

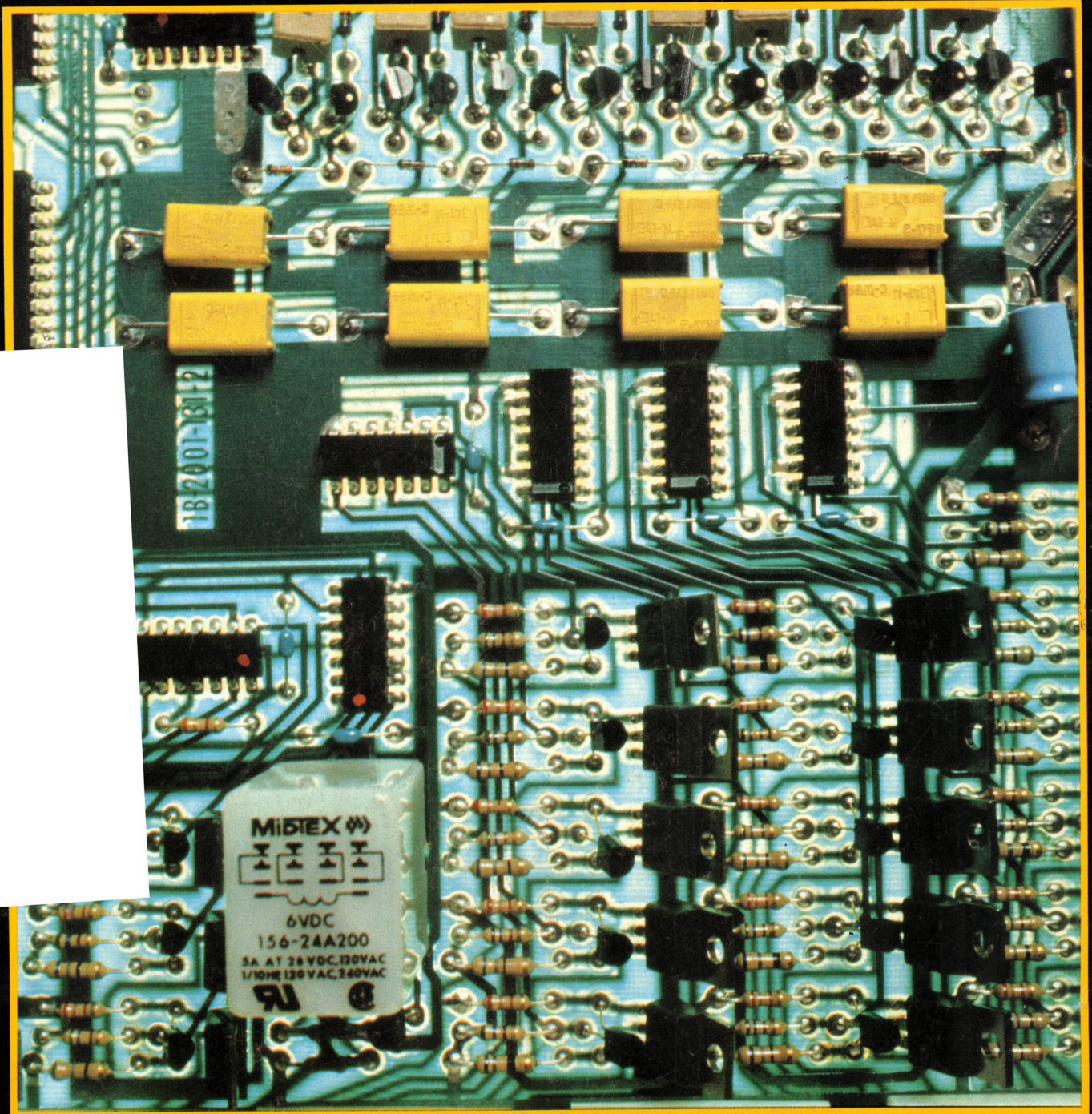
The Twice Monthly Publication
for the Coin Operated Entertainment Industry

Service Issue

PLAY METER

Volume VII, Number 14

August 1, 1981



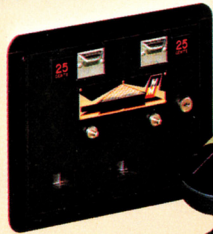


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Title 17 of the United States Code contains the following provisions:

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Although the United States Customs Service has for some time enforced copyrights in original audio-visual works embodied in video games such as **GALAXIAN™**, **PAC-MAN™**, and **RALLY-X™**, and the Federal Courts have recognized the validity of such copyrights, there are some manufacturers, distributors and operators who continue to flaunt the law by dealing in infringing games. These companies undermine the creativity which is essential to the life of this industry.

Because of the serious nature of this problem, Midway now gives notice that it intends to seek criminal prosecutions against such companies in cases of willful infringement of its copyrights in **GALAXIAN™**, **PAC-MAN™**, **RALLY-X™** and **GORF™**, as well as in its newest game, **WIZARD OF WOR™**, and other video games when released. Midway will also continue its activity to obtain enforcement of its copyrights by the U.S. Customs Service and the International Trade Commission, and by civil actions against infringers for injunctions, damages and profits. At present, Midway is actively engaged in such civil actions in the U.S. District Courts against seventeen defendants, in Phoenix, AZ, Omaha, NE, Providence, RI, Chicago, IL and Canada. In some of these actions the defendants' games and circuit boards have actually been seized by the U.S. Marshal pursuant to the impoundment provisions of the Copyright Act. Every available legal action is being taken to protect Midway's proprietary rights in its original and highly successful video games.



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PLAY METER

Vol. 7, No. 14
August 1, 1981

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PLAY METER

Coinman Interview: Randy Fromm 12

Technical instructor and writer Randy Fromm offers his observations on what training is needed by the service personnel in today's coin machine operation. He also proposes an innovative approach to providing the training for today's electronic needs in this business. So it is that *Play Meter's* own technical writer is this issue's Coinman.

'I Had A Dream Today' 39

And what a dream: Art Seglin writes of an ideal world where replacement of key trained servicemen is easy. His allegory offers insight from experience on what it would take to make it easier to staff the service department.

The Arcade School 42

Inaugurating a new feature of this magazine, Randy Fromm details an important component servicing procedure in this first of a two-part article to be concluded next issue.

Desoldering Components 45

This procedure is explored in depth by Al Rosenthal—with special attention to printed circuit boards used in coin-op amusement games.

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UP FRONT

With the sudden turn of media attention on our industry, there has been a tendency in some quarters to toss around astronomical numbers about the potential of coin-operated entertainment. Industry people have told the media there are cases of games that make over \$1,000 within a few days, of games that literally pay for themselves inside of a few short weeks.

In many cases, these claims are made by factory personnel who, like proud parents, brag about the great potential of their new video game brainchildren. Now, while such effusiveness may help the fortunes of the individual companies, it must be pointed out that it could have adverse effects on the industry as a whole.

We should all remember that exaggerated or isolated instances of a particular game's earnings could create some wrong impressions where we would least like to have them. For instance, local governmental officials may see the coin-op entertainment industry as an ideal source for additional revenue, or something which needs to be more strictly regulated. Or location owners might get the idea that operating is easy—so easy, in fact, that they're missing out on half the fun (and half the money, too), and so they'll want to buy their games direct and eliminate the operator.

I'm not saying the industry should stop talking to the media now that the media wants to start talking to the industry. But it should be pointed out that when industry people are interviewed by the media, they should recognize they are, in effect, spokesmen for the entire industry. And, as industry spokesmen, they should make sure they point out a few things which would bring this whole video game phenomenon into perspective.

The media has to understand that this is a high risk business. Investing untold thousands of dollars on a hunch that a certain game will be a hit may be second nature to those who are in the business, but the financial risk is staggering all the same.

Consider, for instance, the operator who guessed wrong and put his money down on *Battlezone* rather than *Pac-Man*. Many people this past fall thought *Battlezone* would be the successor to *Asteroids*, and *Pac-Man* was dismissed by many as too cute.

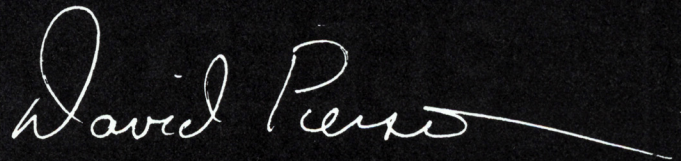
Now, try to find the operator in this industry who guessed right on every single one of these: *Space Invaders*, *Asteroids*, *Pac-Man*, and *Defender*. And see if initially he hadn't also invested as heavily in *Frogs*, *Lunar Lander*, *Ripcord*, *Space Encounters*, and *Battlezone*. This is not meant as a rap against those also-rans (many of them turned out to be satisfactory earners in their own rights), but they definitely were not in the same league with *Space Invaders*, et. al.

We must not only keep this in mind, but we must make sure the media understand it too—that there are countless games out there and which one, if any, will hit it big is anybody's guess.

Factories' representatives should keep in mind, especially when they are talking with the media, that although they may be the proud parents of a bright, new beaming video. They also have several other "closet children" which operators had to take a risk on.

They should make sure the public understands the risk inherent in this industry. They should make sure the media understand it's a lot like picking hit records—only it costs a whole lot more per record. They should make sure the media also realize that these games don't just run themselves, that it costs money to service these temperamental, sophisticated machines. Otherwise, the public is going to get the wrong idea about this business; and, besides the quick-buck artists, we'll find governmental officials and irate parents with other ideas about what should be done about this "easy money."

An industrywide co-op advertising program could get the message across. But with video game and jukebox copyrights getting all the attention, it appears we may have to rely on what the media say about us. The least we should do is make sure they get a true picture of our industry.



David Pierson
Editorial Director

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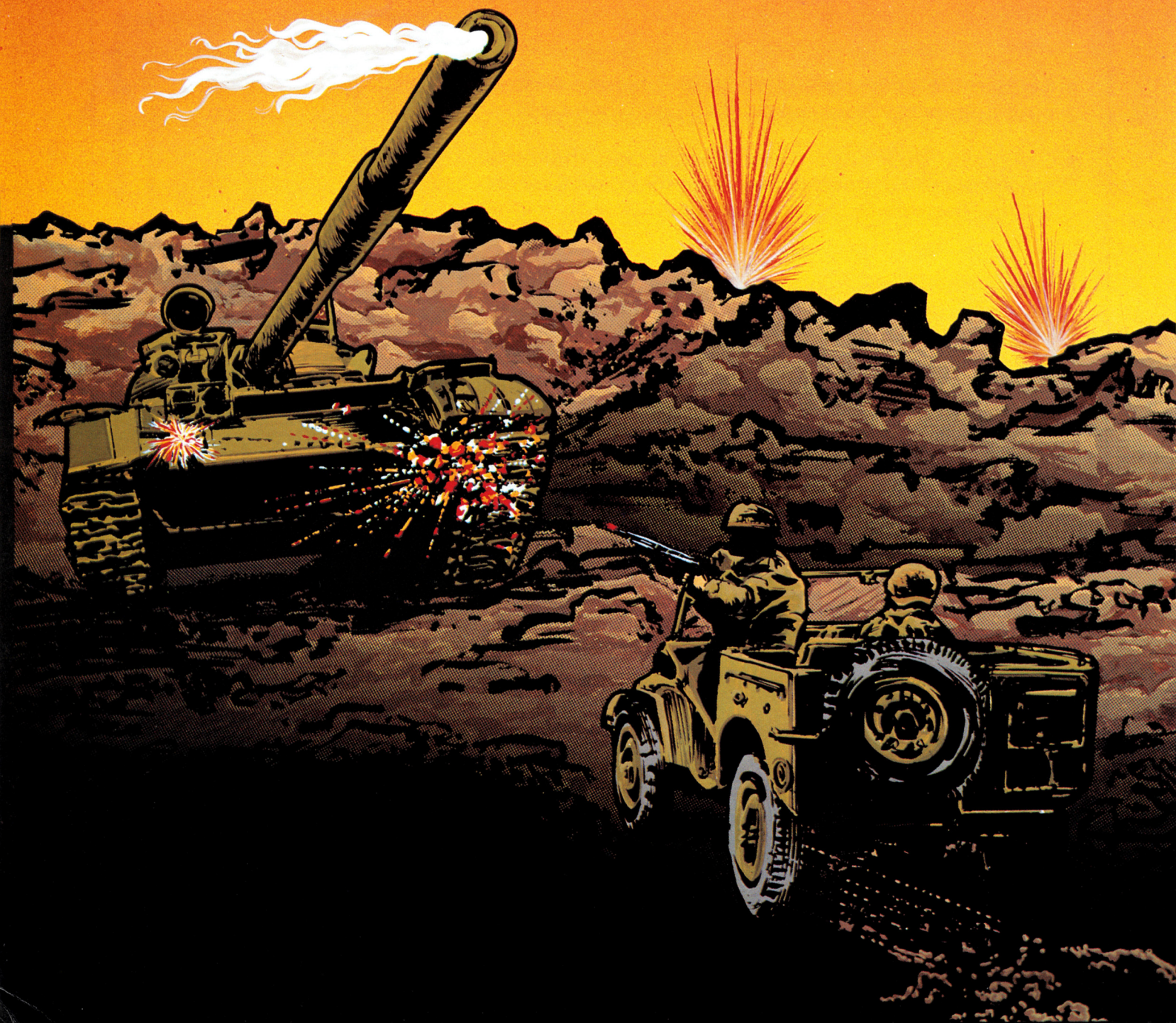
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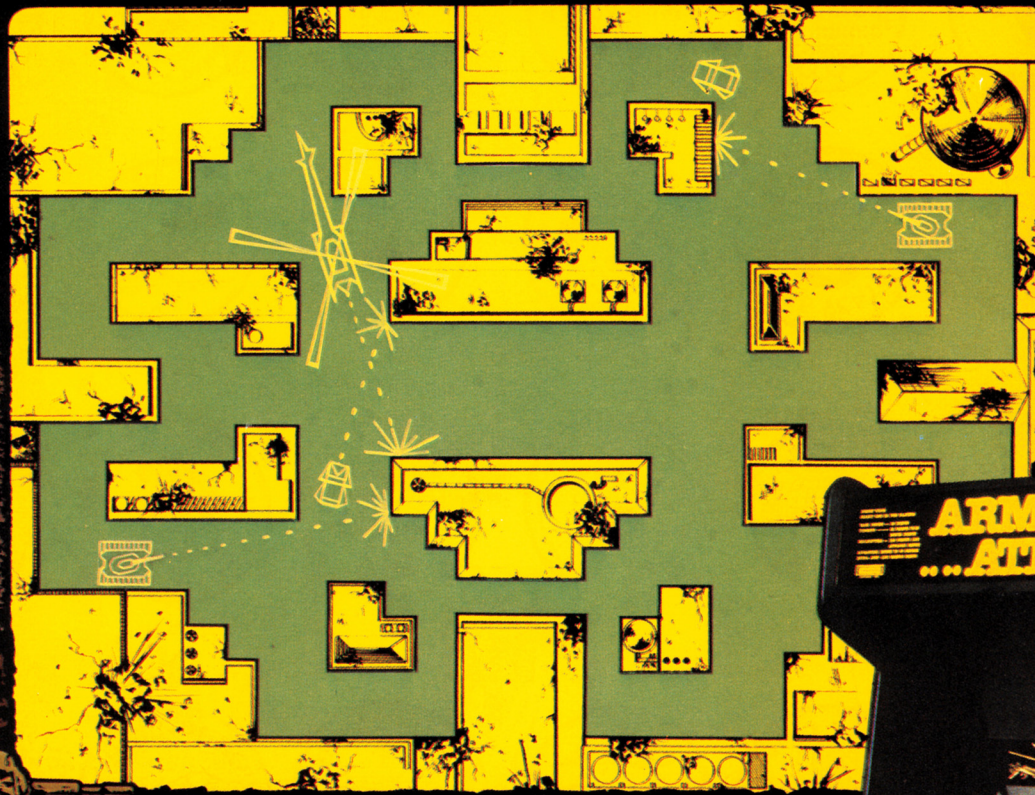
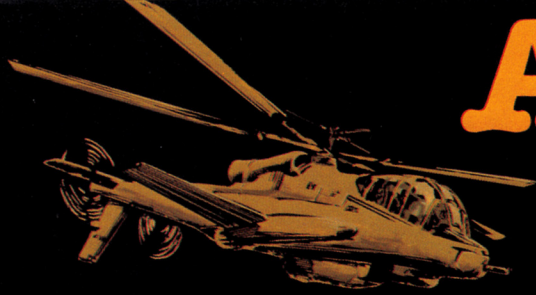
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ARMOR... ATTACK



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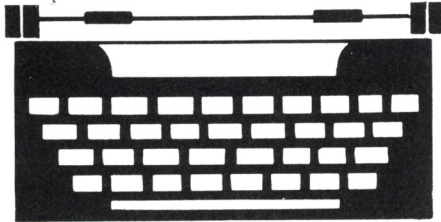
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Letters to the editor . . .



Couldn't wait

I just got around to reading your article, page 26, June 15, issue. ["Las Vegas exit planned in questioned closed-door meeting."] I couldn't wait to congratulate you on your presentation of the issue in such an objective and articulate fashion. Keep up the good work.

Jim Mullins
Miami, Florida

Correspondence course

In regard to a section appearing in Play Meter's Technical Topics: It states that the material comes from a correspondence course by a Kurz Kasch of Dayton, Ohio. If possible, could you please forward to me the full name and mailing address of that program?

Christine Ulaky
Canobie Lake Park
Salem, New Hampshire

[Ed.: The course, "Digital Circuit Design," is no longer marketed by Kurz Kasch, but the Dayton firm has given Play Meter exclusive permission to run the course in serial form which continues in these pages.]

Looking for schools

The ASUCLA Bruin Bowl is currently upgrading the training of its mechanics/technicians. We would like to train them in circuit board troubleshooting/repair, signature analysis, and other state of the art troubleshooting techniques. As the leading publication of the amusement machine technicians. We

would appreciate any details you could provide on these seminars, including sponsor, content, location, cost, etc.

Paul D. Witman
Senior Technician
ASUCLA Bruin Bowl
Los Angeles, CA

[Ed.: Two such schools exist in your area—Play Meter technical writer Randy Fromm's San Diego Arcade School; and Cinematronics' former engineer Don Wright's American Arcade School; plus the traveling schools of Don Miller (contact the AMOA for dates); Cal's Coin College of Nicoma Park, Oklahoma; and Nevada Gaming School of Las Vegas.]

Ralph Nader nominee

Your magazine is great. And let me be the first to nominate Frank Seninisky as our Ralph Nader, he

tells everything exactly as it is. Maybe the manufacturers, might just listen.

Anthony Music Systems, Inc.
Allentown, Pennsylvania

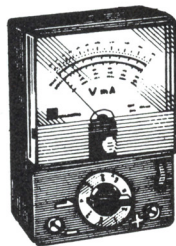
Wants schematic

I am trying to find the schematic for a pinball machine I own, in order to repair it. The machine is a Chicago Coin Top Ten machine. I know that they are out of business, so I can't go that route. Is there perhaps a central clearing house that might be able to help me? Any information you could give me would be appreciated. I'm borderline desperate.

