



BY D. W. FOSTLE

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MIKE MCLEAN,  
BERRY GORDY,  
AND THE QUEST  
— FOR THE —  
“TRUE SOUND”

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AS CHIEF TECHNICAL ENGINEER, MIKE MCLEAN DESIGNED, BUILT, OR SPECIFIED NEARLY EVERYTHING IN THE MOTOWN STUDIOS FROM 1961 UNTIL 1972. AT THE END OF LAST MONTH'S INSTALLMENT, MCLEAN HAD GONE TO NEW YORK TO BUY A DISC-CUTTING LATHE, SO BERRY GORDY COULD LISTEN TO NEWLY CUT ACETATES RATHER THAN TAPES.

*So Berry Gordy wanted to hear what was in the grooves?*

You better believe it. He wanted to put a record on the turntable and drop that needle and hear what was there. It was a hell of a problem whether they would track or not. There was an incredibly crummy phonograph, just like a gum-chewing teenager might have. You know, a crappy little thing with a crummy arm and a cheap crystal cartridge. They'd put that acetate on there and see if it skipped. That was in addition to the good hi-fi Empire turntable with a Fairchild SM-2 magnetic cartridge. It was the first quality-control setup.

*What was the next big challenge?*

Acoustics became a problem all across the board in 1962. Berry wasn't satisfied with the sound he was getting from the studio. The acoustics were not satisfactory, and he wasn't satisfied with the monitoring. He kept saying, "I want you to fix those speakers so we get a true sound." That was what he would say, over and over again. He thought the sound was muddy, mushy, not enough definition, all blurred together. It didn't have clarity in the individual parts, which was a result of many factors: poor sound isolation, poor acoustics, improper monitoring that made recordings sound okay in the control room but not on the reference system. That drove them to use equalization, with the same results. When I say "reference," I'm talking about some system they'd played enough oldies-but-goodies on to get an idea of what it sounded like.

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D. W. FOSTLE WORKED FOR MIKE MCLEAN AT MOTOWN FOR TWO YEARS IN THE EARLY '70S. DESPITE THE EXPERIENCE, THEY STILL SPEAK.



# MOTOWN

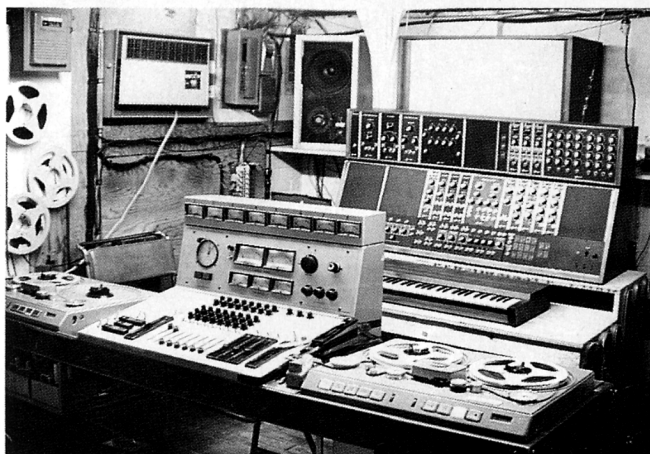
*So they'd play their favorite records. . .*

So they had a sense of perspective on that system. They learned the monitor. It went like this: "I know this record; I've heard it in my car, at the beach, heard it here, heard it there. I'm hearing it now. Now I put on this new acetate. Listen to how muddy and boomy that is. It doesn't have enough volume. Why doesn't it have more volume?" I'd say, "Berry, there's so goddamn much bass on it that you can't turn it up any louder without overcutting and skipping." He'd ask, "How come we got that much bass?" I'd tell him, "Well, somebody set the bass too high on the equalizer because there's not enough bass response in the control-room monitor." And Berry would say, "I want a true sound." I bought a General Radio 1554A third-octave analyzer because I naively thought that if I could adjust the speaker response somehow, we could get a true sound. It never occurred to me that I had no plan at all to build the equalization circuits for correction. This was five years before any manufacturer built a commercial third-octave equalizer.

