to the development of balanced line audio for, typically, high impedance microphone amps in the late 1930s, the 600ohm standard coming out of the Bell 'phone system.

Nevertheless, Charles is of the view that the added complexity of a balanced application, 'particularly when the interconnect is less than ten feet, typically outweighs any advantage over a traditional, simpler single-ended solution'. And Bluetooth... in an ultra-specialist triode tube amp? 'About 90% of all audio is bought by men' (of an age) says Charles, 'but it's the wives and younger family members who want to access this high-end sound via their phones. It is bringing a new generation into our world of hi-fi'.

In my May '22 Welcome page I discussed WE's ambitions to offer a wider range of tubes to other amp brands. 'We're way down the road on this', says Charles, 'but our tubes will have reduced microphonics, a longer life and better stability than the norm. Roll out be in the third quarter of 2023 with ECC83/82/81 triodes, then 6N7 octal-base tubes, and KT88s up to KT170s (which we'll call the KT180). We'll also bring 6L6/6B6/EL34 tubes for the guitar guys'. PM



WESTERN ELECTRIC TYPE 91E

Western Electric's own spec for the 91E – 2x14W, 16W and 20W/ 8ohm at 3%, 5% and 10% THD, respectively – is higher than typically achieved with 300B/SETs but its 'SCS' circuit arguably departs from purist principles, influencing not only power [see text, p41]. The 2.1-2.8ohm output impedance of the Bohm transformer tap will modify the amp/speaker frequency response in line with the varying load of the latter even though, into a non-reactive 8ohm, the 91E offers a response that's flat to -1dB from 14Hz-21.4kHz before rolling away to 100kHz/-16dB. In practice, power output was a shade lower than specified into 8ohm at 4W/1% THD, 10W/3% and 11W/5% but bang-on target at 5W/1% THD, 14W/3% and 17W/5%. Under dynamic conditions this translates to 12.3W and 15.3W into 8 and 4ohm loads but just 3.2W and 1.5W into low 2 and 1ohm loads [see Graph 1]. The trend of THD vs. output level is clear from Graph 1 as is the increase at low and high frequency extremes – from 0.45%/1kHz to 1.0%/20Hz and 2.8%/20kHz (all re. 0dBV) – in Graph 2, below. Finally, the A-wtd S/N ratio is a creditable 83.8dB (re. 0dBV).

WE's resistor-ladder volume control operates over a ~100dB range where its 0.5dB steps are most accurate from volume '90' down to '40', but are closer to ±0.6dB from '30' to '10', and less reliable below '09'. The BT input, meanwhile, offers a 94.8dB A-wtd S/N (re. 0dBV via the line out) and linearity good to ±0.1dB over 60dB and ±0.7dB over 90dB (data is muted at 96dB/16-bits). Distortion is a minimum of 0.003-0.005% but lossy compression kicks in at just -50dB above 14kHz while the response (measured using a multitone to saturate the aptX bit pool) rolls away by 5dB from 100Hz to 1kHz and 9dB from 1kHz to 20kHz. PM



ABOVE: MM/MC phono (with external loading RCAs), four line inputs, line (tape) and preamp outputs are joined by single pairs of 4mm speaker outputs. Antenna services Bluetooth while network (RJ45) and USB-A are for in-factory servicing and updates

and managed the sheer power and dynamic contrasts with the sort of authority one expects of amps with ten times the wattage.

In this case, the percussion was reproduced with the sounds of the drum heads stretching so believably that I wouldn't have been surprised had a subwoofer suddenly been revealed behind a curtain. The mass and shape of the drums were as palpable as one could hope to hear in a domestic space, abetted by a soundstage with width and depth that would defy any listener to locate the speakers. As far as disappearing acts go, the Type 91E is borderline thaumaturgy.