Diane Lajoie
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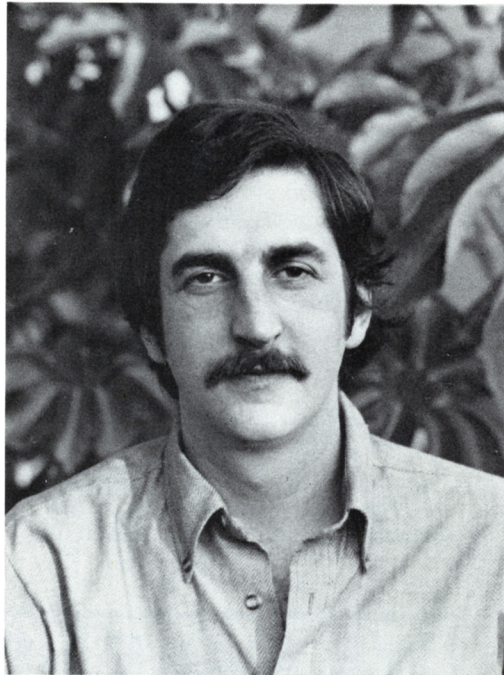
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Coinman Interview



Randy Fromm

Randy Fromm is a name that is recognizable to most industry people, if for no other reason than that he's been a technical writer and editor for *Play Meter* magazine for some time now.

Married (wife's name, Lenore), Randy started in the coin machine business in May, 1972 working for various operators as a technician in the southern California area. Prior to that he had been in television repair. After spending a few years in the business, he went to work for a little over a year for Ruffler and Deith in London where he helped that distributorship set up its solid state repair division. Following that, he went into business for himself as a game technician. It was about that time he also started writing for *Play Meter*, bringing his insight of the problems in the field of other operators and technicians.

He began offering ideas on modifying existing games, which some factories did not exactly appreciate because they saw it as pointing out the flaws in their equipment. But the column survived and so has Randy.

About a year ago, Randy's career took a somewhat different twist when he started to teaching game repair. He started San Diego Arcade School in, of all places, San Diego, California. His school stresses the effective use of a digital multimeter and a logic probe, relatively inexpensive test equipment, to isolate problems in the field. "It's a comprehensive and effective course, even if I say so myself," said Randy. "I don't try to push a lot of useless theories on the guys."

The school has recently undergone a name change to Randy Fromm's Arcade Schools, with the opening of a second school in Dallas, appropriated named the Dallas Arcade School. The Dallas school, Randy said, will have as its instructor, Nathan Bush, who, it just so happens, was interviewed as *Coinman* in July, 1977. So with packed classes at the San Diego Arcade School and the grand opening of the Dallas Arcade School—not to mention his technical tracts for industry's trade magazine—Randy has kept quite busy.

But the subject which attracted *Play Meter* to interview its own technical editor for the *Service Issue* wasn't so much his arcade schools as it is a novel idea of his about reaching new technicians. Randy is presently working on a series of fourteen video tapes which he plans on marketing to the industry. The videotapes will instruct new and inexperienced servicemen about how to repair electronic games. They will be available on VHF and Beta formats. And he's working on a training workbook, and even a cassette tape training program (which we envision could even be used by technicians as they drive their trucks to their appointed rounds).

These sounded like some novel ideas to us as far as educationing new technicians at least, we hadn't hear it taken this far before— so we felt, for the *Service Issue*, we should talk to him about how such a videotape program could be used.

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BECKMAN

PLAY METER: A few years ago when the industry made the switchover from electro-mechanical to solid state technology, there was a general overall panic on the part of the operators. Apparently the operator has adapted or at least survived this technological change, but is he where he should be today?

FROMM: Many of the operators have made the transition by hiring people who are informed and educated and have the ability to repair these games. I really have no idea what the percentage is, but many of the operators now have their own electronics man, and that certainly helps out.

But the problem comes for the guys who are out there in the field. I'm finding that a lot of the guys in the field are still not real sure what they're doing. Many of them can spend too much time looking for the problem and never find it, or they'll spend a lot of time finding the problem but are limited to pulling out the logic board and taking it back to the shop. So, generally speaking, the state of the industry is such that we could still use some upgrading—for the guys out in the field.

Many operators still depend too heavily on their distributors for replacement boards and exchanges and things like that. But that's getting a lot better than it was in 1976. The reason is many operators have managed to find at least one person who knows what he's doing. But, naturally, some of the routes out there are huge, and so there are a lot of service guys out there who need help. What I mean is that if you may have a crew of, say, ten guys, only two of them may be really sharp; five of them may have a pretty good idea what's going on, and three of them are merely board swappers and mechanical-type guys. So you really have all levels of ability within a route as far as reparability.

PLAY METER: Dismissing personnel for a minute, are today's operators properly equipped?

FROMM: I'm finding that people in this business tend to want to spend a lot more money on repair equipment than they need. Quite frankly, I teach my course and do all my repair centered around the use of a digital multimeter, which is a \$45 piece of test equipment, and a logic probe, which could run anywhere from \$40 to \$100. And I feel that's enough test equipment to do almost all game repairs. Sure, it's nice to have an oscilloscope, but that can run you around \$1000. And, for many of the operators who have them, these oscilloscopes just sit on the shelves gathering dust. Very little use is made of them.

Now, if you plan to do a whole lot of very intense electronic repair, and you have someone who is capable, it might not be a bad idea to have an oscilloscope. But, what I'm saying to you, is that I don't have one, and I can fix 95 percent of everything I come up against. An oscilloscope is a real nice thing to have. Don't get me wrong. And there are problems where you would need an oscilloscope to repair. But, with the repair of electronic games, the problems are so straightforward and are so easy to diagnose that it's just not necessary to have that capital outlay. You really don't need things like that. You don't need a transistor checker. You don't need a frequency counter. You don't need a capacitor meter because they just are not necessary to do effective repair.

It's not that important to have all this equipment in your shop. What I feel is more important is the technician's knowledge of how the games work. That will help you fix games a lot more than an expensive piece of equipment.

PLAY METER: So we are back to the subject of service personnel. When this industry underwent the technological metamorphosis, there were many who said we could not compete for the type of people it took to repair these games. Has this changed? Can this industry compete now for the type of people needed to fix the games.

FROMM: That's still a problem. Many operators are realizing they have to pay a man a little more, especially if they're trying to lure the same people to their job market that otherwise will go to other industries where they can get such extra incentives as built-in gymnasiums and all that. But our big incentive is that I can't think of any business that is more fun to work in. And I think we draw the people to this business, although we may end up paying slightly less, because what we do is so unique and so much fun. This business gives the technician so much freedom. That's what attracted me. A lot of technicians will go for a career as an amusement device technician rather than being a bench technician at some factory because of the unique challenge of this industry.

PLAY METER: Is there any single trait which you should look for in a good technician?

FROMM: You have to have someone who really enjoys working with electronics and who doesn't look upon it as a job. You can pick that out right away when you're interviewing someone. You can get a general feeling about how they feel about the work they're doing and if it seems like a job to them or if they really enjoy it. If it seems like just a job to them, then they're not going to be successful.

On the other hand, if they're enthused and are talking about how they built their own game when they were sixteen and how they always want to look inside whenever someone opens up a game, that's what you're looking for. You can detect enthusiasm in a potential employee pretty easily.

Now, the military guys are okay, but a lot of their military experience has been confined to black box changing. And they sometimes have a tendency to look beyond the problem because they get so involved in the technical aspect of it that they fail to see the practical end.

What I would look for, to be quite honest with you, is someone who is right out of high school or else right out of electronics training or still in electronics training in college. That way you can mold them to do exactly what you want them to do. You don't have to worry about them getting involved in other areas of electronics that may be theoretically interesting but which don't mean a thing while you're fixing games.

PLAY METER: What are your feelings about the manufacturer's service schools?

FROMM: I think the manufacturers do an excellent job of presenting detailed descriptions of their particular machines. They're to be commended for all the effort and money and time and everything else they've put into their training program. And you can always get additional information from them by making a toll-free telephone call. They'll answer your questions and send you as many schematics as you need. Their teaching methods are very good. What they teach in their schools is very detailed and specific about how their games work.

But there is a problem; and that is, while they do an

“The operator must work out an agreement with his serviceman before he sends him away to a school”

excellent job describing their different systems, they are very often speaking to mechanics who have not quite progressed to the level they should be at in order to understand what the manufacturer's technician is describing to them about the system. That's the only problem with the manufacturers' seminars. Generally speaking, they are more advanced and, of course, limited to what they can accomplish as far as troubleshooting techniques because it's only one day.

PLAY METER: Of course, many operators, as you pointed out, have one top-notch electronics man in their employ. Aren't there a lot of operators now conducting their own in-house technical schools?

FROMM: Yes, and they're good. I remember some years ago when I was still working as an operator's technician. All the servicemen would have to go into the shop about once a week. And either the head technician or whoever knew more about a particular problem would simply tell everybody else in the company about it. It's an extremely worthwhile process that many operators are doing today.

PLAY METER: That brings us still another source for technician training—a specialized technician school such as the two arcade schools you run— where a

technician is sent away to school. Isn't there a potential problem here? What I mean is what kind of assurances does the operator have that, after he has paid for the education, his serviceman won't take his newfound talents and knowledge and go to greener pastures?

FROMM: The operator must work out that agreement with his serviceman before he sends him to a school such as mine. And there are a number of ways he can do that. Certainly he could have a legal contract drawn up which would bind the technician as his employee for a certain period following the school, maybe a year or so. Or he could offer a bonus plan which says, in effect, “You're going to be worth more to me after you go to this school; so I'll give you such-and-such a raise for every three months for a certain period of time.” That's not quite as binding as a contract, but it does provide some assurances for the operator.

Another possibility is that the employer could offer to pay the technician's salary for the time he spends away from work in the school, but the technician has to pay his own airfare, hotels, meals, tuition, and so on. And, after the technician has been with the company for a certain amount of time, the operator would agree to pay back all those expenses.

You could even work out an agreement whereby you'll pay everything, but if the servicemen leaves your employ



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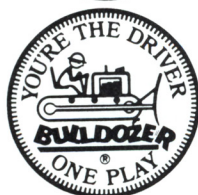


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within a certain period he has to pay for the school and expenses. And if he leaves, say, a year later, he only has to pay back half the expenses. But mechanics are notoriously broke. So it might be hard to get them to pay it back when they leave.

But, certainly, this is all something that has to be worked out on a personal basis between the employer and technician. And it depends upon your relationship with your technician.

PLAY METER: Now, in addition to conducting your own service schools, you're also getting involved in a new venture, aren't you?

FROMM: You mean the audio-visual tape program?

PLAY METER: That's right. Could you explain what your plans are on this?

FROMM: Well, right now I'm working on a series of fourteen video tapes with each video tape running around a half hour to 45 minutes—one of them may run an hour, though.

I got the idea to do this video tape series when I was asked to be a guest speaker at the second annual Amusement Operators Expo in New Orleans. I was asked to give a seminar on servicing games, and I based a lot of it on the same thing I base my school on—that is, the practical use of the digital multimeter to repair electronic games. So I prepared this half hour video tape on how to use the digital multimeter to repair games, and I used it in conjunction with my seminar.

It was a very comprehensive tape which took you from the basics of how to insert the leads into the meter to checking for integrated circuit failures, checking transistors and diodes, power supplies—all the important kinds of tests that you can do when you repair an electronic game with the meter.

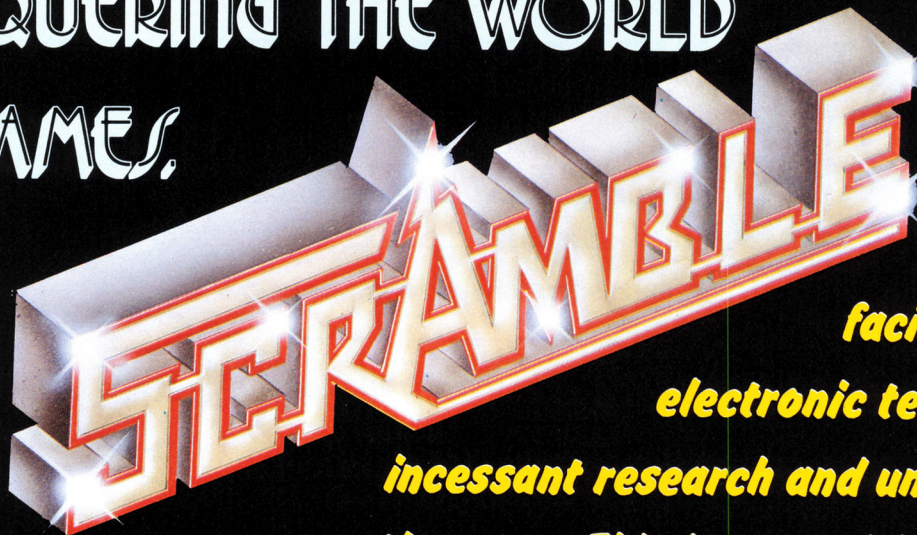
Well, then I displayed the tape at the booth for my arcade school, and I got a tremendous amount of response on it. Most of the people who came by my booth, as a matter of fact, were not interested in my school. They wanted to purchase the video tape on how to use a digital multimeter.

The demand was so great for the tape, but at that point I wasn't prepared to sell it because I had only made it to be used in conjunction with a live seminar. So I decided to go ahead and make a series of tapes to include instruction in not only how to use your digital multimeter but on a whole lot of other subjects as well. I'm working on those scripts now and hope to have the complete series of fourteen video tapes ready in time for the AMOA Show in Chicago.

It's a progressive learning system, which means that tape number six might be making a reference to something that was discussed on tape number two. So if you don't follow the tapes through in sequence, certain things will appear incongruous.

The tapes will be, of course, in the permanent possession of the operator, and he could make them available to his servicemen to learn at their own pace. I'm designing the tapes so that they can be reviewed as often as possible to reinforce weak areas of knowledge. The

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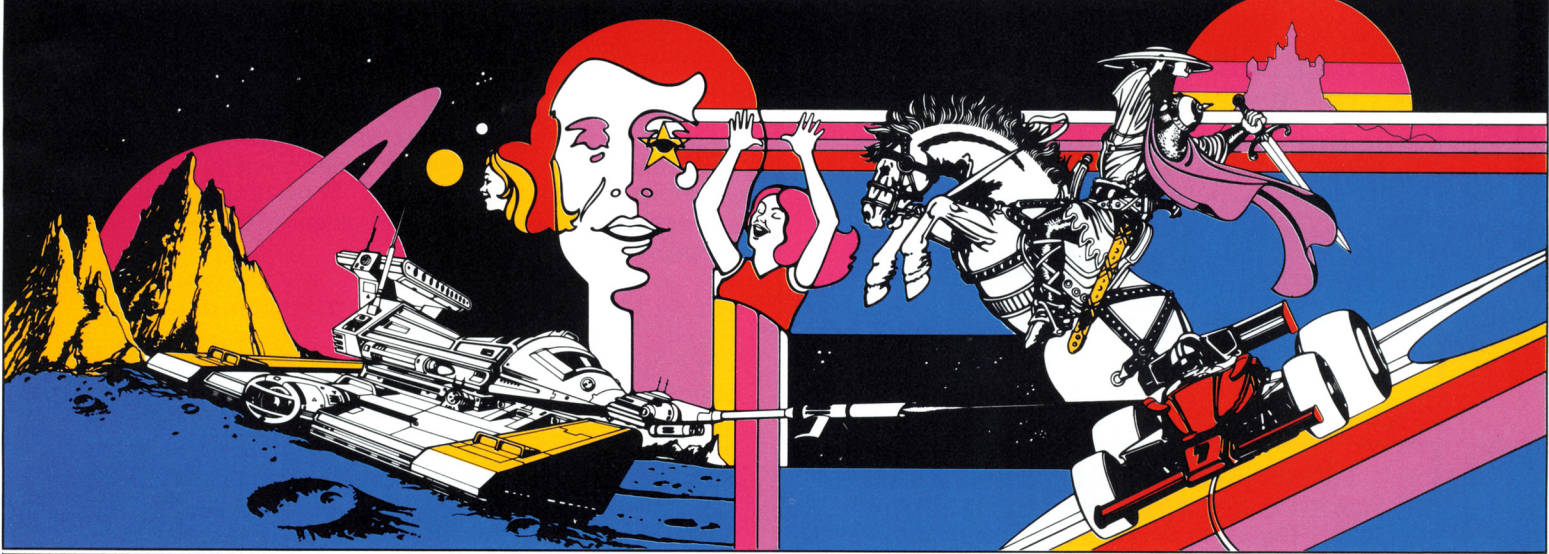
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tapes concentrate on the aspects of electronics that are critical for electronic amusement repair. It bypasses time-consuming and useless theories and concentrates instead on the most practical and efficient ways to repair games.

PLAY METER: What is the subject matter of the video tapes you're planning?

FROMM: The tapes will include instruction in how power supplies work, how transistors and semiconductors work, how all the different types of monitors in video games work—with separate tapes for black and white monitors, color monitors, and the XY-type scan monitors. There's also going to be one tape on each of the three pinball systems—Bally's, Gottlieb's and Williams'. And there'll be video tapes on basic troubleshooting techniques for conventional and XY systems and another tape on soldering techniques and repair work in general.

PLAY METER: How would such a program as yours be used?

FROMM: I can see it being used by the technician who comes into the shop in the morning and who sees he has a service call, say, on a particular type of equipment. He can take some time to review this tape showing him the troubleshooting procedure for isolating the problem. By studying the tape on *Asteroids*, for instance, he'll not only be able to fix *Asteroids* but also *Lunar Lander*, *Battlezone*, *Red Baron*, and so on because Atari's XY systems are all the same. The same thing is true for conventional video games. Since they are all the same, a review of the troubleshooting tape on conventional video game monitors will allow the serviceman to isolate the problem.

PLAY METER: And I assume this video system will also help with the education of new employees.

FROMM: Absolutely. Instead of wasting money having your new employee sit down with your best man so that your best man can teach him, you can sit your new employee down in front of this video tape for a few days before sending him out into the field. That way, even if you go through a dozen or so new servicemen in five or six years, you have still cut down the cost of educating those employees.

Without a doubt, it would reduce the cost of training new employees and have your new people in the field a lot faster and making fewer mistakes because they'll know where the problems are going to be.

If everybody in the company uses the same troubleshooting techniques, then at least everyone will know what everyone else in is talking about when they come in with a problem.

I find that very often when people come to me with a problem and I ask them if they did this, this, and then this, they'll reply that they didn't do that, and they did this, but they did it last. And I'll have to point out to them that they didn't really accomplish anything when they were looking for the problem if they didn't follow a proper troubleshooting procedure.

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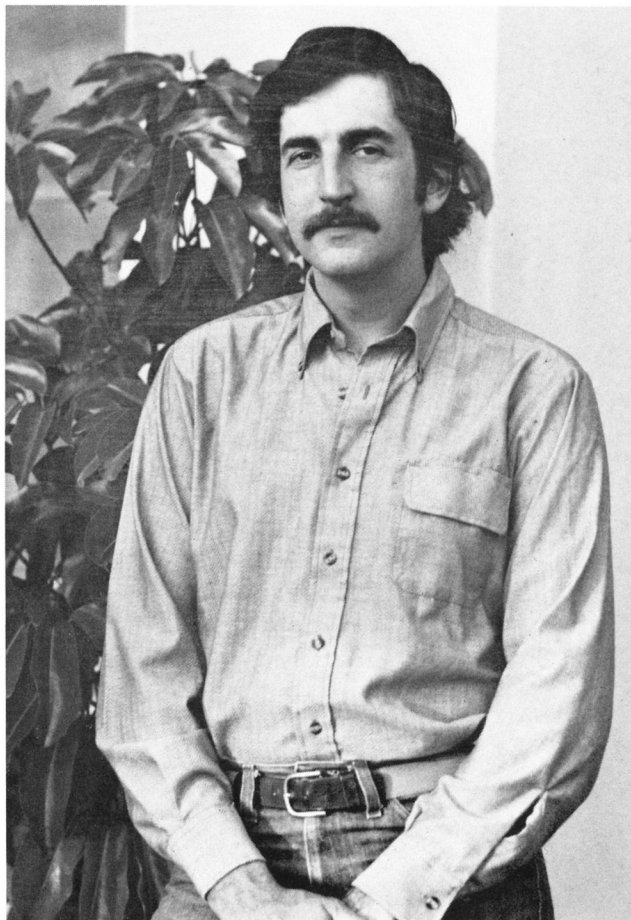
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**“I’m hoping to develop more
advanced tapes as well”**

PLAY METER: Could the video tape series be expanded ?