*Did Berry Gordy ever get his "true sound"?*

After a lot of effort we compromised, tweaked the bass a little and pumped up the treble. When we showed a flat curve on the analyzer, it sounded terribly screechy. The cause was absorption in the room soaking up the reflected energy. Something that sounded right would have a treble rolloff.

Mike McLean, with the original home-brew eight-track recorder he built for \$5,000.



The Motown mixing room, Detroit, circa 1967. The gear included a Studer quarter-inch stereo tape recorder (right front), a custom eight-track mixing console (center front), and an Acoustic Research AR-3 speaker (top center).

What shape rolloff is another story in itself; it took me years to figure it out.

*After learning it was not feasible to apply existing technology to the goal of "true sound," what did you do?*

All we could do, which was to try using better speakers. We got on a kick of using Acoustic Research AR-3s. We burned out midranges left and right. Roy Allison was in charge of AR at the time. There was just something about the idea of Motown using ARs that

seemed to appeal to him. He told us, "Don't worry about it. Just send us the old drivers and we'll send you new ones, no charge. I don't care how many you burn out." He sent us six of them as revolving stock.

One midrange would last about a week. They didn't last for zip until we built what we called the Super System. It had an AR-3 woofer, a Bozak midrange that was extremely robust (operating between 500 and 1,500 Hz), the AR midrange, and then the AR tweeter. It wasn't as transparent as the AR-3, but it was still reasonable and had many of the AR's merits. The guys doing the mixing used to blast that monitor. We had to triamp it to make it all work. We had a 200-watt McIntosh amp driving the woofer, and I think we had two 60-watt Macs—one for the Bozak mid and another on the AR treble section. It would handle the power—up to a point.

The whole thing caught fire once. The pigtail wires on the woofer got so hot that they ignited the baffle insulation. Somebody shouts, "The speaker's on fire!" We came running up, pulled the woofer out, and, sure enough, there was a fire inside the cabinet. So now we had to go to Roy Allison and ask him to send a few woofers out. It was insane. I would estimate that AR had to rebuild 75 to 100 dome midranges for us over four years. I'd walk into the control room, and I couldn't take it for 30 seconds. "This hurts my ears; this will damage my hearing." You come back two hours later and it's still going on. How those guys can hear anything at all today is beyond me. They ran at threshold-of-pain levels without regard to distortion. Distortion was up in the 20% range. They'd say, "We're gettin' the feel we want." Most of the producers worked like that.

*So these were the conditions when a song like "I Hear a Symphony" was cut?*

I'd say so.

*Was the next big thing your home-brew, 1-inch eight-track recorder?*

We worked on that for a couple of years. There were a lot of problems. Ampex eight-track machines were custom and cost like three Cadillacs, about \$15,000. I figured what the hell, we could build the thing for

\$5,000. It would be fun, and why not? That was my attitude. By the time we got it finished, Motown was having all these monster hits. All of a sudden the attitude was, "Why don't we buy an Ampex? We could have it right now." Profits changed the picture.

This time we went and bought a lot of Ampex parts: motors, solenoids, the big banjo casting, and more. We made our own deck plate. The electronics had relay-switched sync. We did that a year before Scully had its Syncmaster.

Another thing we built was a big guitar amp. It had five channels, so we could take the electric instruments direct.

*This replaced the Fender amps for the musicians?*

Oh, yeah. They didn't have to bring any of those in. Just plug into this beast, with its high-quality flat preamp, and a Mac 30 and Altec 605A for the studio. Each channel came out as a direct feed, transformer-isolated at +4 dB on the control room's jack panel.

*How did the musicians respond to that?*

They probably thought it was a bit less desirable than having Fender amps there, but they sure as hell dug the fact that they didn't

*What gear was ultimately used to cut the hot Motown singles?*

We used a Westrex 2-B mono head on a Scully lathe at RCA Chicago for all the releases. Later we utilized a Neumann ES-59 head, driven by a Mac 200, for the references cut in Detroit. At the time we used the Grampian, Bell Sound in New York was mastering the releases on a Grampian, so we had a nice match.