THE LONG STRETCH

Because the 91E is so fatigue-free (another 300B/SET trait), I was driven to feed it track after favourite track, in the manner of one so possessed that his or her listening session will stretch into the wee hours, oblivious to the passing of time. The classiest album I have ever heard – yes, even

over Tony and Frank and Dino and Nat – is Lou Rawls' *At Last* [Blue Note CDP 7 91937 2], which is my preferred title for vocals. That's not to say the richness of Keb' Mo' was ignored, and the 91E handled every nuance with style, but Lou is something else.

LEFT: WE's solid alloy remote handset covers input select and input level trim (gain), volume, balance, mute and display brightness



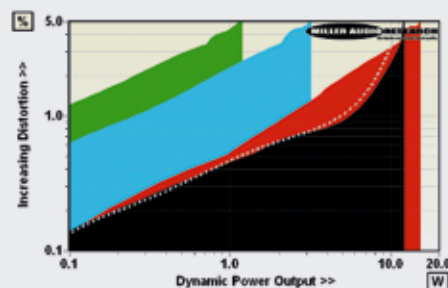
On the title track, as he trades lines with Dianne Reeves, the listener is drawn into a duet that provides both harmonising and contrast. The listener who is most captivated by the emotional elements of a performance will revel in the way that the two singers' peerless powers of expression are presented against a backdrop of rich textures and tones, especially the piano, dominant from the outset. It's as if one has recreated a smoky nightclub in one's listening room. It almost begs the audience to dress for the occasion.

As voluble as I am most of the time, I find myself at a loss to convey just how marvellous is this amplifier though I will repeat to the point of tattooing it on my forehead that it *must* be matched to speakers of high sensitivity. I can only dream about how it will sound with Quad ESL 57s, which were never designed to demand bags of power though, to be fair, plenty of users will still pair the 91E with traditional horns. But the experience with DeVore's O/93s? It's a marriage to join Krell/Apogee and Audio Research/Magnepan in the annals of high-end audio. ☺

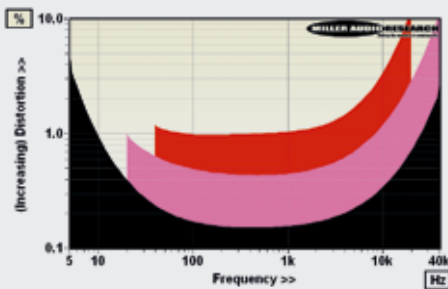
HI-FI NEWS VERDICT

My 'road to Damascus' moment aside, the Western Electric Type 91E will also be revelatory for 300B/SET fans because it rewrites the rules. Added to what has already seduced SET devotees are precise frequency extremes and enough drive to expand the choice of eligible speakers. This is the best low-power amp I've ever heard, its scale and naturalness rivalling anything I can name – whatever the wattage.

Sound Quality: 89%



ABOVE: Dynamic output versus THD into 8ohm (black trace; continuous), 4ohm (red), 2ohm (blue) and 1ohm (green) speaker loads. Max. current is 2.0A



ABOVE: Distortion vs. freq. (5Hz-40kHz at 0.1W/8ohm, black; 20Hz-40kHz/1W, pink; 40Hz-20kHz/5W, red)

HI-FI NEWS SPECIFICATIONS

Power output (<5% THD, 8/4ohm)	11.3W / 16.9W
Dynamic power (<5% THD, 8/4/2/1ohm)	12.3W / 15.3W / 3.2W / 1.5W
Output imp. (20Hz-20kHz/100kHz)	2.14-2.78ohm / 6.9ohm
Freq. response (20Hz-20kHz/100kHz)	-0.4dB to -0.88dB/-16.0dB
Input sensitivity (for 0dBV/12W)	87mV / 302mV
A-wtd S/N ratio (re. 0dBV/12W)	83.8dB / 94.6dB
Distortion (20Hz-20kHz, 0.1-1W/8ohm)	0.15-0.7% / 0.43-2.8%
Power consumption (Idle/Rated o/p)	145W / 140W
Dimensions (WHD) / Weight	480x280x380mm / 22.2kg