FROMM: Yes, I’m hoping to develop more advanced tapes as well. For instance, there is no tape in the original series of fourteen which deals heavily with microprocessor theory. And the reason for that is that most of the guys in the field are just not up to the level.



“I got the idea to do this videotape series when I was at the second annual Amusement Operators Expo in New Orleans.”

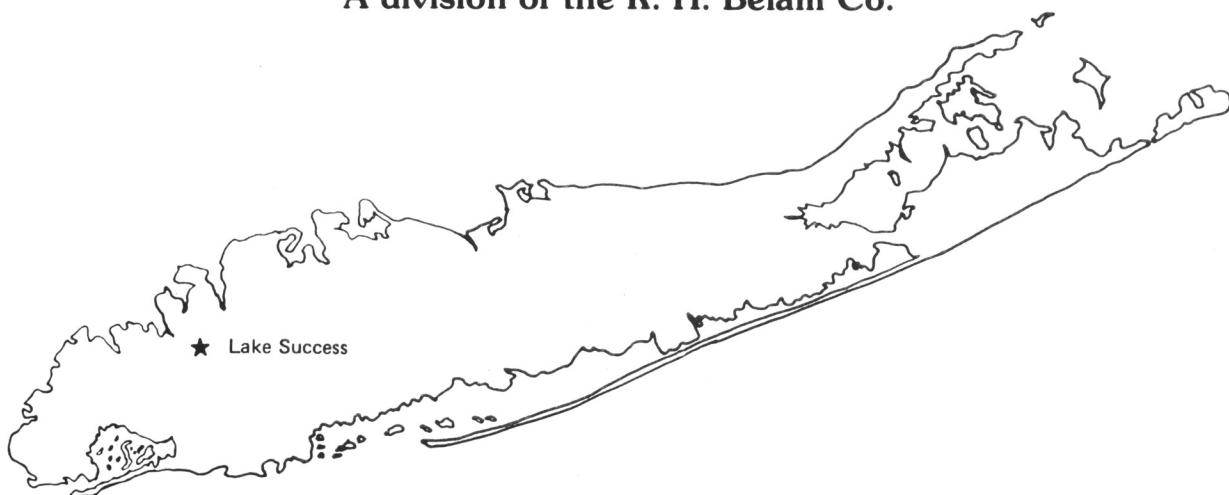
PLAY METER: The video tape idea is a novel approach to teaching servicemen. What indications do you have that it will catch on?

FROMM: Well, the reception that one tape got at the Amusement Operators Expo was a strong one. Also, based on the reception the video tapes received there, I was asked to present a proposal to the AMOA board of directors at their annual meeting in Monterey, California. And I did. They wanted me to give them an estimate and a proposal on doing the series of tapes for use by AMOA members I guess. So I guess it’s an idea whose time has come.

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'Unnecessary' —CRT

Location lists eliminated

The Copyright Royalty Tribunal (CRT) adopted a rule change June 5 which removes the requirement for operators to submit lists of their jukebox locations in order to remain in compliance with the compulsory jukebox copyright law.

The CRT location list regulation, which was adopted by the federal agency in 1978, was the target of an unsuccessful legal challenge by the operators' national association, AMOA, which argued that the CRT did not have the authority to require the lists.

The vote on the rule change was 3-1 with only commissioner Frances Garcia dissenting. Commissioners Douglas Coulter and Mary Lou Burg joined in voting with CRT Chairman Thomas Brennan for the regulation repeal. It was Brennan who made the motion that the regulation be reconsidered by the CRT on the grounds that it was unnecessary.

Brennan told *Play Meter* the CRT plans to publish its rule change in the *Federal Register* by the end of July.

"Based on the information currently available," Brennan said, "the commission determined there was not enough of an intention to make use of this source for us to continue with this regulation."

Brennan told *Play Meter* in 1979 that, when the CRT issued the regulation, it intended to monitor the performing rights societies' use of the location lists to see if there was a

need for the location lists to settle copyright collection disputes. He said at that time that if the performing rights societies could divide the royalties without controversy, the Tribunal might be well advised to cut back on what we think are very modest reporting requirements. Certainly it would be appropriate after some experience to see if that point could be reviewed" (July 15, 1979, *Play Meter*: "Trying to Understand the Copyright Royalty Tribunal's Reasoning").

After the rule change was adopted June 5, Brennan told *Play Meter*, "It was clear that the majority of the commissioners were greatly influenced by the jukebox distribution proceedings which had been held earlier in the day."

Brennan said, "The three commissioners who voted for the proposed rule change asked a number of questions of the performing rights societies as to the need of the surveys for future distribution proceedings."

The earlier distribution proceedings found ASCAP, SESAC, and BMI entangled in a dispute about what shares they should each get of a jukebox copyright pool totalling about \$1.1 million. According to Brennan, the performing rights societies did not show enough intention to make use of the jukebox location lists to settle the dispute. In

fact, Brennan said, BMI produced its own survey based apparently on samplings at jukebox locations. And, at the time it was introduced, Brennan said, ASCAP argued that the survey be dismissed. But, Brennan added, the CRT decided to accept the survey into evidence.

Brennan said the AMOA "supported the repeal we made, but," he added, "they wanted to make it clear they were reserving their position on the jurisdictional matter about whether we (the CRT) had the authority to make such a regulation in the first place."

Brennan continued, "I also made it very clear to AMOA's counsel (Nicholas Allen) that the commission had not changed its view about its own authority to issue such a regulation. The fact is the courts have upheld our right to make such a regulation every step along the way. Because of that, I made it clear that it was the opinion of the CRT that the regulation was being repealed because it did not appear to be necessary, not because we had changed our minds about our right to make such a regulation."

According to Brennan, the performing rights societies could challenge the CRT rule change in court, but at presstime *Play Meter* could not reach knowledgeable sources at the performing rights societies to see if they intended to make such a court challenge.

—by David Pierson

Royalties kick up record prices; operators to pick up the tab

Prices of record albums and sheet music were rising in late spring, and 45 rpm records would not likely be far behind, with the Copyright Royalty Tribunal's mandated increase of the mechanical royalty rate from 2¾¢ to 4 cents per song.

According to an article in *Rolling Stone* music industry publication [May 28, No. 344], the major American record companies were boosting the list price of all \$7.98

pop, jazz, country, and soul lps to \$8.98, "and there's no end in sight." That bit of pessimism was sustained by the July 1 schedule for the mechanical royalty raise.

One record shop owner was quoted: "We feel badly about albums going up one dollar. It's pricing kids out of the market."

Jukebox operators would feel a pinch also, with the average of about

13 discs per month per jukebox he buys in 45s according to statistics derived from *Play Meter*'s most recent operators survey.

In addition to the royalty fees that are both built into recording sale prices and assessed per-jukebox, there was more economic bad news in vinyl. A Capitol Records executive, asked by *Rolling Stone* how high can prices go, answered: "It's all relative to inflation."



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Bans on teen arcade-goers await Supreme Court test

By Ray E. Tilley

The U.S. Supreme Court will decide, probably before October of this year, whether youths under 18 have a constitutional right to play coin-operated amusement games, as prohibited by a number of localities.

The case arises from a Mesquite, Texas ordinance that bans minors from entering an amusement arcade unless accompanied by a parent or guardian. If this ordinance is struck down by precedent of a high court ruling—and numerous operators in conversations with *Play Meter* have said they expect it will be struck down—it will greatly impact the coin machine trade. Minors are the life

blood of coin-op.

The test case developed in 1976 when, Aladdin's Castle announced plans for an arcade in a Mesquite shopping mall. Permits were granted by the town and the Bally arcade chain subsidiary reportedly spent \$80,000 toward developing its plans for Town East Mall. The city council amended the age-prohibition for arcades, and Aladdin's Castle proceeded with its unit. However, the city later restored the age limitation and denied Aladdin's occupancy of its game center.

Robert Hughes, attorney for Aladdin's, explained that the arcade was "designed for kids to use, and of

course it cut off a good portion of their business." He added, "And why the heck would you keep someone from playing an amusement device in the first place?"

Mesquite apparently has felt strongly about the need to prevent minors from doing so. The denial of license was appealed by Aladdin's to U.S. District Court in Dallas and a ruling went in the Bally company's favor. The city appealed to the Fifth Circuit Court of Appeals in New Orleans, and Aladdin's was again upheld.

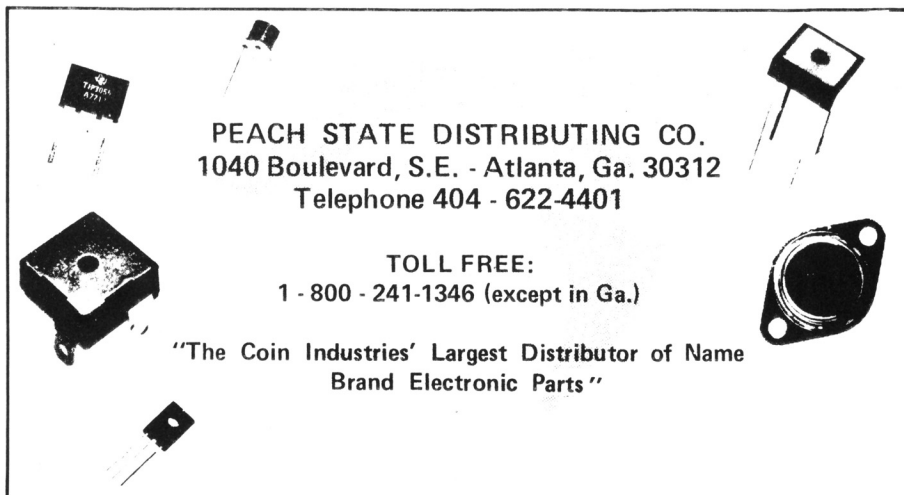
Other Texas cities including Dallas, until last year, had similar restrictions, noted B.H. Williams of B & B Vending in Dallas. The original legislation had tied the playing of coin-op amusement machines to the use of gambling devices, he noted. Of the court action, he commented: "I hate that it's coming about, but Bally's attorney did a professional job."

The Fifth Circuit Court ruling was published in early 1981, and Mesquite within 30 days appealed again, to the present arena of the Supreme Court. In June, the high court agreed to hear the case, and attorney Hughes said he expects a determination of the issue by October.

The Fifth Circuit Court of Appeals found the ordinance in violation of a youngster's First Amendment right of "social association." Mesquite in its further appeal asked that the Supreme Court justices to rule that minors do not have a right of association that would insure them entry into an arcade.

Hughes summarized his case: "You can't put someone out of business just because you want to. It's just as logical to pass a law to say kids can't go into a clothing store, play baseball, or whatever the hell it is."

If the Supreme Court sustains the lower court rulings, Hughes speculated: "I think they'll let (municipalities) put limitations for which they can show some reason." Ruled out, he expected, would be "arbitrary hours, arbitrary locations, and all kinds of things put on them for no reason."



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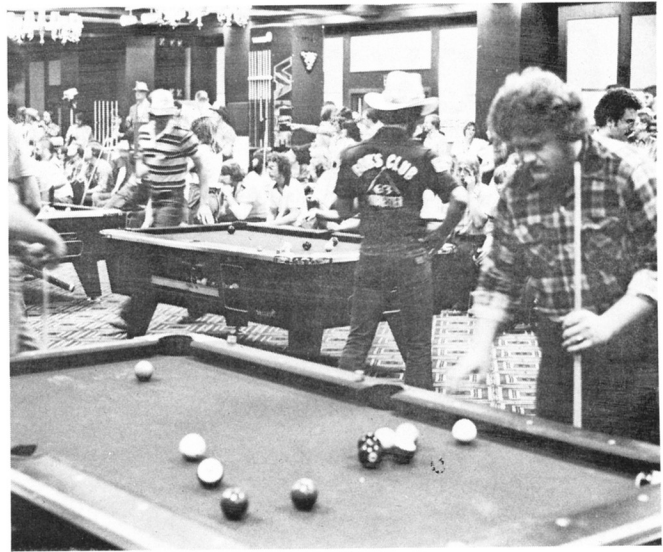
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League play leads to Valley's championship pool play-off

More than 400 players representing teams across the United States and Canada met and matched shot-for-shot in Valley's 8-Ball League Championships. Held May 28-31, in Rochester, Minnesota, the playoffs were the culmination of Valley's first season of organized league play.

"This event met and surpassed our expectations in every way," said Chuck Milhem, president of The Valley Company. "And it was all due to the enthusiasm and cooperation of so many dedicated people; they made it everything we wanted it to be."

The 80 teams participating were divided into five divisions of 16 teams each (four men's; 1 women's). The winners of the four men's divisions were Alumni Inn, Onalaska, Wisconsin; American Billiards, Faribault, Minnesota; Hondo's Bar, LaCrosse, Wisconsin; and Kelsey's Lounge, Denver, Colorado.

Each of these winning teams received \$1,000 and qualified for the final four. Hondo's Bar came out on top, winning its title only after fourteen tense games, in which the lead repeatedly changed hands. This first place team also won an additional \$800 in bonus money. American Billiards, Alumni Inn, and Kelsey's Lounge won bonus money of \$600, \$400 and \$200 for finishing second, and third and fourth respectively.

The women's division title was

taken by Bob's Club Two of Rochester, Minnesota, winning the \$1,000 division prize, plus \$400 bonus money. This team was followed by The Pub, also of Rochester, Hondo's Bar, of LaCrosse, and Point After Bar, from Rochester, as well.

All participating teams in the Championships shared in the total of \$17,900 in prize money, which represented 100 percent of all sanction and entry fees paid into the escrow account of The Valley 8-Ball League Association. Winning teams and sponsoring locations also received handsome engraved plaques commemorating their victory.

Aside from prize and bonus money, a number of other awards were presented by Valley. Chuck Curtis, of Pioneer Bar's team from Duluth, Minnesota, won a Valley home pool table in the door prize drawing, and two dozen Valley American-made two-piece cues were awarded by drawing during the four days of play.

"This was a first-rate tournament," Milhem continued, "with excellent 8-ball shooting, good sportsmanship, and excitement right down to the last shot in the championship match. But it was a lot more, too. We are convinced that this first Valley 8-Ball League Championship is a milestone in the industry. It's part of a movement by

distributors, operators, and players alike to build 8-ball league play on an international basis, and to help halt and reverse the trend toward location ownership of coin-operated tables.

"Valley, too, is committed to the distributor-to-operator-to-location-to-player concept. This league concept is going to grow, and next year we anticipate at least twice as many players will participate in league play. Many of them will be in areas that right now do not have leagues. We're already working hard to make next year's championships still better," said Milhem.

Seven distributors and eleven operators were represented by the teams participating. The host distributor was Sandler Vending Company, Minneapolis, and the host operator was D & R Star, of Rochester. "It's people like those we've met during these four days—who will make the league concept go. They're backing us all the way, as is "Mr. Pool," Red Jones, who is an institution in this great game, and added the final touch by serving as Head Referee. Together, we're going to build something that will bring great benefits, both in credibility and income, to the industry," Milhem concluded.

Ed note: For in-depth reports about pool league operators, see next issue.

Copyright war talks in U.K.

British games producers failed to reach total agreement in a recent meeting called in London with the purpose of forming a trade association similar to those of video game makers, already set up in Japan and the United States.

American producers' representatives were on hand as interested observers with the 60-plus British video game manufacturers and distributors in attendance. Among them was Stan Jarocki, Midway Manufacturing vice president of marketing. He declined, however, to voice any opinion on matters arising during the meeting at the Westbury Hotel, noting only that Midway is at litigation in several arenas in the United States concerning infringement. [See related news story, this issue..]

Shane Breaks, Atari's international marketing director, however, was able to add some constructive thought to a meeting which sought the right to negotiate licensing for the manufacture of games through proper legislation and negotiation.

"I see my own company, and I'm sure Midway, turning away machines they put four or five hundred thousand dollars into and discarding them," Breaks pointed out. "So when they do come up with this winner that we all look for, we would like to keep it ourselves, and use our own factories and spread that market. It doesn't all have to be filled in three weeks."

Bill Tulloch, managing director of Subelectro Ltd. of Cheltenham, initiated the move to form an association but was challenged as to its validity by Malcolm Mailer, a director of Zenitone Microsec—the company which created *Invaders Revenge*, a successful British conversion of *Space Invaders*.

"Why should a British manufacturer have the right to manufacturer a machine that has been designed by, say, Midway or Atari, who have production facilities to produce these machines and have spent thousands of pounds or dollars to design these games?" asked Mailer.

There was no real answer until Atari's Breaks intervened. And with BACTA (the British Amusement Caterers Trade Association) also observing through General Secre-

tary Alan Willis, Alca Electronics' Mike Green steered the meeting in a different direction. "I wonder how many of us are actual manufacturers, or are we assemblers of products," he pondered.

"I think if the association has any chance of being formed and being successful, we have to analyze where the problem lies. It doesn't really lie in this country, it doesn't really lie in America. The problem really lies in Japan," Green continued. "The problems we have lie with some of our Japanese associates who license many companies within their own country to manufacture their games.

"Albeit that the undertaking or the agreement is valid only for domestic consumption doesn't stop them offering these machines into the world export market, how can you really blame people from buying them?" Green posed the question.

Green went on the say he'd spoken with Joe Robbins, the Atari chief officer and president of ADMA (the Amusement Device Manufacturers' Association of America) and that Robbins agreed with his line of thinking. The American association, he was told, is going to write a very strong letter to the Japanese counterparts asking them to get their house in order.

"The problem is at the fountain head," said Green. "And with great respect to companies like Midway

and Atari who are world leaders, the majority of products and ideas still emanates from the Far East. We really have to get them to get their house in order and if they do, then certainly our house will come into order as well.

"If we are to be successful in forming this association and we are going to be strong to achieve our ideas, it is the gentlemen on the other side of the Pacific Ocean who must cooperate. Because without their cooperation I'm afraid we have no chance," he said.

Green later moved the meeting around to its eventual outcome, pointing out the merits and stability of BACTA as "the avenue along which we should probably walk."

It was decided a working committee be formed to look into the proposals, for manufacturers to voluntarily bind themselves to non-copying agreements just as if the Copyright Act was positively binding on video games, and to look into the video games industry in general for a report to BACTA.

That the association was not formed was an obvious disappointment to Bill Tulloch. "I felt the manufacturers in general were prepared to back efforts to put the British video games industry's house in order. The willingness is there, but it is also correct that foreign manufacturers must be prepared to play ball also," Tulloch said.

Operator slapped for Defender 'kits'

In a trademarks and copyright case involving Williams Electronics' video game *Defender*, an Alabama operator has admitted charges of infringement in assembling games from kits, and the federal court required the illegal copy games to be delivered to Williams.

On June 5, Judge J. Foy Guin, Jr. of the United States District Court for the Northern District of Alabama entered an order permanently enjoining the defendant, a game operator in the Russellville area, from any further infringement of Williams trademarks and copyright pertaining to *Defender*.

The defendant, who had assembled the infringing games from kits, admitted the substance of

Williams' charges of trademark and copyright infringement. The court required that the defendant deliver to Williams all games, circuit boards, and components in his possession which constitute infringement of Williams' copyrighted audio-visual material or computer programs.