*Is it your opinion that the sonic qualities of the Grampian are still unexcelled for cutting 45s that cook?*

When cutting at levels of about +6 dB, the Grampian added something, a tail end. A sibilant would have a little burst to it that sound-

## NOTHING WAS MORE IMPORTANT THAN MAXIMUM LOUDNESS AND IMPACT, AS LONG AS THE RECORDS DIDN'T SKIP.

have to bring their amps in. It cleared things up; there wasn't as much clutter, and it made life a lot easier for the musicians. They could just walk in, plug in, and go. I think that countered any purist disadvantages there might have been from the sonic point of view. The attitude was that if there's reverb or anything needed, we'll add it later. You just play the music, and we'll take care of the rest; you're just a musician. Berry believed in specialization. To him, it was like an auto factory. The musicians will play; we'll fix it so we get true sound electronically. Then we've got the real thing right there on the jack panel—no leakage, no extra microphones.

*When did the disc-mastering capability first appear?*

We spent a lot of time in 1962 on that. We had a Grampian head with a 150-watt Gotham amplifier. The cutting lathe was a Neumann AM-131. Originally this was supposed to be cutting everything, both reference acetates and release master lacquers. The Grampian was a magnetic cutter head, and it had a nice saturation-distortion characteristic combined with a very high resonance frequency. This meant that it would self-limit at high levels but still put out a lot of velocity at the high end. With a feedback cutter like the Neumann, down, down, down goes the [cutting] level capability at high frequencies. But the Grampian had a power capability that was much more uniform across the spectrum.

The Grampian was great for cutting hot 45-rpm singles. It had a nice kind of grunge distortion, just the right amount, to give a commercial zap to the sound. It had a unique, steamy-hot quality on the top end, but the Grampian couldn't reach blisteringly high levels without mushing out into excessive harmonic distortion.

It was fabulous—just the right amount of the mush distortion with that great steamy high end. Sweatless. And here would be your Neumann super-purist cutter head that couldn't keep up with the Grampian unless you went to half-speed mastering. If you want to hear the Grampian, get an original 45-rpm single of Barrett Strong's "Money (That's What I Want)." That's the sound of Grampian. If you want to cut records with that little funk thing, you can't do it more tastefully than a Grampian running about +5 or +6 dB. At the end of the vinyl era, a real hot pop LP would be cut +4 or +5 dB on the same scale. Hot Motown 45s were eventually cut at +9 to +10 dB.



ed great. "Money" is a magnificent example of this. The Miracles' "Shop Around" was cut that way. It was loud, but not preposterous; it was a rational compromise. Any Motown record cut after 1964 was likely done with the Westrex 2-B if it was mono. "Hitch Hike," "Sugar Pie, Honey Bunch," and "My Girl" were all cut with the Westrex. In theory, the Westrex was garbage, but in practice it was only a little bit worse for linearity and distortion than the ES-59. Both the Westrex and Neumann systems could cut records that no stylus could track. Both could also overcut easily.

*And then?*

We put in a bandpass filter with ultra-sharp slopes at 70 Hz and 15 kHz. Any extra bass that's not going to add commercial impact is wasted stroke-cutting into the next groove. By 35 Hz, our response was 40 dB down. In case somebody did something stupid with the high-end EQ, we'd stop it in its tracks at 15 kHz. A 5-kHz low-pass is the fundamental characteristic of AM radio, so who cares? The main thing was the low end, where overcutting occurs.

*So why didn't you master releases in-house? Why was that done first at Bell Sound and then RCA?*

Either our later Neumann half-speed cutter or the Westrex 2-B at RCA could cut a record that was louder than we could possibly release, because of the limitations imposed by skipping and distortion. But if RCA cut it and there was a problem with returns, we had somebody to complain to. We could take it up to the point where Berry would say, "This is just too loud." If they'd been able to, the Motown guys would have reduced the record length to about 10 seconds to get the highest level. If there were a phonograph that could have played it and they could have gotten away with something that short, believe me, they would have cut them at +30 dB.

The only thing that stopped them was the fear that they would get returns from the stores because of skipping. Berry Gordy knew that; he used to own a record store. Distortion didn't bother the decision-makers at all. And that's an understatement.

The big problem was difference-tone intermodulation distortion caused by playback-stylus mistracking. The cutter head could put down a perfect tambourine or a castanet, but on playback the click of the castanet sounded like a crunch. Hack, hack, hack. That caused a ghastly, garbage sound. The difference-tone IM products



garbled up the midrange with gross-sounding stuff. Basically, what Motown did was write off distortion as the price of doing business. The attitude was that it certainly wasn't worth lowering the recording level. This was not Deutsche Grammophon recording the Berlin Philharmonic. Nothing was more important than maximum loudness and impact, as long as the store didn't send it back because it skipped. The distortion level tolerated was very high by audiophile standards.

**Were Motown levels hotter than other record labels'?**

I would say so. I think Motown ran levels 2 to 3 dB higher than most. Others had more sophisticated ways of making the loudness

I would agree that this was a legitimate goal for Motown's stuff, but it did interfere with the ensemble playing. The rooms were made out of concrete blocks, the kind you'd use to put up a gas station. There was no acoustic treatment on the walls. We had a dropped T-bar ceiling and concrete floors. The horns went into one of the rooms. Vibes might be in another, maybe a harp.

**What did you do about the ensemble-playing concerns?**

We built a binaural headphone system so that everyone would be able to hear a mix of the other three rooms and themselves. Each room had a separate binaural mix. The binaural mikes consisted of two E-V 636s, about 8 inches apart and separated by a 1-foot-square

## AS FAR AS BERRY GORDY WAS CONCERNED, STEREO WAS ASSOCIATED WITH COVER ALBUMS. THESE MEETINGS WERE ABOUT GETTING HIT 45S.

in the midrange as effective as possible, and they just didn't bother to put quite so much bass and highs on. Hearing bass, midrange, and highs loud—that's what Berry Gordy wanted, and who am I to say he was wrong with all the success he had?

**So the studio was operating on a pretty heavy schedule by the time your eight-track machine was running?**

You better believe it. It was a meat grinder. We maintained a taxi that ran around the clock. We had to go over that equipment every morning. That was all vacuum tube gear. In the eight-channel recorder, each electronics package had six tubes plus all the other stuff. The Fairchild limiters had a whole bunch of tubes. They used four dual triodes in push-pull parallel in the 660 and double that in the 670. We had to keep an eye on a couple of hundred tubes each day. I had built about a dozen preamps with a 12AX7 and a 12AU7 tube in each one. That's 24 more tubes. You could almost watch all this stuff disintegrate before your eyes.

**Around the time the eight-track went in, there were three isolation rooms added—on the right, as I recall, as you look out the control-room window in the Hitsville building. . . .**

That's right. Once we had the eight-track machine and a greater ability to separate the channels electronically, it was a natural thing to separate them acoustically. One of the problems was that Berry was never really satisfied with the sound we got. He mentions that in his book. It was like some 1949 hi-fi bug trying to improve his phonograph. "Too boomy, too muffled, not enough definition."

I've always maintained that a significant aspect of this problem was the musical arrangement. The music has to be arranged to create sonic clarity, and I feel that the acoustics were only part of the problem. The eight-track and the direct feeds for electric instruments were all a part of the search for clarity and isolation. A fundamental premise that was never questioned was that in a perfect world we would have an infinite number of channels, and every single instrument would sound as though it were in an anechoic chamber. All of this would cause no loss of ensemble playing. If we had that, we could electrically mix for the best result possible.



ceiling tile. With the 'phones on, it had all the usual "Oh, wow, it's binaural!" realism. But the musicians usually pushed one 'phone back; the realism didn't seem that important to them. Adjusting to binaural was a much bigger problem for them than adapting to the isolation. They liked to listen with one earphone and hear themselves better.

Perhaps the quality of the playing suffered. Maybe a historian will study this for 20 years and be able to show that the grooves weakened. Who knows? They still cut plenty of hits.

**Where were all the tracks that were recorded at 2648 West Grand mixed?**

By 1964 to '65, there was a total production bottleneck with that one control room. Record, record, dub, dub. So now they couldn't get the work out. Stereo was finally beginning to become a consideration. We were big enough that it wasn't acceptable to just put out a mono LP to cover the single. This would be about the time when "Baby Love" came out.