Afterward, Williams announced that it has successfully protected the trademarks and copyrights of *Defender* in the federal courts.

"Our policy is to rigorously protect our trademarks and copyrights", stated Ron Crouse, marketing director at Williams. "We will take whatever legal action is necessary to stop the manufacture, importation, distribution, sale, or operation of any games that infringe Williams trademarks or copyrights."

Orders to seize Midway copies

The United States Customs Service recently issued orders for the seizure and re-delivery to the port of entry of alleged piratical copies of Midway *Pac-Man* and *Rally-X* video games covered by recorded copyright registrations on the audio-visual works embodied in these games.

Such orders were issued against Sutra Import Corp. of Oceanside, New York, with respect to "Gobbler" video games; Stan Russo, Inc. of Los Angeles, California, with respect to "Pac-Man" video games; and Chens International, Inc. of Winchester, Massachusetts, with respect to "Rally-X" circuit boards.

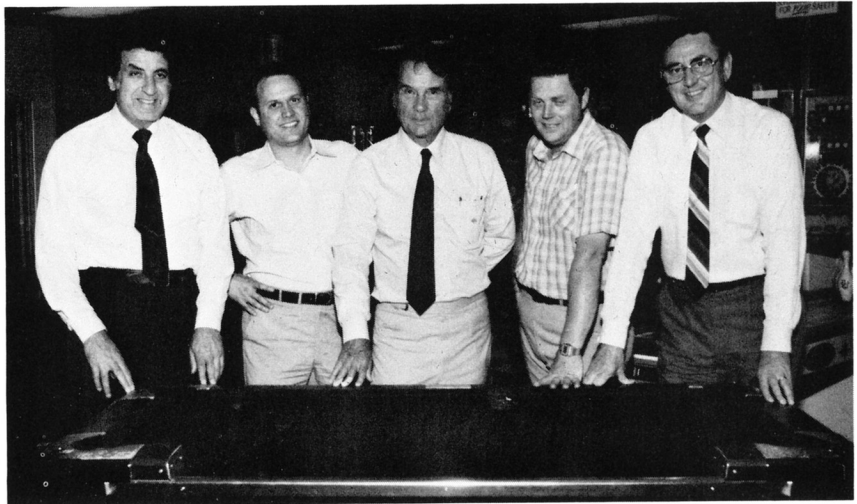
U.S. Customs ruled that such orders may result in forfeiture of the seized goods or of the entry bonds for penalties in the amount of the full value of the goods plus duties.

Midway manufacturing announced that it will continue to actively seek enforcement by the U.S. Customs Service of its copyrights in *Galaxian*, *Pac-Man*, *Rally-X* and *Gorf*, as well as in its newest game, *Wizard of Wor*, and other new video games as they are released.

The Franklin Park, Illinois manufacturer said it will also continue its activity to obtain enforcement of its copyrights by the International Trade Commission, and by civil actions against infringers for injunctions, damages, and profits. Midway was currently engaged in such civil actions in U.S. District Courts against seventeen defendants, in Phoenix, Arizona, Omaha, Nebraska, Providence, Rhode Island, Chicago, Illinois, and Canada.

In some of these actions the defendants' games and circuit boards have actually been seized by the U.S. Marshal pursuant to the impoundment provisions of the Copyright Act. "every available legal action is being taken to protect Midway's proprietary rights in its original and highly successful video games," said a statement from the manufacturer.

**You saw it in
PLAY METER**



"One of a kind" desks were presented recently to two key distributors of Valley coin-op pool tables. Appearing happy at the "Distributor of the Year" presentation recently were: (top photo) Chuck Milhem, Valley president; personnel of H.A. Franz and Co./Houston—Joseph Franz, "Hoddy" Franz, and Larry Twardowski; and Darrell Lawless, Valley rep. Also cheerful around the table at Peach State Distributing/Atlanta: (bottom) Alan Schafer of Valley, W.N. Hawes and A.J. Hawkins of Peach State, and Milhem. Ink pens in the corner pocket?

Valley hails key distribs

Two distributors—H.A. Franz Company, of Houston, Texas, and Peach State Distributing Company, of Atlanta, Georgia—have been named "Distributors of the Year" by The Valley Company, Bay City, Michigan. The selections were based upon total volume of purchasing during 1980.

This award is part of Valley's continuing program to reward distributors for outstanding performances. In recognition of achievement, each distributor received an unusual desk. To all appearances it is a Valley *Black Cougar Limited* coin-operated pool table, but the unit has drawers on one side, with knobs made of eight balls. The desk has the same billiard cloth cover, the same trim, the same high-laminate on rails and apron,

along with other Valley construction features, to form a decorative and useful item of furniture.

In making the awards announcement, Chuck Milhem, Valley president, said, "H.A. Franz and Peach State are excellent customers, but they're much more than that. They have supported Valley in so many ways over the years, and have been progressive in making this coin machine industry stronger and more stable. We're obligated to them for their loyalty to Valley, and to the industry.

"They and our fine distributors have been the key to the growth of our industry, and in making Valley the world's largest manufacturer of coin-operated pool tables," Milhem continued.

Defining basic problems from Japan's point-of-view

All Japan's leading manufacturers of coin-operated game machines, as well as amusement park equipment, kiddie rides, etc., 91 companies in total, have banded together to form a new organization to represent the industry. The organization, called Japan Amusement Machinery Manufacturers' Assn. (JAMMA), came into being January 1, 1981.

Its parent organization, Japan Amusement Trade Association (JAA), had limited its membership to manufacturers, operators and distributors of amusement park equipment only, and reportedly had been having more and more difficulty in fulfilling its functions. It was, therefore, divided into three independent associations, including JAMMA.

Masaya Nakamura, president, emphasizing the problem of copyrights, made the following statements concerning the course JAMMA is to take and problems the new organization must urgently take up.

THE COPYRIGHT PROBLEM

"In Japan, we have not yet reached the stage of defining whether copies should be covered by copyright laws, or whether they fall under the category of rights relating to computer software, in the broad sense of the word, and this has been a frequent source of trouble.

"All game concepts, logos, and characters are the previous fruits of brainstorming by talented individuals, the result of many efforts on the part of manufacturers. It is absolutely intolerable that this property of the manufacturer should be so widely plagiarized simply because of advances in decoding technology. These plagiarists are nothing like a high school boy picking up radio messages with a gadget he himself took great pains to assemble. Our anger is directed toward those who dare to pretend to be our fellow businessmen, and who are trespassing on our territory armed with weapons they have actually stolen from us.

"The most important thing to do, I would like to emphasize, is to enact



Masaya Nakamura

legislation that ensures that the efforts of manufacturers will be justly rewarded so as to encourage advancements in technology such as would be naturally of use in the development of society.

"From the standpoint of lawmaking, because such legislation, by its very nature, calls for perfectionism, it is likely to require considerable time to enact. There is enormous complexity involved in the procedures and methods of formulating the definition of such copyrights. Nevertheless, we think the problem can be considerably remedied by taking such legislative measures as to enlarge the concept of unfair competition, or to extend the idea of the territory of competition. In any case, it is certain that the copying problem will grow worse and worse if we remain a passive onlooker just because there is no applicable law at present.

"In our opinion, all influential members of the industry, and members who have invented new products, should join together in exerting every necessary force to build an industry that can truly be said to be run on sound judgement and high principles. We have very high hopes that the scope of influence and the regulating force the new association can have in the industry will be great.

"This is especially the case with video games, which depend entirely on their software for their commodity value. Software developed by Japanese manufacturers has been in great demand recently, especially in overseas markets, and, taking advantage of this, some unscrupulous manufacturers are distributing, in an unordered way, imitations in various overseas markets. Cases of infringement upon the interests of foreign manufacturers holding lawful licenses have become quite frequent.

"Namco Ltd., which is owned by myself," said Nakamura, "sponsored an emergency international conference in Japan on March 9, 1981, which was attended by four other leading Japanese manufacturers, and such overseas manufacturers as Mr. Joseph Robbins, president of Atari, Inc.; Mr. David Marofske, president of Midway; Mr. Stanley Jarocki, vice president/marketing of Midway; Ms. Lila Zinter, director of marketing of Exidy Inc.; and Mr. Joaquin Franco, president of Interflip, Spain. Following much fervent discussion, a joint statement was issued." [See "Tokyo Huddle on the Copying War," *Play Meter*, June 1,]

Host of this year's Japan Exhibition

The theme and purpose of the 1981 version of the show sponsored by the former JAA in October 1981 are to be settled on later. It has been decided that the show will be held and operated under the joint sponsorship of the three newly-organized associations (including—besides JAMMA—JAPEA, (Japan Amusement Park Equipment Association) and NAO, (Nippon Amusement Operators Association) with due consideration given to relations which then existed between the former JAA and overseas manufacturers.

The address of the association is: Japan Amusement Machinery Manufacturers' Association, Room No. 704, Shuwa Nagata-cho, TBR Bldg. 2-12-2, Nagata-cho, Chiyodaku, Tokyo 100, Japan; phone: 03-593-2563.

FACE UP 21

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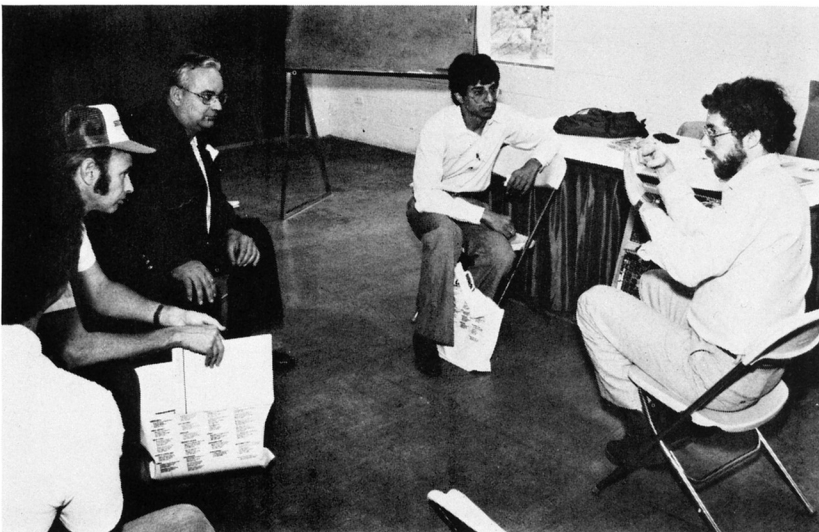
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At well-attended Southwest Vending Sales Game Show, the Southwest team poses with Bob Lilly of the Dallas Cowboys (extreme left): Peggy Magill, sales manager; John Gatens, president; and Tom Chatten, general manager of Southwest Sales.



Some of the manufacturer reps at the Southwest Show: (from left) Marty Glazeman, Williams; Bernie Powers, Bally; Tom Petit, Don Osborne, Atari; Marshall Caras, Abi Carmen, Jim Phillips, Gottlieb; David Stroud, Cinematronics; Ivan Rothstein, Centuri.



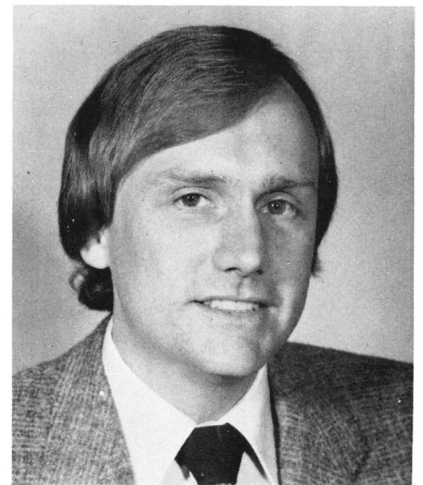
Lew Rudolph of Stern gives technical answers to a group of operators after one of the service schools he taught during the Southwest Game show in Dallas.

Universal promotes

Universal U.S.A. announced the promotion of Tina Zucchi as sales administrator.

Miss Zucchi, who has been with Universal U.S.A. since its opening in Santa Clara, will be responsible for customer parts, and equipment order processing and expediting as well as the many administrative functions that are involved in the daily sales department.

Hal Watner, Universal U.S.A. sales manager, said, "Tina has a good understanding of our industry and has adapted quite well to the customer demands."



Steve Blatspieler

Nat'l sales manager

Steve Blatspieler has been named national sales manager for Cinematronics, Inc. An eight year coin machine veteran, Blatspieler made his mark in the industry as Tournament Games' vice president of marketing. In that post he handled all sales duties as well as coordination of marketing and promotion.

Cinematronics Vice President David Stroud said, "Steve needs no introduction to distributors or operators. He is well known throughout the industry, and we are proud to have him on our team."

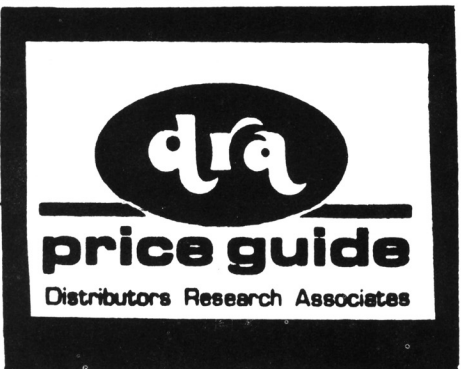
Other recent appointments include Kay Kiedrowicz as customer service manager, and Ron Cole recently moved from electronic test manager to field service manager.

"We feel the recent addition of these professionals to our marketing team will strengthen our ability to service customer needs as well as our growing commitment to the coin machine industry," commented Stroud.

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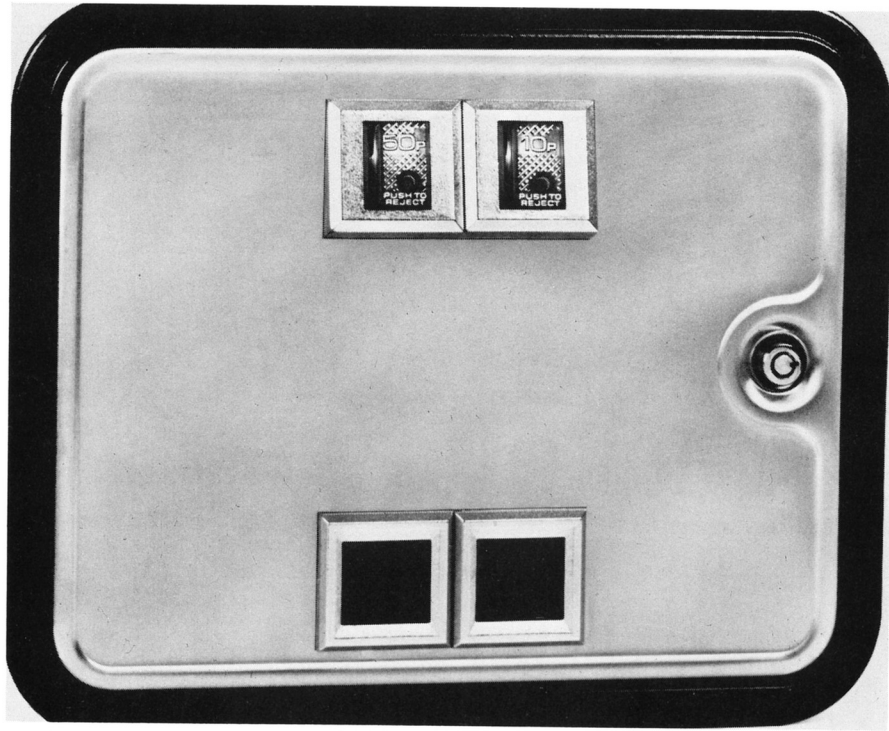
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The amount of cash which Britain spends in amusement and gaming coin chutes is under debate. Now being considered by the Government are 'robot' devices with which to monitor all transactions with the machines.

Video game controls coming in the U.K.?

LONDON—General feeling at present is that license fees on gaming machines will increase, probably in a mini-budget later this year. The possibility of other amusement equipment, particularly video games, coming under government legislation does not appear to be too far off either.

One Member of Parliament has already tabled a motion in the House of Commons to "control the proliferation of video machines" and to restrict their use.

His proposed bill will give power to local authorities to issue licenses for all electronic machines and to control amusement arcades through planning procedures. There was no hint that video games needed to be brought under their control in the Gaming Board's 1980 report issued by the Home Office recently, however. Their attention was mainly hinged on a desire to have "black box" monitoring systems installed in new machines.

In its report, the Board said: "During the year, with the help of our consultants, we produced outline proposals for a monitoring device which incorporated standard mass-

produced components and/which was capable of recording virtually all that happened to a machine over a period of up to twelve months.

"We formed the view that it was not necessary to build such a monitor into every machine but it should be capable of being plugged into a machine as and when required. There would have to be a common interface with the host machine but, other than this, there would be no burden on the host since the monitor would be self-contained.

The Gaming Board report continued, "The cost of each monitor would depend mainly on the number produced, the amount of memory catered for, and the cost of the programming and development work. It could be as low as about £13. In addition, there would be a need for interrogator devices which would also have to be micro-processor based. The cost of these devices would depend on their complexity, the number produced, and the amount of programming and development work and might work out at about £500 each.

"But only a limited number would

be necessary since one interrogator could serve many monitors," concluded the Board.

The object of the exercise, according to the Home Office, is to help cut down on the theft from machines in clubs and although this might be true, there are a great many questions left unanswered in the Board's report.

There are undoubtedly grounds for applying such a system to pubs because the breweries have the control, the staffing and the electronic accounting aids to make use of it.

Cash flow picture

The British pub continues to take on a changing face. Already irate at the acres of aging mock leather and gloss finish pine used by the brewers in a bid to change the typical drinking man's bastion into a contemporary eating house, the British licensee is further alarmed at the increasing slice of the action the powers-that-be are taking from the gaming machine, etc.

Just how much cash flows into the brewers' coffers from machines is a matter for debate—but conjecture is

running high within the licensed trade at present and to such a pitch that the inevitable is more than likely. That is, further government legislation and the possibility of increased taxes.

This is perhaps understandable as the subject of the present craze in pub entertainment, the machines, is so closely controlled by the brewers. Pub tenants have to ask permission to have a machine installed, and in the case of a fruit (amusement with prizes) machines, some brewers may take up to 60 percent of the machine and the license fee.

Estimates of how much cash flows into the brewers' coffers from this source has been fiercely debated over recent months, possibly because the Office of Fair Trading is taking interest in the agreements between brewers and tenants over machines. Some financial experts reckon that the brewers derive nearly 30 percent of their total profits from machines, with an average around 14 percent.

Others put the total much lower, at about six percent of the industry's profits. At this lower level we are talking about maybe £20 a week clear profit for the brewer on each machine—icing on the cake for him, but a lot of money, by comparison, if it went to the tenant.

But if pub tenants are sometimes a bit sore about the division of spoils, it is nothing to the sense on unfairness they feel about jackpot machines. There are 36,000 of these in the U.K. compared with 106,400 "amusement with prizes" machines. But all jackpot machine are located in the members' club and may pay out prizes of up to £200 and are reckoned to show a profit of around £15,000, a year apiece.

By contrast, the maximum legal payment from a pub fruit machine is only with £2, with £1 of it paid out in tokens. So the clubs are selling beer, frequently subsidized by loans from brewers, and able to offer their customers casino-style payouts while the machines in pubs are just keeping their drinkers in peanuts!

Somewhat surprisingly, then, the government failed to raise the price of license fees for gaming machines in its budget earlier this year. These have stayed at £25 for the first fruit machine and £100 for any others since 1969. Jackpot licenses, however, are considerably higher.