So we had to take the pressure off the main control room and add stereo at the same time. In the Motown tradition, they decided to stick us in a crummy little room in the basement of a house three doors east of 2648 West Grand. A doctor owned the house next door. He wouldn't sell, so we had to work around him. We had to run wires up and down the alley because he wouldn't let us run them across his property.

Most of that house was filled up with offices. It was a wretched room; you couldn't get more minimal. So to get the true sound, we put in a pair of AR-3s.

We had to have an eight-track reproducer to play back our eight-track tapes. We negotiated with 3M for one of its Isoloop transports. Since 3M didn't make a reproducer, we bought the amplifier cards from them and the deck with a playback head only.

For quarter-inch tape machines, we had Studer C-37s. The very important reason for that was the Studers were available from stock, and we needed quick delivery. It was kind of pricey, \$3,700 instead of \$2,000. The C-37 had some idiosyncrasies that were pimpier than hell, but overall it was a good machine. There was a warmth to the sound, something about the electronics and the



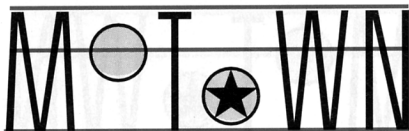
heads. They were tube electronics, and something funny was going on in that department. I don't know what explains it.

So we built up a console, a home-brew, with a frame that was heliarc-welded by Custom Metal Products, and we dropped the Studers in on either side. This provided eight channels of mix-down to stereo. Each position had three echo pots. We had three acoustic chambers now, an EMT plate, plus Fairchild spring Reverbatrons, and I think we had a Fender tape delay. There was a panpot for each track, and that's about all there was to it.

The console had a unique feature. You could turn the eight sliders upside-down. Lawrence Horn wanted that because at Atlantic Records the pots were like that. The volume was raised by pushing up or pulling down on the sliders, depending on which way you put the panel in. Otherwise it was a simple console.

*Did that mix room have the first "Motown Graphics"?*

We built the "Motown Graphics" for that room. Basically, this was a Langevin graphic equalizer with a gain control added. It was executed with ultra-high-quality, heavy-duty rotary switches instead of sliders—the best military grade money can buy—mounted in an extremely robust, 1/8-inch-thick aluminum chassis. It was 600 ohms, transformer-coupled in and out, with an Op-Amp Labs output amplifier. It was a kind of military-spec, Hummer version of the Langevin graphic EQ. All told, we had about 46 of the equalizers built. We used these beautiful General Radio knobs with strong setscrews and flats on the shaft. You could walk up and twist that knob with all the force your fingers could stand. It would sit there and take it like you were trying to twist the head bolt on an Allison engine. There was a big, telephone-type key that kicked the whole mess in and out. Out, there was only the line

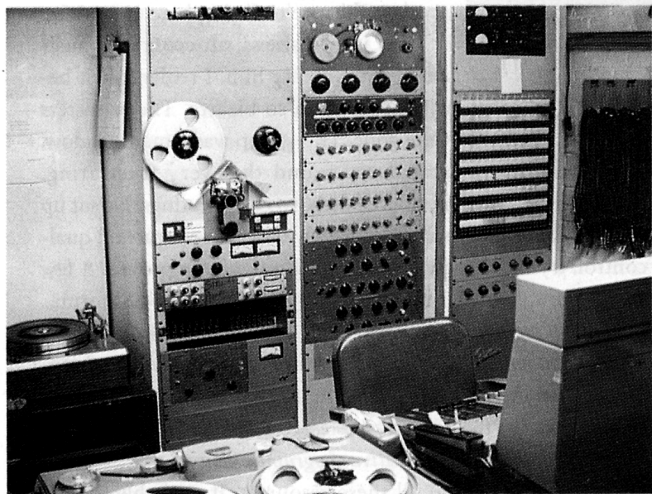


Wingate bought it, and Wingate had the whole studio set up.