The changing face of the British pub continues...without doubt, the old spirit and sawdust days are long gone

—Play Meter's International Desk

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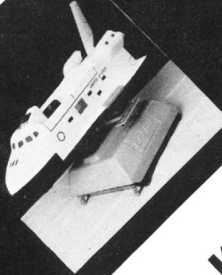

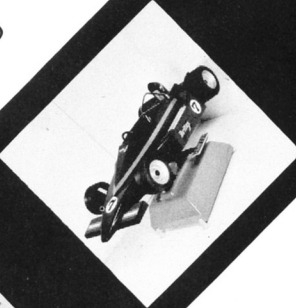
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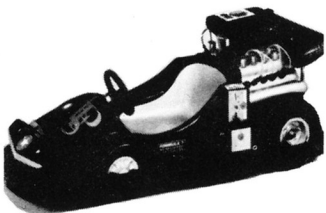
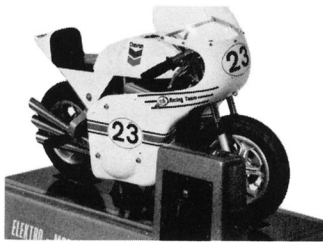
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Midway service mgr.

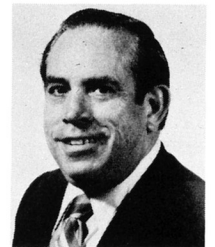
Richard (Dick) Konopa was recently appointed to the position of customer service manager of Midway Manufacturing Company.

Konopa has been with the company for 22 years. He has held responsible positions in the Parts, Production, and Engineering Department. He was most recently involved with the Consumer Products Division. "We know that his experience with the company will make him a most valuable addition to our marketing team," said Midway vice president Stan Jarocki.

He will be working closely with director of sales, Larry Berke, in the scheduling of games in conjunction with production, traffic and shipping to expedite orders. He will also be assisting distributor customers.



Richard Konopa



Harvey Spurlin

Banner sales exec.

Harvey Spurlin has been appointed executive sales representative for Banner Speciality Company, it was announced by Albert M. Rodstein, president of Banner Specialty Company.

A native of Willow Grove, Pennsylvania, Spurlin will be directly responsible for equipment sales in eastern Pennsylvania, New Jersey, and Delaware.

Prior to joining Banner Specialty Company, Spurlin was regional executive salesman for Canteen Corporation. Before that, he was national sales manager for the Continental Coffee Company's Guardian Filter Division where he also was employed as a vending product specialist. He started his vending industry career with Rudd-Mekikian, Inc.

With executive offices in Jenkintown, Pennsylvania, Banner Specialty Company has been in the business of distributing coin-operated vending and amusement equipment for the past 64 years and currently has offices and showrooms in Philadelphia, Pittsburgh, and Baltimore.

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Equipment Poll

Top Videos

June 5	May 20	June 5	May 20
1 PAC-MAN/Midway	1	6 BERZERK/Stern	5
2 DEFENDER/Williams	2	7 ASTEROIDS DELUXE/Atari	7
3 ASTEROIDS/Atari	3	8 GALAXIAN/Midway	9
★ 4 SCRAMBLE/Stern	8	★ 9 ARMOR ATTACK/Cinematronics	—
5 GORF/Midway	4	10 PHOENIX/Centuri	—

Honorable Mention: ASTRO BLASTER (Gremlin), SPACE INVADERS (Midway), STAR CASTLE (Cinematronics)

Top Pins

June 5	May 20	June 5	May 20
1 BLACK KNIGHT/Williams	1	6 FLIGHT 2000/Stern	6
2 FIREPOWER/Williams	2	7 BLACKOUT/Williams	8
★ 3 EIGHT BALL DELUXE/Bally	—	★ 8 MARS, god of war/Gottlieb	—
4 XENON/Bally	3	9 JUNGLE LORD/Williams	9
5 FLASH GORDON/Bally	4	10 GORGAR/Williams	10

Honorable Mention: ALIEN POKER (Williams), FLASH (Williams), SPACE INVADERS (Bally)

★ indicates rising on the survey's chart.

If you would like to join readers currently participating in the survey, simply fill the coupon below and mail to: Play Meter Equipment Poll, P.O. Box 24170, New Orleans, LA 70184.

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Troubleshooting Clinic

Phoenix Spaceship Setting

Centuri Inc., citing "wide customer play variation," recommends the number of spaceships per play be limited to three.

This adjustment can be done by placing dip switches 1 and 2, located on the logic board assembly, to the ON position.

Phoenix 50¢ per play option

Incorporated on the later *Phoenix* boards, the 50¢ per play option can be controlled by dip switch #5. Set switch to ON for 50¢ per play.

Note that the game counts number of coins inserted and *not* the number of credits. If no change occurs in pricing when the dip switch is placed in either direction, EPROMs R0, R1, R2, and R3 need to be exchanged with the new EPROMs available through Centuri's Parts Department.

Pac-Man Credit Multiplier

The credit bypass jack is not needed when a credit multiplier unit is used (PC #A082-91348-C000). The credit multiplier is intended for foreign games, said Andy Ducay, Midway's service manager.

When the credit multiplier is missing, the coin jack must be inserted to the credit bypass jack for proper coin operation.

Rip Off Contrast Adjustment

There may be too great an intensity difference between the fuel cells and the ships if your *Rip Off* game is positioned in a low ambient light environment. This contrast problem can be solved by the insertion of a variable resistor in the intensity network located in the monitor PC board.

Replace R10 (5.6K) with a 5K ohm potentiometer. This will allow the fuel cells to be adjusted to an acceptable level.

High Voltage Section Regulators

On older Cinematronics monitors incorporating a high voltage cage and associated components, a substitution may be made for the +18 (7818) and -18 (7918) volts regulators if these are unavailable.

IC3, the +18 volt regulator, may be replaced by a +15 volt regulator, 7815. IC 5, the volt regulator, may be replaced by a -15 volt regulator, 7915.

There will be a 20 percent decrease in overall output levels that does not degrade game performance. Potentiometers R102 and R209 may be adjusted to compensate for increase in screen size. Verify that resistors R12 and R13 are rated at 4 watts as there will be a 20 percent increase in power dissipation.

—Zac Oliver

Digital service film plan on MOM's agenda to sell

The Music Operators of Minnesota association was deciding in late June the methods for marketing and distributing an instructive film on games' technical troubleshooting.

The film is based on a two day class recently hosted by MOM and presented by Jim Sneed and Gene Rooney of Kurz Kasch, Dayton, Ohio. The course, similar to those taught by Sneed at the Amusement Operator Expo '81 and elsewhere, covered means of isolating digital logic faults at the component level.

In the seminar/workshop Sneed discussed this technique using the Signature Analyzer. The method, he said, "is not only considered the most useful in microprocessor-based products troubleshooting but

is also applicable to all digital components."

The tracking of signals and the conversion of lengthy bit streams into four-digit "hexidecimal signatures" was highlighted during the in-depth session, which included hands-on application by the 25 students during the second day.

Rights to market the filmed sessions were granted to MOM by Kurz Kasch, and the film will be edited to four hours of audio visual instruction, said a spokesman for MOM.

The MOM Education Committee was to meet June 19 to decide on means for distributing the film. A MOM officer said it will likely be offered to operators outside Minnesota, not to members only.

PLAY METER CALENDAR

July 24-26

Amusement & Music Operators of Tennessee, annual convention, Hyatt Regency, Nashville

September 11-13

North Carolina and South Carolina coin operators associations' combined annual convention, Carolina Inn, Columbia

September 25-26

West Virginia Music & Vending Association, annual meeting, Ramada Inn, South Charleston

October 6-8

JAA Convention, International Trade Center-Harumi Bldg., Tokyo

October 7-12

Japan Electronics Show, Osaka International Trade Fairgrounds, Osaka

October 12-18

Taiwan Electronics Show, World Trade Center, Taipei

October 14-20

Korea Electronics Show, Exhibition Center, Seoul

October 15-18

Enada Show, Rome, Italy

October 16-17

Amusement & Music Operators of Virginia, annual convention, Holiday Inn, Richmond

October 29-October 31

NAMA annual convention, McCormick Place, Chicago

October 29-31

AMOA Exposition, trade show and convention, Conrad Hilton, Chicago

Pages flip-flopped

To: All those readers who wondered, on reading the July 1 issue of *Play Meter*, why there was a technical chart on the page following page 62;

And, to all those who were baffled by reading the last page of "Critic's Corner" on page 59 following technical articles:

There is an explanation.

Elves in our press made the mischief, transposing pages 59 and 63 faster than the eye could see. We distinctly recall placing those pages in their proper places. So it had to be the pixies at work.

We apologize to the readers and to the writers of the material, Zac Oliver and Roger Sharpe, for this inadvertent flip-flop.

—The editors

“I had a dream today, oh, boy...”

In which there is a world where replacing service personnel is no problem

By Art Seglin

The news had been given to me as I was leaving for the day. Joe, after twenty-two years with the company, was leaving my employment. Now, I had to find a replacement.

My wife had complained about my lack of appetite at dinner and attempted to determine what was “bugging” me.

Now, here I was tossing and turning in bed trying to fall asleep. Until now, I did not realize how much I was disturbed, because I remembered that Steve, the other “old-timer,” was contemplating retirement within a year. I was about to lose one employee of twenty-two years and another close to thirty years. My entire service organization was disappearing. Who and where would I find two devoted, conscientious, knowledgeable people to take over the maintenance of my machines?

Finally, sleep overcame all the anxieties that this day had brought, but the daytime events “triggered” my nighttime dreams. The dream started as my working day ended; Joe was giving me his two-weeks’ notice, and at the same time, Steve was telling me of his plans to retire. Having met this situation in reality, the announcement did not have the same traumatic reaction in my dream.

My initial thoughts took the memory trail, going back to the day my father hired Joe. Steve had been a fixture by the time I was old enough to be able to go on calls with my father. Joe, as a spectator, was looking over my dad’s shoulder as he struggled with a frustrating service call. A suggestion from the onlooking spectator, followed by the application of advice, got the machine back in operation. With no inquiries about Joe’s background, my father offered

Joe a job, and we had a new mechanic on the payroll.

Tension about replacement people was non-existent, because things had changed since my father’s time (in my dream world). I would contact SATAN, which stood for Service Aid Too All Needs; they would go through their computerized listing of available personnel and I would have a replacement for Joe within days.

Having SATAN as a source of personnel had alleviated the problem of searching for new employees. Newspaper advertisement, completing employment applications, screening many to narrow the field, were now an obsolete process of the past. People available for all types of positions were accessible by simply punching in the request at my office computer terminal.

When a candidate was selected, much of the guesswork as to their abilities and character was removed. PET CAT (Potential Employee Testing and Telling) would take over the job of submitting the applicant to all types of testing. The applicant’s character would be analyzed, and I would know his stability standing, truth quotient, mechanical rating, and all the personality possibilities that usually take a long time to discover.

Mechanical, electrical and electronic capabilities would be charted as well as learning aptitudes in all repair areas. Equipped with all of this pertinent data, I could now place this person in the proper job to fit his abilities. Knowing the good points and the shortcomings I would be able to start an in-house training program, using Steve as the instructor and the new employee as the student.

I would order the training program

required to upgrade the new employee’s knowledge to meet the needs for the equipment that I operated. The course of instruction would be ordered from SWIFT (Scientific Work Instruction For Technicians.) Using my video disc player, Steve would direct the newcomer through the course, with the workbook and tests to check progress. A side benefit from SWIFT is that Steve would be refreshed in his knowledge as he teaches and would update his learning. Both Steve and the new employee would be sent to the SWIFT quarterly check-out seminar to verify satisfactory comprehension of the course.

The new systems had acted as an aspirin for an old headache. I could sleep easily—until the awakening, still faced with an uneasily resolved problem.

A dream solved the dilemma which has to be faced by so many during their business years. It is a situation that has plagued the coin-op business since its very inception. There is no central source from which to draw personnel. Testing of people coming into or already in the industry is either haphazard or non-existent. Training, no matter what type, is spotty and inconsistent.

A nightmare is more nearly true than a dream to describe the hiring, testing and training as it is at present. It is a problem that has troubled me for all the years I have been in the business.

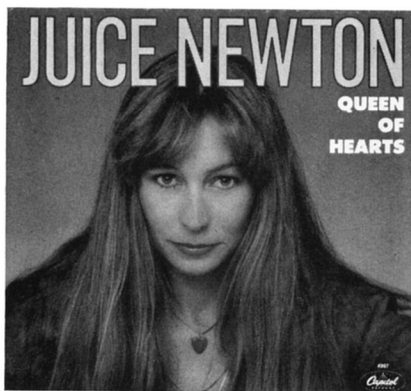
Hang in—I am applying myself, with the aid of experts in all areas, to bring a panacea to the industry, and if not a panacea, at least a large step in the right direction for me, for you, and the industry to make the dream come true.

MUSIC PROGRAMMING



By Pat Matthews

Desserts for the summer



The summer, any part of it, is good for hit records. And usually plenty of 'em. Summer in America, especially, for some reason has always meant a time for growing. Young people, through life experiences as well as the obvious chronological aging, have done most of their "growing" during summer months. So, as we near the end of another, here's a tip of the hat from this corner to young people (no matter how old) everywhere. I hope your summer's been as good as the music we're about to talk about.

Queen of Hearts—Juice Newton—Capitol/P-4997

Our "cover girl," so to speak, this issue is the lady with the name that in no way resembles the innocence of her smile. As you may recall, I reviewed her debut single a while back and mentioned how she was

one of those artists who had to pay her dues for a long time to finally get just desserts. Well now she's back. Which only goes to prove the age old axiom that things are a bit easier the second time around. Immediately obvious to the ear is the change in tempo from the "first" single, *Angel Of The Morning*. Also, it's fairly obvious, this one may not make it on Easy Listening or Pop formats. However, that won't stop it from being a chart topper of the Country persuasion: *10 out of 10* on the just mentioned chart.

On And On And On—Abba—Atlantic/3826

It's been a long time for this Swedish "empire." A long time for them to release this type of "rock and roll" sound as a single. I might dare say it's the most rockin' thing they've ever done. Despite the slight change in musical direction, those uplifting trademark harmonies are once again in evidence to add somewhat of a "contradiction," if you will, to this obvious commercially viable record. See if you don't agree after just one listen: *9 out of 10* or better on Pop and, yes, the Adult Contemporary charts. Those guys will play just about anything.

Slow Hand—Pointer Sisters—Planet/P-47929-A

The sisters are back on what seems to be *another* rise to the top in

what has to be one of the more "up and down" careers in recent memory. Their initial splash on the entertainment scene back in the early Seventies was auspicious enough with all that 1930s jive dressing, but then the girls disappeared soon after that. Thanks mainly to current producer Richard Perry, they were brought back to life, so to speak, in 1978 in the form of the "Energy" lp. That album had a tremendous hit in the Bruce Springsteen-authored *Fire*. It finally seemed they were back to stay—even if it was without sister Bonnie who decided that disco would surely outlive Rock 'n' Soul. She was partly right. The remaining three sisters couldn't seem to find the missing ingredient to produce a hit in the subsequent lps (released in 1979, and then '80), even though Richard Perry has stuck with them. But now, I think they're on to something. This time I believe Perry and the Pointers have recaptured that feeling which has been missing since the *Fire* days, if you will. Even to the point of sounding similar to that song which has become a rock classic to some. This one should do *10 out of 10* on best chart.

Genini Dream—The Moody Blues—Threshold/TR 601

Sounding a lot like their "successors" in the land of Grandiose Rock, the Electric Light

Orchestra, the Moodies are back after being left for dead several times over the past five or six years. Even if it is without our personal favorite, Mike Pinder, some of the magic has transcended previous adversities to bring this classic collection of songwriters/singers/musicians to the forefront once again. The main thing that sets this particular song apart from anything they've done in the past, is the simple fact that you may see someone dance to it. Heaven forbid! *My Moody Blues*...a dance band? Give it *9 out of 10*, at least.

You Are Forever—Smokey Robinson—Tamla/T54327F

This one is certainly a surprise release. Not because of the choice, but because of its timing. *Being With You* is still the powerhouse we predicted sometime back. But as we mentioned earlier on this issue, summer seems to bring out the best in everyone and Smokey Robinson is no exception. It's as breezy as *Summer Wind* and should follow as well; *10 out of 10* on the highest chart.

Boy From New York City—Manhattan Transfer—Atlantic/3816

What would a music review column be without at least one remake? Its hard to imagine. So here goes. Remember the Ad-Libs? Who could forget 'em. They had a hit with this one, but it was one of those

which might be forgotten just as easily as one would forget the group which immortalized it in song. So, for a moment, let's pretend this is a brand new song, never before heard by the human ear. It's a definite harkening back to those *Cool Jerk* days of the Sixties when Soul bands had singers who had to know how to dance better than they could sing and continued to impress this upon the public through most of that decade and part of the next. Well, the Manhattan (appropriate) Transfer sings a lot better than they dance and are probably the premier arrangers of the music biz today. Witness what they did to the theme from "The Twilight Zone." All of which adds up to a tremendously successful record...and yes, it should cross over to the R & B charts. *10 out of 10* on the highest, at any rate.

A Texas State Of Mind—David Frizzell & Shelly West—Warner Brothers/WBS 49745

Not quite as bluesy as Billy Joel's state of mind salute to his home town, New York, but more country blues than country pickin'. The last time this two-some got together was to sing about Oklahoma and that one did well, as we predicted. Now as they travel farther south, we get that lazy "down home on the range" feel from a team that is turning into quite a combination. Should go Top Ten Country, but I'll play it safe and only wager *9 out of 10*. Okay?

- AMERICA—Neil Diamond—Capitol
 SUKIYAKI—A Taste of Honey—Capitol
 WHAT ARE WE DOING IN LOVE—Dottie West—Liberty
 A WOMAN NEEDS LOVE (JUST LIKE YOU DO)—Ray Parker, Jr. & Raydio—Arista
 BETTE DAVIS EYES—Kim Carnes—EMI America***
 BEING WITH YOU—Smokey Robinson—Tamla
 THIS LITTLE GIRL —EMI America***
 LIVING INSIDE MYSELF—Gino Vannelli—Arista
 STARS ON 45—Medley—Radio Records/Atlantic
 TAKE IT ON THE RUN—REO Speedwagon—Epic ***
 I CAN TAKE CARE OF MYSELF—Billy & The Beaters—Alfa ***
 MODERN GIRL—Sheena Easton—EMI America ***
 THE WAITING—Tom Petty & The Heartbreakers—MCA/Backstreet
 JESSIE'S GIRL—Rick Springfield—RCA
 THE ONE THAT YOU LOVE—Air Supply—Arista ***
 YOU MAKE MY DREAMS COME TRUE—Daryl Hall & John Oates—RCA ***
 SWEETHEART—Franke & The Knockouts—Millenium
 ALL THOSE YEARS AGO—George Harrison—Dark Horse***
 WINNING—Santana—Columbia
 NOBODY WINS—Elton John—Geffen
 SAY WHAT—Jesse Winchester—Bearsville
 TIME—The Alan Parsons Project—Arista***
 ELVIRA—The Oak Ridge Boys—MCA

***denotes records reviewed previously by PLAY METER

Centuri profits

Centuri, Inc. has reported record-breaking earnings for the second quarter ending April 30, 1981.

Revenues were \$16,238,220, with net income of \$2,642,120, or 27¢ per share. This compares with revenues of \$747,120 and a net loss of \$609,670 or 8¢ per share for the second quarter in 1980.

Revenues for the first six months of fiscal 1981 were \$22,722,599 with a net profit of \$3,021,262, or 31¢ per share. This compares to revenues of \$1,485,077 and a loss of \$1,280,674, or 17¢ per share for the same period in 1980.

The Hialeah, Florida electronics games manufacturing company currently has a net operating loss carry forward of \$10,137,000 which can be utilized to reduce taxes payable on future earnings, Centuri reported.