*Ed Wingate had Ric-Tic Records, with artists such as The Fantastic Four and Edwin Starr.*

Yes. The console was built by Ken Hammond, who later had a lot of credits with Telarc and was a fellow disciple of Steve Temmer, at Gotham Audio. Offhand, I'd say we bought Golden World in 1966 or 1967. Wingate was getting tired of it. He'd been a thorn in Berry's side, and Berry preferred not to have somebody else buy it and turn it into another pain. The third factor was that we could use another studio. We ended up totally rebuilding it. When we were finished, there were 16 inputs on the console, with separate fader sections for the program and monitor mixes. Along about the time of Golden World, we finally gave up on the AR speakers and decided to go back to the Altec Duplex, this time the 604-E. It didn't sound too bad, so we went with the flow. I think perhaps we had some equalizers behind the rack to nerf the Altecs up a little. Out in the studio, we had a 604-E and an Electro-Voice 30-W woofer halfway up the wall. That was a hairy monster.

Motown studio at West Grand Blvd., Detroit. Note binaural mike, suspended from ceiling, used by musicians for headphone monitoring.



Rear of Motown mix room, Detroit, circa 1967. The equipment included an Empire turntable (left), a 3M eight-track tape transport, a Fender tape delay (center rack, top), "Motown Graphics" equalizers (center rack, middle), and a Fairchild Reverbatron (behind chair).

amp. This allowed you to A/B the effect of the EQ and gain settings. That was a very important feature for me.

*What was the story on the Golden World studio?*

I can't remember the address; it was on West Davison, not too far from the old garbage plant—that general vicinity. It was an old electric supply house that sold fuse boxes, conduit, and stuff. Ed

*Had all the idealism evaporated by the time you jettisoned the AR-3s?*

No-o-o-o-o! We were still up to our old tricks. That E-V 30-W was obviously an eccentricity of the first magnitude. And then we went to all Neumann KM-86 condenser microphones: "The purpose of the transducer is to pick up the sound! It is not to provide engineers with finger paint! So we will give you identical precision instruments for this purpose. So shut up." That was the attitude. *Are you saying that the only mike available at Motown studios in the late '60s was the Neumann KM-86?*

Yes. I was highly susceptible to such a concept. Everybody will have the same set of

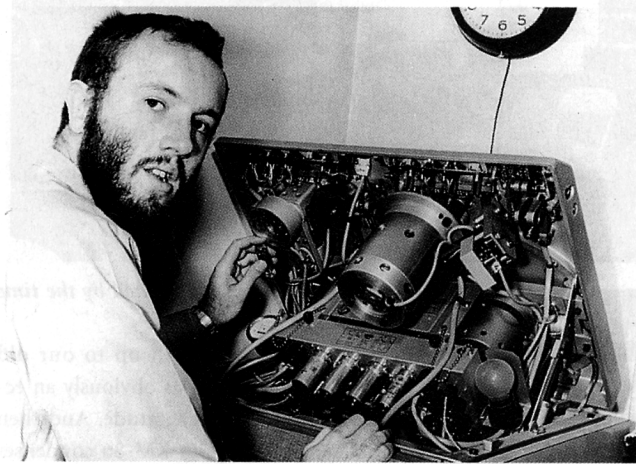
gauge blocks on Henry Ford's production line, and then the engines will all fit together. We won't have different brands of blocks. We pick the best ones, and all the toolmakers get a set. That was the basic mentality. The U-87 mikes were so beat to hell after years of abuse that they were worthless. I honestly believe the KM-86 was a better mike. It had the linear admittance capsule used in the

KM-84, with a constant directional pattern at all frequencies. That was better in theory than the 87. It had three patterns like an 87. It was smaller, and it had an elegant capsule instead of those old funk 87 capsules. The KM-86 was cheaper and was more resistant to dirt. It was bulletproof.

I was sick and tired of people dropping the mikes on the floor and rippling the membranes. Getting the U-87s repaired was a pain in the ass. When you spray spit into a U-87, it gets noisy. That was a classic problem. So the all-Neumann KM-86 approach made a hell of a lot of sense in the Ford-factory atmosphere at Motown. Berry was saying, "We want a standard system and a true sound. Everybody's gonna do this the same way. We're gonna get out our hits on this production line." Considering the policies of the company, the hit-factory mentality, this wasn't at all out of line. There have been many people who've made fun of this, but now that I'm thinking about it again, I have to say I would defend the KM-86 decision even now. There were people at Motown who didn't know how to set a mike aimed straight. That didn't motivate me to put in all sorts of esoteric instruments in order to equip them with a greater range of choices for subjective, nuance-level things in the process.