"The video game marketplace, in which Centuri is heavily involved, continues to grow stronger," said company President Ed Miller. "Our expanding manufacturing and support facilities have allowed us to be very competitive and produce some exceptionally well-received games."

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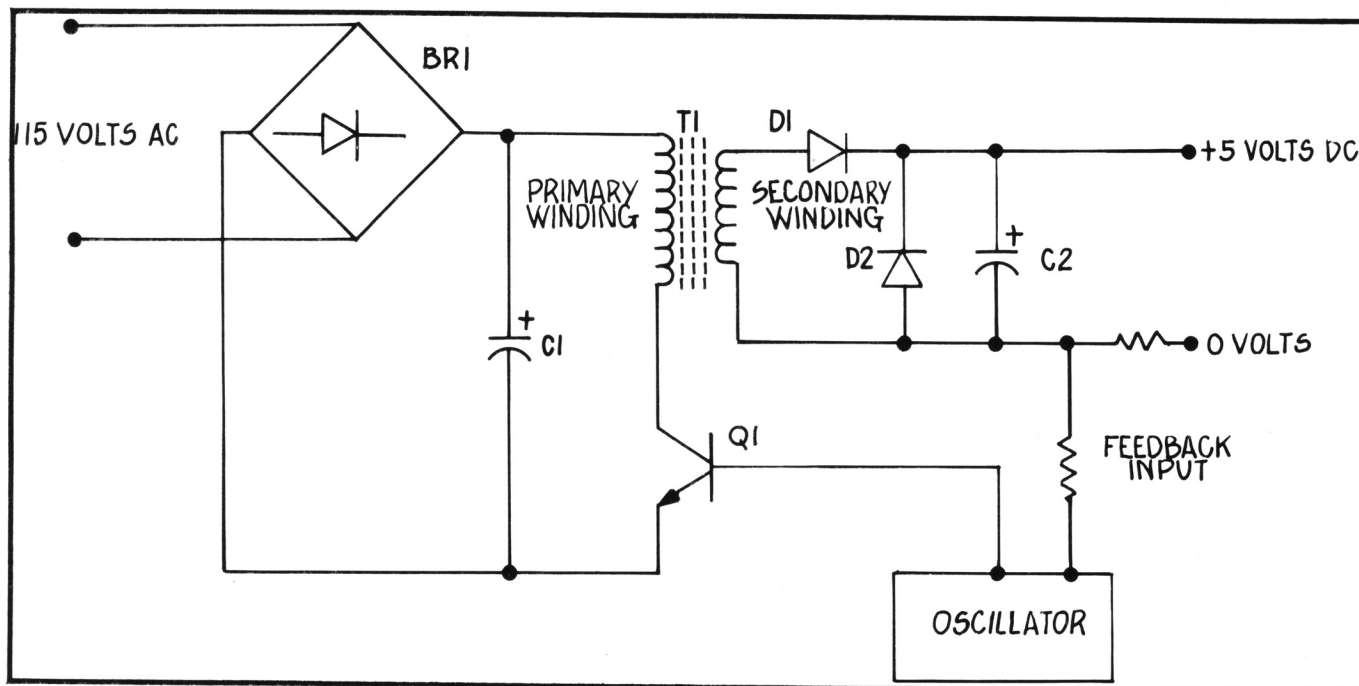
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**You saw it in
 PLAY METER**

'The Arcade School'

by Randy Fromm

Switching Regulator Power Supplies



There's a new type of power supply that's popping up in some Japanese video games. It's lightweight because it doesn't require a conventional iron core transformer. It generates very little heat, making it more efficient and keeping the game cooler inside.

It's called the switching regulator power supply, and as prices drop for these tiny power supplies that can deliver large amounts of current, they'll be showing up more often. Sega uses a switched regulator power supply for *Monaco GP* and *Space Tactics*.

The power supply, which is about the size of a one half of a carton of cigarettes, can deliver six AMPs of current at five volts!

Let's take a look at the basic circuit and see how it works.

Theory of operation

The 115 volts AC from the AC

receptacle is run directly into a bridge rectifier, BR1. The output from the bridge is filtered by Capacitor C1, so we now have a DC power supply of about 140 to 150 volts DC.

Remember, our goal is to end up with five volts DC, so at the moment our DC power supply is much too high a voltage to connect directly to the computer.

Transistor Q1 acts as a high frequency switch to switch our power supply voltage on and off across the primary winding of the high frequency transformer, T1. The secondary winding of the high frequency transformer has fewer turns of wire than the primary winding has, so it picks up less voltage.

We have succeeded in lowering the voltage using a high frequency transformer, but in doing so, we have changed it back to AC again. Diodes D1 and D2 rectify the high frequency

AC, and it's filtered by capacitor C2 and sent out to the logic board as five volts DC.

The driving signal for Q1 comes from an oscillator. This oscillator, called a pulse width modulated oscillator, senses the output voltage of the power supply through a feedback loop, and changes the length of time that Q1 stays on.

If the output voltage of the power supply is too low, the oscillator allows Q1 to stay on longer. This stores more power in the high frequency transformer, and the output voltage goes up. If the output voltage is too high, the oscillator allows Q1 less turn-on time, and the output voltage of the power supply goes down.

Why go through all that trouble just to get our five volts? First we rectified the 115 volts AC, converting it to a high voltage DC power supply. Then we converted

Part One

that high voltage DC power supply to a high frequency AC supply, ran it through a transformer, and rectified it and filtered it again for a five-volt DC output.

There are a couple of good reasons for using what at first seems like an unnecessarily complicated circuit. First of all, the switching regulator's speciality is providing large amounts of current. To make a conventional power supply that would provide 6 AMPs of current at five volts would require a fairly large and heavy power transformer to step-down the 115 volts AC. The switching regulator still uses a transformer to step down the voltage, but instead of using a conventional transformer that operates at the 60 cycle per second frequency of the line voltage, it uses a high frequency transformer.

Why a high frequency transformer? Because a high frequency transformer works with a lightweight ferrite core instead of the heavy laminated iron core required by a conventional transformer. This high

frequency transformer is similar to the flyback transformer used in monitors, but the voltage is stepped down instead of being stepped up. Both use a ferrite core; ferrite is a kind of compressed carbon material.

So the reduction of size and weight is one advantage of the switching regulator power supply. The other advantage is in the amount of heat dissipated by the supply, because it runs very cool compared to conventional power supplies. Conventional supplies lower the output voltage by changing excess voltage to heat energy.

In the switched regulator, the high frequency switch is simply not turned on long enough to allow any excess voltage on the output. Since the transistor is either fully on or fully off, there is very little dissipation of heat required.

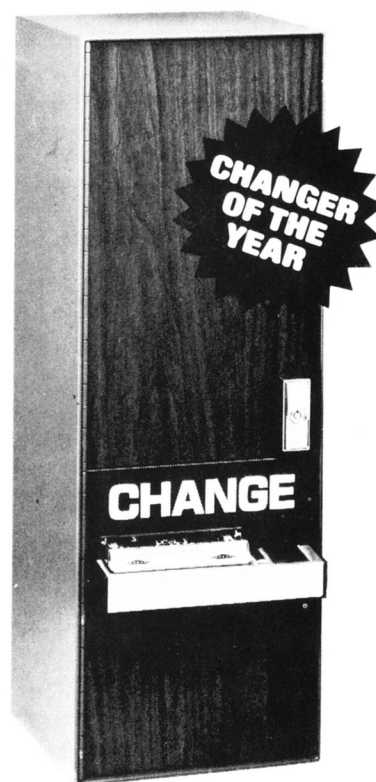
In part II of our discussion of switches regulator power supplies, we'll look at an actual schematic for a typical switched regulator power supply, and see how it works. •

AC Current Ratings

ASTEROIDS(Atari) upright	1.5 amps
DEFENDER(Williams) upright	1.66 amps
PAC-MAN(Midway) upright	1.6 amps
PAC-MAN(Midway) cocktail	.84 amps
SCRAMBLE(Stern) upright	1.4 amps
QUASAR(U.S. Billiards) upright	2.0 amps
QUASAR(U.S. Billiards) cocktail	1.4 amps
ROUTE 16(Centuri) upright	1.4 amps
PHOENIX(Centuri) upright	1.05 amps
MISSILE COMMAND(Atari) upright	1.52 amps
BATTLEZONE(Atari) upright	2.1 amps
STAR CASTLE(Cinematronics) upright	1.4 amps
SPACE INVADERS(Taito) cocktail	.56 amps
TARG(Exidy) cocktail	1 amp
MONACO GP(Gremlin)sit down	1.6 amps
GALAXIAN(Midway) upright	1.24 amps
BERZERK(Stern) upright	1.55 amps

—by Randy Fromm

Ardac's newest dollar bill changer. Compact. Low cost. Bulk loaded.



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GREAT IDEA

Another in a series of
'tried and true' service hints
from Play Meter's readers

What's wrong with video games

Serviceability???

1. No schematics or poor erroneous outdated ones.
2. No program listings on *Proms*.
3. No information, because manufacturers are afraid someone is going to copy the game.
4. Can't read the printing on Japanese schematics.
5. Test sets for one game are expensive and who has enough of one game to pay for special test sets?
6. No one cares about the owner or service people. *Wrong!*

Someone took time to send in this article to share some service hints.

There are two important things to remember about service:

1. *Quality is your future.*
2. *Time is money.*

Without proper documentation and expensive test equipment it is practically impossible to service the equipment. If it is serviced with the aid of expensive computer test equipment you'd be afraid to give anyone the bill for service if you billed for the hours you spend on servicing, and the cost of special equipment.

On video games if a Programmed Read Only Memory chip (PROM) is bad, what do you do? You start to work on the board and since you don't have a set of spare PROMs, you start to change out soldered—in chips, in the hope that this will fix the board.

If you had a set of PROMs and changed them all, then the board worked, which one is bad?

When a new game appears on the market, you start to sell some and would like to keep your customers. You better be prepared for service.

On a new game the PROMs (2716's and 2732's mainly) can be removed easily because the manufacturer has to have an easy way out if the game goes out in the

field and then a problem with the program comes up.

This is solved by placing them in sockets.

This seems to be a selfish thing. Programmed PROMs are the responsibility of the game manufacturer and he must not be sure of them or else he wouldn't put them in sockets. He certainly doesn't care about the regular Ic chips as he can blame the manufacturer if they go south, so these are soldered in the board.

How to solve the problem

When a new game appears, remove the 2716's or 2732's and take them to a semiconductor sales house and make copies. These should be then filed as masters.

When a board comes in for service, the PROMs in the board can be checked against the masters in an inexpensive comparator.

The word inexpensive means something under two hundred dollars such, as the one on the market by MD Electronics in Phoenix, Arizona.

Since most new boards use Z280 microprocessors, a few spares will go a long way in checking these by substitution.

At least now, if the board doesn't work, the microprocessor and PROMs are known to be good and the board won't go back to the factory for a simple plug in change.

Joe Moran
Phoenix, Arizona

Hotlines: Tech service

Operators and their technicians can find a wide range of service and technical aid at their fingertips... through the use of the telephone. Many factories provide a toll-free phone line for calls in to their customer service and parts departments.

Here is a current list of the appropriate service and parts call lines for manufacturers in the U.S.A.:

Atari/California 800/538-1611
Atari/New Jersey 800/526-3839
Bally: 800/323-3555
Centuri: 800/327-7710
Cinematronics: 800/854-6577
Data East: 800/538-5129
Exidy: 800/538-8402
Exidy/California: 408/734-9410

Electro-Sport: 715/979-1875
Game Plan: 800/323-9425
Gottlieb: 800/323-9121
Gremlin/Sega: 800/854-1098
Gremlin/Sega/California: 714/277-8700
Midway: 800/323-7182
Nintendo: 212/741-3247
Rock-Ola: 312/638-7600
Star Bull: 800/633-1572
Star Bull/Alabama: 205/749-2061
Stern: 800/621-6424
Stern/Illinois: 312/935-4600
Taito America: 800/323-0666
Taito America/Illinois: 312/981-1000
Tournament Games: 800/426-8897
U.S. Billiards: 516/842-4242
United Billiards: 201/686-7030
Universal USA: 900/538-8548
Williams: 800/621-4765.

Desoldering components from high-density PCBs

By Al Rosenthal
of Pace, Incorporated

High density circuit boards now incorporate very tight lead-hole spacing so that the lead fits tightly into the plated-through hole. In addition, there are often large ground busses located on the surface of these boards that tie-in to several leads on each component, adding additional thermal mass properties that must be overcome during desoldering.

To overcome these problems, it is almost mandatory that the desoldering technician must now consider the thermal mass properties of each solder joint prior to commencing desoldering operations. And, it is still important that heat applied to each joint still be limited to a maximum dwell time—normally 2-3 seconds.

Since most components associated with printed circuit assemblies have been soldered in place, heating is one of the key factors in component removal. The circuitry ruined completely in the application of excessive heat.

On semiconductor devices, the desoldering operations must be performed rapidly, in no more than three seconds per solder joint, as a rule.

Similarly, the circuitry itself is highly susceptible to heat damage. Since controlled pressure and heat were used to bond the circuitry to the base material in manufacturing, when these same forces are applied during desoldering operations,

delamination can occur.

At temperatures necessary to melt solder, the bond strength of circuit elements can be reduced to approximately 20 percent of their cold strength in just a few seconds. If excessive pressure from a soldering or desoldering tool is applied, it can easily delaminate the circuit pads or runs.

Thermal Mass Considerations

A primary factor to consider before attempting to desolder any joint is the joint's *thermal mass*. In general, the greater the mass, the more heat required. The mass of any particular joint may vary over a wide range. If we consider only a single pad on a single-sided circuit board, there's relatively little mass involved, so the pad heats up quickly.

But if we have a double-sided board with plated-through holes, we have more than doubled the mass, and that's before the mass of any component lead is taken into consideration. The lead mass itself can vary greatly, since some leads are thicker and longer than others.

Additionally, the circuit runs to each joint may vary in size and number, and some joints may have large metal surface planes or busses connected to them. There may be stand-off terminals mounted at the joint, with one or more connecting wires attached to the terminal.

Each joint, then, has its own particular thermal mass; and how this joint mass compares with the

mass of the heat source (soldering iron tip, desoldering tip, etc.) determines the rate of temperature rise of the work.

Surface Condition

A second factor of importance is the *surface condition* on the joint at the area of contact between the heat source and the joint. If there are many oxides, coating or other contaminants covering the solder joint, there will be a barrier to the flow of heat. Then, even though the heat source is the right size and temperature, it may not be able to supply enough heat to the joint to melt the solder in an acceptable time period.

Thermal Linkage

A third factor to consider is *thermal linkage*. This is the area of contact between the heat source and the solder joint. In desoldering for component removal operations, thermal linkage is made between the tip of a desoldering tool and the solder joint itself.

Heat Rate Recognition

For desoldering, the primary workpiece indicator is *heat rate recognition*...observing how fast heat is flowing into the solder joint. In practice, this means observing the rate at which at the entire solder melts, which should be within 1-3 seconds for desoldering.

Any component removal procedure must control the amount of heat and pressure applied to the solder joint, within acceptable time

A primary factor to consider before attempting to desolder any joint is the joint's *thermal mass*.

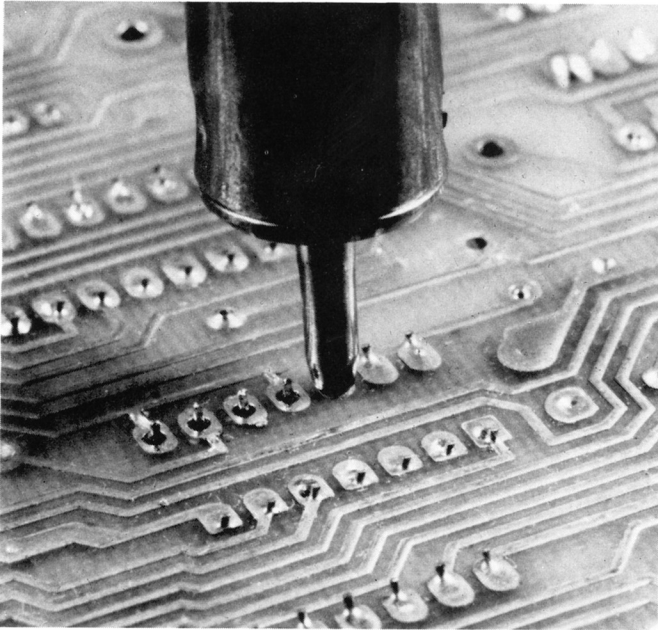


Figure 1— Desoldering of Dual In-Line Pack using a heated Solder Extractor having continuous vacuum. Desoldering performed on a lead-by-lead basis.

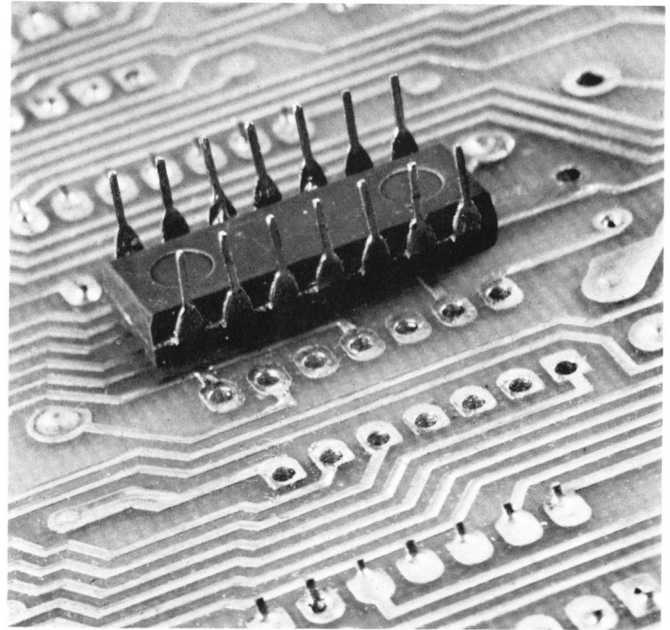


Figure 2— 14-pin DIP completely desoldered and shown removed from circuit board. Note that holes in board are fully cleared of solder, and that all pads are clean and intact.

limits. To achieve effective soldering with minimal risk of damage, we must consider the best means to achieve efficient heat transfer from the heat source to the solder joint. And, the prime pipeline for quick, efficient heat transfer (flow) through a solder joint is via the *solder mass* itself.

The secondary means is via the *component lead*. Ideally, optimum heat transfer should be through a combination of these two media. However, application of heat directly to a circuit pad itself, with heat transfer through the plating in the hole, should be avoided. These are low mass elements which are easily damaged by excessive heat!

Prior to any desoldering operation, the solder joint should be inspected to assure that there is sufficient surface solder fillet to work with. If not, then additional solder fillet should be added to the joint prior to desoldering.

Desoldering System Selection

There are many types of solder removal methods; however, a continuous vacuum solder extraction system is ideally suited for desoldering components from high density PCBs. An ideal solder extraction system consists of a handpiece having a hollow tip, heating element, heat transfer tube, and a solder receiving chamber that collects and solidifies the waste

solder (and in some systems, clipped leads as well).

The solder extraction handpiece normally is provided along with a power source that controls the vacuum (and in some cases, pressure), and the necessary electrical voltage to the desoldering unit heater.

The advantage of this type of system is that it can provide full control of both heat and vacuum. In some systems, a power source can also provide variable control of the temperature level at the heated tubular tip. This is ideal since it will permit more precise operation on different board, hole, solder mass, and heat sinking configurations.

For solder extraction, the heated tip is applied to the solder joint (not the pad). When solder melt is noted, the vacuum is activated causing the solder to be withdrawn from the joint and deposited into a collection chamber.

To overcome the critical problem of the lead re-sweating to the side walls of a plated-through hole, the lead should always be oscillated with the tip, prior to and during vacuum application. This permits cool air to flow into and around the lead and hole side walls, causing them to cool down, thereby preventing lead re-sweating.

Solder extraction with continuous vacuum is the only consistent method for overcoming this re-sweat problem for either dual- or multi-

leaded components terminating into plated-through hole solder joints in double-sided boards.

Desoldering Tip Selection

A solder extraction handpiece is normally provided with various sizes of tubular tips. In operation, the tip performs four basic functions. First, it is the primary means of transferring heat to melt the solder joint. Second, it initiates the path through which the molten solder will flow. Third, it pulls ambient air through the joint to cool the joint and to prevent lead-to-surface re-sweating. Fourth, it is used to manipulate the lead during the entire sequence.

Considerations for selecting the proper tip size are based on the minimum Inside Diameter (ID) which will fit over the lead or pin for maximum heat transfer, while allowing sufficient clearance around the lead to permit molten solder and air passage through it.

The maximum Outside Diameter (OD) of the tip selected should not cover the pad completely or touch the circuit board base material itself, nor extend over the figures of an eyelet or funnelet. For desoldering terminals, the tip OD is selected to permit entry into the desired area.

The Desoldering Operation

When desoldering, the operation is performed on a lead-by-lead basis (see figures 1 and 2). This permits

controlled desoldering based on the individual thermal mass properties of the joint, while limiting heat build-up over a large area. It is best to first examine how the component is mounted to the board in terms of the thermal mass of each joint, on both sides of the board.

Typically, some joints will be connected to one or more circuit tracks, some to surface ground planes, busses or large solder masses, and some will be totally unconnected (pads/terminals only). Then, determine the amount of solder mass at each joint. Each should have an adequate solder fillet to assure positive heat transfer through the joint. If sufficient solder is not apparent at the joint, it is best to add solder to the joint to build up the fillet, thereby assuring good heat transfer characteristics for desoldering.

It is best to hold the desoldering handpiece, like a pencil or soldering iron, for maximum operator comfort and control. The tip should be placed over the lead so that it is approximately at a right angle to the board. The operator's arm should be so positioned so that he is comfortable, and that there is no strain.

During any desoldering operation, it is necessary that circuit pads or adjacent circuitry be protected from lifting or damage, and that measling does not occur on the adjacent base material. The two most damaging elements that can cause problems are *excessive heat and pressure*.

To prevent any of the above problems, only a light touch should be used when desoldering—essentially allowing the desoldering tip to just lightly touch the pad. Also, dwell time on the joint should be kept to a minimum—normally about 2-3 seconds maximum after the initial solder fillet melt.

The tip should be held tightly against the solder joint with no more pressure than a pencil balanced lightly on its tip. The solder should be permitted to melt.

Once the melting action starts, and the tip comes down over the lead, the tip should be used to move the lead until the lead swings free and easily, indicating full solder melt through the joint.

When desoldering round leads, the tip should move the lead in a circular motion. When desoldering flat leads, such as on dual in-line packs, the tip should move the lead back and forth along the flat plane of

the lead. Once the lead moves freely, indicating full solder melt through the joint, the motion is maintained while the vacuum is applied. Then, with vacuum still applied, the tip is removed, and then the vacuum is turned off.

When desoldering multi-leaded Dual In-Line (DIL) components, avoid working on adjacent leads to prevent localized heat build-up. A good procedure is to do the corners first, then do every other lead.

A good rule to follow for most double-sided boards is to apply heat at a tip temperature of about 375°F - 600°F (302°C - 316°C), for approximately 2 seconds following initial solder fillet melt on the lead side. Then, apply vacuum (with the lead kept moving) for at least 1 to 2 seconds. This will permit ambient air to be drawn up through the hole, causing cooldown of the hole and the lead, and preventing lead re-sweating.

NOTE: If, after desoldering all the leads on a component, it is found that sweat joints still occur, or that the solder joint was not completely desoldered, *do not attempt to apply more heat to the joint*. Allow the joint to cool down; then, resolder the joint and desolder it once again.



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FRANK'S CRANKS



By Frank Seninsky

Cranking about joysticks

This time around, I got to take a good look at *Crazy Climber* by Taito and Nichibutsu, and Stern's new pinball game *Lightning*. Before getting to these two games I'd like to "crank" about joystick controls on the video games.

By now I must have gone through about twenty versions of joystick. Each has its own deficiencies, but the bottom line is that none are designed very well.

These controls take a tremendous beating. Metal stops were tried, then nylon, then plastic. I thought that Midway had developed a fairly sturdy joystick when I saw the one on *Pac Man*, but as we've seen, it worked well horizontally for a while but wore out quickly vertically. It's not even supposed to be pushed down and pulled up by "super human" players, but it certainly is.

After trying to come up with a better design, my only suggestion is that if the game must have joystick controls then these controls should be made as small as possible. The smaller they are, the less of a beating they will absorb. Sure, some may say that part of the attraction of a game might be a large control arm, but I for one would be willing to trade this for fewer service problems.

Enough things can go wrong with the games without constantly having to worry about replacing control joysticks. Games with only button controls have done remarkably well: *Space Invaders*, *Asteroids*, etc. So it's not a joystick alone that makes a game successful. The manufacturers should concentrate on making controls simple and durable instead of getting fancy.

Another matter to crank about is the difficulty with putting heads on Bally pinball games lately. It seems that Bally has added a cabinet support right across the opening that I used to stick my hand down into, to pull up the harnesses and plugs. My hand isn't that big, but I cannot fit it into the opening in the cabinet. One must lift up the playfield with the head door already open, and then do some fancy stretching to push the wires up from underneath with one hand and try to grab them inside the head with the other hand.

A useful suggestion would be to carry a straightened section of a hanger around to reach down and pull up the connection wires. It's always a good idea of having a hanger also in case you lock your keys in your car.

Service Tips...

Be careful when assembling *Black Knight*! When connecting the plugs in the head, there are two 36-pin plugs that could be connected to the wrong mating plug. Although the wires are color-coded, it is easy to plug the wrong ones together, and that will result in a blown CPU board and possibly a blown driver board as well.

In other technical news, Williams is now using micro switch assemblies in place of wire actuated blade switches in the ball return track on its new pinball game *Jungle Lord*. This, hopefully, will be an improvement and there won't be as many repeat service calls on this pinball as there have been on *Black Knight* due to the return switches getting dirty or coming out of

adjustment.

Todd Erickson of *Star Tech Journal* stated that there is a new modification nylon sleeve for the *Pac-Man* joystick now available from Midway. This new sleeve has a wider shoulder on it which will better protect the E-clip. There is also a new nylon washer which will aid in preventing the joystick from being pushed vertically downwards and bending the switches underneath out of adjustment.

CRAZY CLIMBER/Taito A couple reviews ago I did *Polaris* by Taito. I remember that this was one of the few times that I was impressed with the efforts made by a manufacturer to supply a strong, well-made cabinet. Taito has continued to use its same cabinet model for *Crazy Climber*. They have not cut any corners.

The cabinet has sturdy metal brackets which are bolted to the cabinet walls. This is far superior to using small wooden one-inch-by-one-inch models that are just stapled or glued in place as is the case with a majority of game manufacturers. The coin door is heavier than most others and all bolts, nuts, and screws have been sealed with "lock tight" to keep them from vibrating loose.

Extra heavy-duty brackets are still part of the coin door locking assembly. These cam guides are bolted to both the coin door and the frame for double protection. The coin door is very difficult to pry open.

The cash box is placed below the coin door area, in its own completely separate compartment. This

"Manufacturers, please make controls simple and durable, not fancy."

compartment is made of heavy metal and is bolted to the front cabinet wall. Without tools, it would be difficult to reach the cash box from the back of the cabinet. Once quarters are in the cash box, they are fairly secure.

The coin meter is also located in the cash box compartment area. This can be helpful to an operator. This can be helpful to an operator. No one but the collector needs access to the cash box and meter. Even the location owner can have keys to the coin door area to unjam the coin chutes, if necessary—but service people won't need to have keys to the cash box area if the operator requires tighter cash control systems. I would hope that in the future all coin-operated games will incorporate the concept of a separate cash box and meter compartment.

As mentioned in the *Polaris* review, the only negative aspect I found was that the chutes going from the coin switch guides down to the cash box are too narrow at the top and cannot be adjusted if they don't line up properly with the coin chutes. If they do not line up (due to a bend in the coin door from an abusive kick or punch) the quarters will get caught between the top of the chute and the micro switch guide, or simply miss the chute and fall to the bottom of the game. A good solution would be either to widen the top of the chutes or make them adjustable by cutting slots where the chutes are mounted to the frame.

The coin return levers can take abuse without bending. The coin return flaps are metal and after a month on location, are still in place. All other games that have (or should I say *had*) plastic coin return flaps have been broken many times over. The plastic flaps (especially on Coin Acceptor doors) are broken almost as fast as they can be replaced.

The angle of the monitor protective covering and the control panel is the same, which makes this front section a smooth incline. It is difficult to place drinks or cigarettes on the panel without having them fall off. So maybe the game will stay cleaner than most.

It would seem logical that the steeper the incline, away from the horizontal, that the screen and panel are, the harder it becomes to place objects there—and also it becomes harder for a frustrated player to



Taito's *CRAZY CLIMBER*



Stern's *LIGHTNING*

punch this section with enough force to do any damage. Less force will be extended on the panel and its covering by a downward thrust which is the type I've almost always seen players use.

The theory is simple but the fact is that the closer to vertical that the screen and panel become, the less comfortable the game is to play. It's a "no win" situation.

There are two joystick controls on the control panel, one for the right hand and one for the left hand. Both must be used to play the game. Micro switches are again used, instead of blade switches, on all the controls. These micro switches have slots for easy alignment and small bolts with nuts to prevent the switches from coming loose.

All of the micro switches and all of their corresponding wire connections have been insulated from the metal brackets by a thin non-conduction cardboard. This should prove to be very important in the number of service calls on the control panel.

Some problems have occurred with the two joystick arms. The use of roller-arm levers on the micro switches has worked out well. A metal square on the bottom of the joystick pushes a metal plate, which in turn pushes the roller arm. The metal square hits a metal travel stop which is supposed to limit the distance the joystick can be pushed in either direction.

As on most joystick controls, the metal stops wear out and the joystick then hits the metal cutout holes in the panel. This causes the hole to widen and the rod to wear down, and finally break off. This is considered a disaster to a service person out in the field, who just happens not to have the entire joystick assembly in his spare parts box. The Taito joysticks have worn out extremely quickly. A better design is surely called for.

The power supply has been mounted vertically and it is well enclosed, protecting its components from stray nuts and bolts. A cardboard cover has been placed over the transformer vertically and is "piggy-backed." These boards are connected by ribbon connectors.

This arrangement makes it difficult to get to the components when the boards are in the game. This means that the game is extremely difficult to fix on location if you should

"Taito has not cut corners and has made the same strong cabinet for Crazy Climber as it did for Polaris."

encounter a board problem. Let's hope you never do.

The volume control is on the logic board and cannot be reached from the front of the cabinet. It would be better to place this pot adjustment near the coin door so the volume could be adjusted easily from the front. It seems that location owners are always complaining that the volume is either "too loud" or "too low," depending on whether they have a headache or what day of the week it is. And sometimes you really can't blame them.

An on-off switch is located underneath the *Crazy Climber* cabinet in the front section. It would be better to place this switch high up on the top of the cabinet, away from the reach of small children but where the owner or manager can reach it.

The monitor slides out fairly easily (no monitor problems so far) and the monitor components and adjustments are accessible from the back of the cabinet.

The placement of wheels underneath the back of the cabinet bottom, has been retained. Slots are located in the back so one can tip the game backwards for moving purposes. This may not be important to you if you're seven feet tall, but I have a difficult time tipping

a game such as *Defender* back onto a handtruck.

Crazy Climber has more positive features than negative. An extra point is deserved for the overall cabinet and cash box design. The controls aren't very durable but then again, hardly any video game joysticks have lasted very long without wearing out. *Crazy Climber* gets an 8. If it had good joystick controls, it would be a nine.

LIGHTNING/Stern This is Stern's response to the multi-level, multi-ball pingames that have seemingly flooded the market in the past few months. Now every manufacturer has a game of this type.

The last Stern pinball that I reviewed was *Nine Ball (Play Meter*, May 15, 1981). A few new features have been added to *Lightning*. A digital display has been placed in the middle of the playfield which keeps track of bonus points as they accumulate. The display is protected by a durable plastic covering and held in place by four countersunk screws. The ball has no trouble rolling smoothly over this area. After three weeks the covering hasn't warped or curled up above the playfield surface. I would expect that as the playfield surface wears away

near this plastic covering, that problems will arise. Anyway, it is a different and attractive feature.

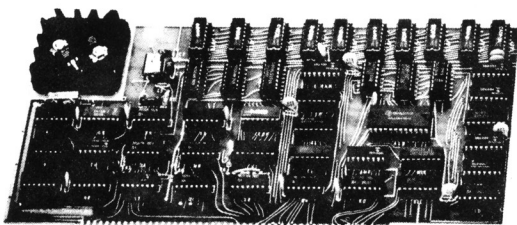
The switches in the ball track that control, count, and award the balls, have been redesigned. On *Nine Ball* production runs, the switch actuating wire arms in the return track were made longer and stiffer and problems still occurred with the switches coming out of adjustment or the balls getting stuck on the wires.

In general, these have been the main types of service problems associated with all the multi-ball games. Stern has placed three blades switches, mounted vertically, under the playfield in a straight row. The switches are activated by stronger rollover wire forms that look similar to a U-shaped ball return gate used on past Gottlieb games. Mounted in this fashion, the switches are easy to adjust and clean with a burnisher.

The balls can still get stuck on the wire forms, especially if the game isn't leveled properly. Debris (readily supplied from the wearing out of the playfield rubbers) easily gets into the return track and can keep the balls from hitting the switch arms properly. The tracks should be cleaned out every few weeks to

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reduce this kind of service call.

Another area of concern is the end-of-stroke blades used on the flippers. On pinball games in the past, one simple, normally closed switch was all that was required. Now there are more switches added and the stacks are getting higher.

Screws holding these switches to the mounting bracket easily vibrate loose, and often the threads become worn out from constant activation. Some manufacturers have supplied small nuts to go on the ends of these screws, and this has helped somewhat. Stern has not even provided nuts for these switch stacks on *Lightning*.

When the stack becomes loose, the end-of-stroke blades can swing over and get caught on the flipper shoe. This can cause the flipper coil to heat up and melt if the blades don't open when the coil is fully energized, or cause the coil not to work at all if the blades get stuck open. This solution has to be redesigned. Until the time comes when a better method is utilized, the end-of-stroke blades must be checked often and kept as tight as possible even when this means drilling out the threaded section and replacing the screws with longer ones and adding nuts and lockwashers.

The same power rectifier board has been supplied in *Lightning* as in past Stern pinball games. In previous games the wires for general illumination and the playfield-controlled light circuits heated up at the rectifier board connectors. This causes a decrease in the current flow due to the carbon build-up at the connectors. Bally, for example, has changed its board connectors from the flat, one sided connection, to circular molex connectors. The circular pins provide more surface area for current to flow across. The more the surface area, the less heat build-up there will be at the connectors.

Stern has not made a change on these connectors but does use double wire connections on each digital display pin connection. Again the surface area is double because each wire is connected to a different area of the four-sided pin.

Positive design features that have been retained include: (1) transformer and power supply located on the bottom of the cabinet under the playfield and not in the head; this keeps the heat away from the sensitive logic boards in the head; (2) strong, easy to slide open and shut cash box; (3) extra wooden board under the cash box area for extra

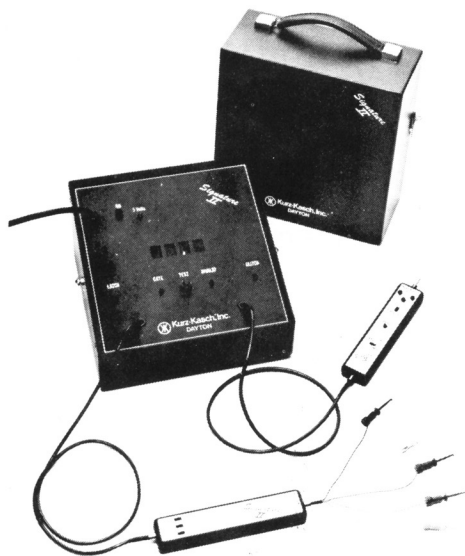
security and cabinet strength; (4) sturdy coin door with metal coin return flaps; (5) good coin return assembly that will not come loose easily. (Stern has not provided a coin lockout coil on *Lightning*; that will be missed.)

Also: (6) extended brackets on the back of the head glass to keep the glass in position if the head lock loosens or slips; and (7) moldings under the playfield that keep wires and components from getting caught when the playfield is raised and lowered. Stern has always taken time laying out the harness wiring in an attempt to keep wires away from sharp edges of brackets and from the edge under the playfield.

The 190-volt voltage supply for the displays has been "crowbarred" to protect the circuit. If the 190-volt shorts high, then transistor Q24 will shunt to ground and no voltage will flow through the 190-volt system.

Since this is the first time I will assign a rating for the pinball machine on a one to ten scale, I'll give *Lightning* a seven, which is passing.

I feel that much more can be done to pinball machines to prevent parts from wearing out so quickly, wires from breaking or heating up at connections, and screws from vibrating loose too easily. ■



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DIGITAL CIRCUIT

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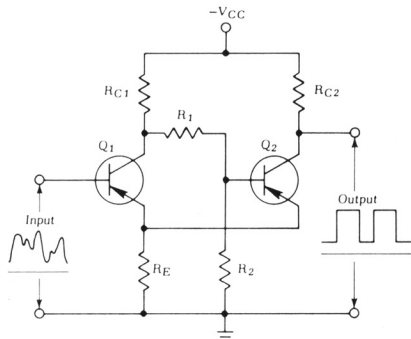


Fig. 14-1. A Schmitt Trigger circuit. This circuit is generally used to produce square waves from irregular waveforms.

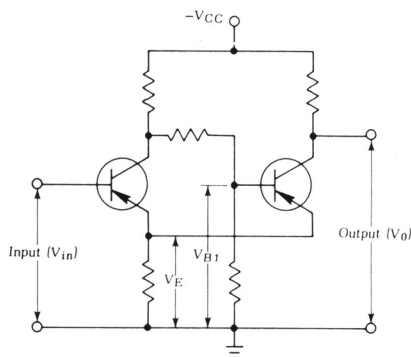


Fig. 14-2. The voltages used in the study of a Schmitt trigger circuit.

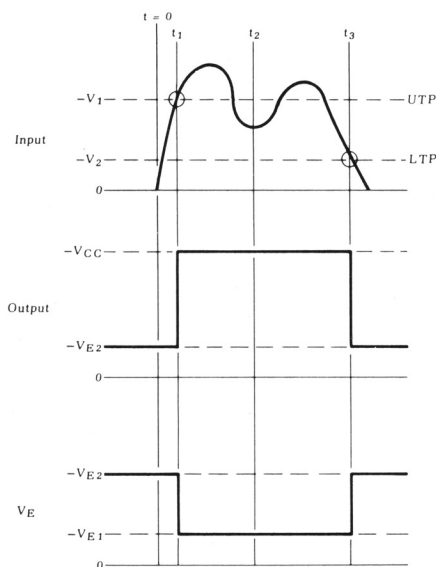


Fig. 14-3. The waveforms associated with a Schmitt trigger circuit. Also, the relationship of the UTP and LTP to the output is shown.