***The decision to standardize on one microphone had the complete support of management?***

Absolutely. I don't think senior management had a ghost of a clue about microphone subtleties. The idea was accepted without even a

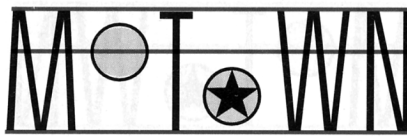


thought; there was no discussion. It was one of those idiosyncrasies of Motown. The KM-86 decision was made about 1969, and we bought 44 of them.

***When Motown outgrew its six or seven houses on West Grand Boulevard, the building at 2457 Woodward was bought, right by the freeway. What went in there?***

The studios were kept running, of course, but now we had to build all these new facilities for the Motown Center. First we built a huge, acoustically treated evaluation room. The new thinking on Berry's part was that he'd call these large meetings. He'd bring everybody into the quality-control meeting so they could get a handle on what it was all about. He was seriously trying to educate his staff. It didn't seem to bother him that he was paying all these people just to sit there, including me.

The first speaker was an Altec 604-E, and an Electro-Voice 30-W like the one at Golden World. This was still mono. As far as Berry



was concerned, stereo was associated with cover albums. These meetings were about getting hit 45s. This was in '68 and '69. Then

I got a couple of sound columns we had lying around, and I set them side by side, so we had eight JBL D-130 15-inch woofers with a 604-E on top. We used McIntosh 2100s for power amps. We did some incredible tests of the Mac 2100 at 20 kHz, running just at the threshold of clipping into big load resistors. That thing was 150 watts, not 105, both channels running. It ran like that for three days, 24 hours a day. Heat was coming off the amp like a register. We'd walk up to it eight, ten times a day and short the outputs. Zap, spark, zap, spark! "Yeah, it's still taking it." So we bought a bunch; it was our standard amp. Excellent equipment.

This JBL/Altec system had its own unique way of honking, and with those eight 15-inch woofers, when you got down into the region of 100 to 400 Hz, that sucker could really punch out some Fender bass notes. B-o-o-o-o-w-wwww! It put it out there in your face, all across the room. Big time.

***Berry Gordy was giving how-to-make-a-hit classes with examples played through eight JBL woofers?***

Yeah. He would sit there and say the same things he said in his office to his old cadre of people like Ivy Hunter and Brian Holland, that group of geniuses he had formed. Now he had this peanut gallery of people, which was all that was left. H-D-H [the hugely successful Motown songwriting team of Eddie Holland, Lamont Dozier, and Brian Holland] was long gone; Mickey Stevenson was gone. Ivy Hunter might still have been there. R. Dean Taylor was there, eager and sincere. New people who didn't have a clue were there. The original group that did all that great stuff from 1962 to 1967 became disillusioned and left.

Berry was trying to re-create things on a larger scale with 40 or 50 people. He'd sit there and play the records and make observations. I can remember him playing "You're All I Need To Get By."

And he'd say, "We're not sitting here to appreciate this; we're sitting here to criticize it. This is a business, an economic business." I'm quoting him. I remember it because it seemed so bizarre. The monsters were gone. This group was a mere shadow, and Berry found that very frustrating.

There were a couple of months of these weekly meetings. He sat up there like it was Sunday school, sincerely trying to educate on quality control, trying to show how a record could be improved. A few weeks later it was announced that Berry was leaving for California.

***What did you see as the purpose of the California move?***

Berry was starting another production operation to feed the factory that he had established in Detroit. The idea was to make hits, new California hits that would be released through the system.

***So Berry Gordy had a new creative geographic center?***

Precisely. Because he had all these resources, it probably looked easy. He was making the rounds of all the studios. Eventually, he bought one, and that became MoWest. There was a gigantic amount of money available, and so we designed and had Electrodyne build a pair of mixing consoles for the Motown Center. It wasn't a total vacuum, but when Berry left it was the beginning of the end for most of us in Detroit.