Lesson Fourteen: Schmitt triggers

This lesson, is about the design of a Schmitt Trigger circuit. Also covered are the waveforms associated with this circuit and the design procedure

Schmitt Triggers:

The Schmitt trigger circuit shown in fig. 14-1 is principally used as a pulse-forming circuit. Notice from the waveforms that if the input is an irregular waveform, the output is a pulse. Other applications of the Schmitt trigger include voltage comparators and voltage level detecting circuits.

Circuit Operation:

Referring to fig. 14-2., at time $t = 0$ transistor Q_1 is zero biased; therefore, the collector is at a high level. The base emitter diode of Q_2 is in saturation. VE_2 is then the difference between the voltage drop across RC_2 and V_{CC} . The output $[V_0]$ is then also at VE_2 [assuming $V_{CE(sat)}$ is too small to account for]. As the input voltage $[V_{in}]$ increases, Q_1 remains off and Q_2 remains on, until V_{in} equals VE . At this time, t_1 , Q_1 will begin to conduct and its collector voltage will begin to fall, taking Q_2 out of saturation. When V_{in} increases to VE_2 plus $V_{BE(sat)}$, $[-V_1$ in fig. 14-3], Q_1 will saturate and cutoff Q_2 . V_0 will then equal V_{CC} . This level of input voltage is referred to as the *upper trip point* t_1UTP_1 .

When Q_1 saturates, VE will switch to a level, $[VE_1]$, determined by RC_1 . If RC_1 is greater than RC_2 , then VE_1 will be less

than VE_2 . At time t_2 , the input falls below UTP but is greater than VE_1 plus $V_{BE(sat)}$. The circuit will not change state since Q_1 is still saturated.

At time t_3 , however, the input has decreased below the level VE_1 plus $V_{BE(sat)}$, $[-V_2$ in fig. 14-3], and transistor Q_1 is out of saturation. The collector of Q_1 will again rise and permit Q_2 to saturate. VE is then raised to VE_2 and the output will again equal VE_2 . The point on the input waveform at which Q_1 came out of saturation is referred to as the *lower trip point* (LTP).

Design Procedure

STEP 1: Find $|VE_1|$ and $|VE_2|$.

$$VE_2 = UTP - |V_{BE(sat)} Q_1|$$

$$VE_1 = LTP - |V_{BE(sat)} Q_1|$$

VE_1 and VE_2 are, of course, the UTP and LTP, minus $V_{BE(sat)}$. The UTP and LTP are the prime specifications for designing a Schmitt trigger circuit.

STEP 2: Find RE .

$$RE = \frac{RC_2 \times VE_2}{|V_{CC}| - VE_2}$$

The above is taken from the formula for finding voltage drops in series circuits. Since RE is in series with RC_2 when Q_2 is saturated, the voltage across RE is:

DESIGN COURSE

$$V_{E2} = |V_{CC}| \left(\frac{R_E}{R_E + R_{C2}} \right)$$

Also, since $V_{CE(sat)}$ for Q2 is very small, it can be neglected.

STEP 3: Find R_{C1} :

$$R_{C1} = \left(\frac{|V_{CC}| \times R_E}{V_{E1}} \right) - R_E$$

The above is again taken from the formula for finding voltage drops in series circuits. Since R_{C1} is in series with R_E when Q1 is saturated, the voltage dropped across R_E is:

$$V_{E1} = |V_{CC}| \left(\frac{R_E}{R_E + R_{C1}} \right)$$

Again $V_{CE(sat)}$ is too small to account for and can be neglected.

STEP 4: Find $|I_E|$
when Q2 is conducting.

$$I_E = \frac{V_{E2}}{R_E}$$

The current through R_E is Ohm's Law value of V_{E1} and R_E .

STEP 5: Find $|I_C|$
for Q2 conducting.

$$I_C = \alpha |I_E|$$

The above is formula 2A in lesson 1.

STEP 6: Find I_B for Q2.

$$I_{B(max)} = 2 \text{ to } 3 \text{ times } \frac{|I_C|}{\beta(\min)}$$

STEP 7: Find V_{B2} .

$$V_{B2} = V_{E2} + |V_{BE(sat)Q2}|$$

The voltage measured from base to ground will be V_{E2} plus $V_{BE(sat)}$ of Q2. Incidentally, this is the voltage dropped across R_2 .

STEP 8: Find I_1 .

$$I_1 \geq 5 \times I_{B(max)}$$

Since I_1 will sum with I_B through R_1 and R_{C1} , the circuit will gain a degree of stability if $I_1 \gg I_B$. The above is a general rule which can be applied, the limit being, the amount of loading tolerable on R_{C1} when Q1 is off.

STEP 9: Find R_2 .

$$R_2 = \frac{V_{B2}}{I_1}$$

STEP 10: Find $|V_{RC1}|$
when Q1 is off.

$$V_{RC1} = R_{C1} \times (I_1 + I_{B(max)})$$

The voltage drop across R_{C1} , when Q1 is off, is the Ohm's Law value of R_{C1} and the currents I_1 and $I_{B(max)}$.

STEP 11: Find R_1 .

$$R_1 = \frac{|V_{CC}| - (V_{RC1} + V_{B1})}{I_1 + I_{B(max)}}$$

The voltage drop across R_1 is the difference between V_{CC} and the sum of the voltage drops across R_{C1} and R_2 .

Design Example:

Design a Schmitt trigger using the circuit configuration shown in fig. 14-1, R_{C1} is a 150 ohm, 6V lamp and the UTP= 3.3V and the LTP = 2.8V. Use a germanium transistor type 2N404. Make $V_{CC} = -9V$.

STEP 1: Find $|V_{E1}|$ and $|V_{E2}|$.

$$V_{E1} = LTP - |V_{BE(sat)}| = 2.5V$$

$$V_{E2} = UTP - |V_{BE(sat)}| = 3.0V$$

The general rule for germanium transistors, $V_{BE(sat)} = 0.3V$, was used in both cases.

STEP 2: Find R_E .

$$R_E = \frac{R_{C2} \times V_{E2}}{|V_{CC}| - V_{E2}} = \frac{150\Omega \times 3V}{9V - 3V} = 75\Omega$$

STEP 3: Find R_{C1} .

$$R_{C1} = \frac{|V_{CC}| \times R_E}{V_{E1}} - R_E = \frac{9V \times 75\Omega}{2.5V} - 75\Omega = 195\Omega$$

(Use 200 Ω)

The use of 200 ohm is permissible provided it does not upset any required degree of precision.

STEP 4:

Find I_E when Q2 is conducting.

$$I_E = \frac{V_{E2}}{R_E} = \frac{3.0V}{75\Omega} = 40\text{ma}$$

STEP 5:

Find $|I_C|$ for Q2 conducting.

$$I_C = \alpha I_E = I_E = 40\text{ma}$$

Since the range in α is 0.95 less a less 1.0, we can, for all practical purposes, say that $I_E = I_C$.

STEP 6:

Find I_B for Q2 conducting.

$$I_{B(max)} = 2 \text{ to } 3 \text{ times } \frac{I_C}{\beta(\min)} = \frac{40\text{ma}}{50} = 2.0\text{ma}$$

The minimum beta was selected to insure saturation.

STEP 7: Find $|V_{B2}|$.

$$V_{B2} = V_{E2} + |V_{BE(sat)}| = 3.0V + (0.3V) = 3.3V$$

The general rule for germanium transistors, $V_{BE(sat)} = -0.3V$, was used.

STEP 8: Find I_1 .

$$I_1 = 5 \times I_{B(max)} \\ = 10ma$$

Since this is a high current circuit, I_1 was made five times $I_{B(max)}$ so as not to load R_{C1} too heavily. In lower current circuits a greater

ratio is preferable.

STEP 9: Find R_2 .

$$R_2 = \frac{3.3V}{10ma} = 330\Omega$$

STEP 10: Find $|V_{RC1}|$ when Q_1 is off.

$$V_{RC1} = R_{C1} \times (I_1 + I_{B(max)})$$

$$= 200\Omega \times 12ma = 2.4V$$

STEP 11: Find R_1 .

$$R_1 = \frac{|V_{CC}| - (V_{RC1} + V_{B1})}{I_1 + I_{B(max)}} \\ = \frac{9V - (2.4V + 3.3V)}{12ma} = 275\Omega \\ \text{(Use } 270\Omega \text{)}$$

PROGRAMMED TEST/14

Instructions: The purpose of this test is to guide you step-by-step through actual circuit design problems. Also, the tests in the Digital Circuit Design Course will provide you with additional design technique. Most important, these tests will provide you with a gauge to establish your degree of understanding of the material covered in the lesson text. The test is programmed: start at block 1 and follow the numbered instruction associated with your answer. A Schmitt trigger circuit switches from the stable state to the quasi-state when the input reaches the

- 1
a. LTP GO TO BLOCK 12
b. UTP GO TO BLOCK 20
- 2 YOU ARE CORRECT!

Design a Schmitt trigger circuit using a silicon NPN transistor with a beta of 50. Make R_C for the normally ON transistor 10K. Also make $V_{CC} = 18V$, $UTP = 3.2V$ and $LTP = 2.7V$.

What is V_{E1} ?

$$V_{E1} = \underline{\hspace{2cm}} \text{ GO TO BLOCK 14}$$

3 $R_E = \frac{10K \times 2.5V}{18V - 2.5V} = 1.6K$

1.6K is a standard value resistor. Did you get the same result? If not, do not go on but check. What is R_C for the normally OFF transistor.

$$R_C = \underline{\hspace{2cm}} \text{ GO TO BLOCK 11}$$

4 $I_B = 2 \text{ or } 3 \times \frac{1.56ma}{50} = 0.078ma$

Use 0.075ma. Did you get the same result? If not, do not go on but check. What is V_B for the normally ON transistor?

$$V_{RC} = \underline{\hspace{2cm}} \text{ GO TO BLOCK 15}$$

$$R_2 = \frac{3.2V}{0.39} = 8.2K$$

5 The nearest standard value resistor is 820 ohms.

Did you get the same result? If not, do not go on but check.

What is the voltage drop across R_C for the normally OFF transistor?

$$V_{RC} = \underline{\hspace{2cm}} \text{ GO TO BLOCK 16}$$

$$R_C = \frac{18V \times 1.6K}{2.0}$$

11 $- 1.6K = 12.8K$
The nearest value standard resistor is 12K.

Did you get the same result? If not, do not go on but check.

What is I_E when the normally OFF transistor is conducting?

$$I_E = \underline{\hspace{2cm}} \text{ GO TO BLOCK 19}$$

12 YOU ARE INCORRECT!
Refer to the text and return to BLOCK 1.

13 YOU ARE INCORRECT!
Refer to the text and return to BLOCK 20.

14 $V_{E1} = 2.7V - 0.7V = 2.0V$
Did you get the same result? If not, do not go on but check.

$V_{BE(sat)}$ is too important in the calculations to consider the transistor ideal.

What is V_{E2} ?
 $V_{E2} = \underline{\hspace{2cm}} \text{ GO TO BLOCK 21}$

15 $V_B = 2.5V + 0.7V = 3.2V$
Did you get the same result? If not, do not go on but check.

What is the current (I_1) through the biasing voltage divider for the normally ON transistor?

$$I = \underline{\hspace{2cm}} \text{ GO TO BLOCK 22}$$

16 $V_{RC} = 12K \times (0.39ma + 0.078ma) = 5.6V$

Did you get the same result? If not, do not go on but check. What is R_1 for the voltage divider as

shown in the figure of BLOCK 22?
a. $R_1 = \underline{\hspace{2cm}} \text{ GO TO BLOCK 23}$

19 $I_E = \frac{2.5V}{1.6K} = 1.56ma$

Did you get the same result? If not do not go on but check. What is I_B for the normally ON transistor.

$$I_B = \underline{\hspace{2cm}} \text{ GO TO BLOCK 4}$$

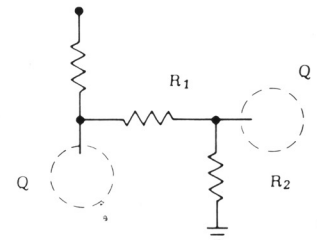
20 YOU ARE CORRECT!

The circuit will return to the stable state when the input falls to the

- a. LTP GO TO BLOCK 2
b. UTP GO TO BLOCK 13

21 $V_{E2} = 3.2V - 0.7V = 2.5V$
Did you get the same result? If not do not go on but check.

What is R_E ?
 $R_E = \underline{\hspace{2cm}} \text{ GO TO BLOCK 3}$



22 $I = 5 \times 0.76ma = 0.39ma$

Did you get the same result? If not, do not go on but check. What is R_2 for the biasing voltage divider shown in the figure?

$$R_2 = \underline{\hspace{2cm}} \text{ GO TO BLOCK 5}$$

23 $R_1 = \frac{18 - (5.6V + 3.2V)}{0.47ma} = 19.5K$

20K is the nearest standard value resistor. Did you get the same result? If not, do not go on but check. You have completed the test for the last lesson and by doing so have completed the DIGITAL DESIGN PROGRAM.

BREADBOARD PROJECT/Fourteen

Schmitt trigger circuit design

1. "Wire-up" the circuit in fig. 1 on the breadboard. Before applying power, set P to the full CCW position.

NOTE: The circuit is wired so as to have a -9V power supply. +3V can be considered ground or 0V.

2. Apply power, both -6V and +3V.

3. The lamp corresponding to Q1 should be on, and the lamp corresponding to Q3 should be off. (You may see a small glow. This is because there is a current flowing through the lamp and, therefore, a small voltage drop.)

When P is full CCW the input voltage is 0V and transistor Q3 is cutoff. Q3 is deep into the cutoff region since $V_B = 0V$ and $V_E = 3.0V$.

The base-emitter diode is heavily reverse biased. Because Q3 is cutoff transistor Q1 is in saturation and the output is at V_{E2} .

4. Rotate P slowly CW until the lamp corresponding to Q1 goes off and the lamp corresponding to Q3 comes on.

At this point transistor Q3 has saturated and cutoff Q1. The input voltage has risen to the UTP. The output is now at $-V_{CC}$ and V_E is at a lower voltage, V_{E1} .

5. Rotate P slowly CCW until the lamps change state.

At this point transistor Q3 has cutoff and Q1 has saturated. The input voltage has fallen to the LTP. Since Q3 has a larger RC than Q1, the Q3 will remain in saturation if, though, the input has decreased in amplitude until the LTP has been reached.

6. Rotate P slowly to the full CCW position. When the UTP is again reached the lamps change state and remain as such.

Notice that after the UTP has been reached the input no longer affects the circuit. All of the action in the Schmitt trigger occurs at the upper and lower trip points.

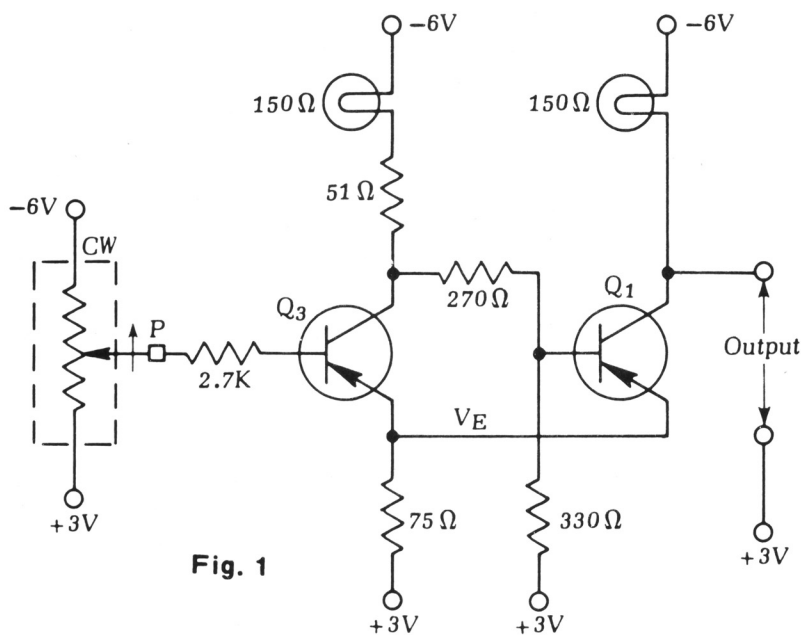


Fig. 1

Kurz Kasch Tech Series to Continue in Play Meter

With the above material, the Digital Circuit Design Course portion of the Kurz Kasch series is complete, having been serialized in *Play Meter* in the issues of March 15, 1981 and subsequent.

Starting in the next issue, the I.C. Logic Design Course will begin, and included will be the programmed test and several breadboard projects. The 10 lessons of the I.C. Course over the topics:

Logic Elements; I.C. Logic Families; Complex Logic Elements; Boolean Algebra and Theorems; Demorgan Theorem; Karnaugh

Maps; R/S Flip-Flops; JK Flip Flop; and Pulse Forming Circuits.

The first two courses in the Kurz Kasch series are recommended by the digital test equipment company as basic to understanding logic as applied in electronics technology for the coin-operated amusement industry. The course was prepared by faculty members of the University of Dayton and accredited by the Ohio Department of Education.

Twice monthly in *Play Meter*, the series will continue, through Course III, consisting of 13 lessons on power supplies, and Course IV,

consisting of 15 lessons on MOS/FET-J/FET circuits.

Breadboard projects will continue with various lessons. Kurz Kasch suggested that operators and technicians interested in completing the breadboard projects could find the suitable hardware being offered by AP Products of Euclid, Ohio. AP Products, which markets through electronic hobby distributors and radio and television parts supply houses, offers an inexpensive breadboard. Components for the individual exercises can be obtained from Radio Shack outlets or from the operator's own inventory.

Benefit video tourney set by Silco West

Silco-West, Inc. of Van Nuys California, has framed plans for a major promotional program, starting with a statewide video games tournament to benefit muscular dystrophy research.

Qualifying rounds for the state championship will be held throughout southern California in several hundred Silco-West locations. The top four contestants in each location will win prizes and advance to the state finals, which will take place on August 29, 1981 at the L.A. Airport Sheraton Hotel.

Silco's Tournament will be played on Atari games and will center around *Asteroids Deluxe*. Johnny Lott, promotional director of Silco-West stated, "Our decision to go with Atari games seemed only natural with Atari being the sponsor of the upcoming World Championship in Chicago." The winner of the Silco tournament will be awarded an *Asteroids Deluxe* video machine plus a sponsorship and roundtrip airfare for two to Chicago for Atari's World Championship. Additional prizes include: a Puch Moped, sound system, color TV, cassette tape-recorders, bicycles, video game T-shirts, and more.

To enhance customers' awareness and spread word of the tournament, Silco has designed a customized promotional van. This van will be used to go out on locations and monitor progress of

the qualifying tournaments and also put on demonstrations of new games.

Silco's State Championship is the first step in what Lott described as "a promotional program unprecedented among operators in the coin industry. Our long range goal is to offer locations an ongoing promotional department which will constantly provide new and innovative ideas in promotion and advertising," he said.

Silco, led by Chairman of Board Sonny Silverstein and President Clyde Love, (with combined career experience of 90 years in the coin-op business), continues to strive for fresh ideas and new concepts to the amusement industry.

To head up the promotions, Silco has hired "1981 World Foosball Champion," Lott. Lott, formerly with Tournament Games in Seattle, Washington, will be developing concepts for the program and monitoring its progress.

"In addition we are putting forth a strong effort to enhance the over-all image of the amusement business. For example, our State finals will run similar to a charity fund raiser. The revenues we receive through the play on the games are to be donated to the Muscular Dystrophy Association. We feel this type of charitable commitment is sure to create a positive effect with the public," said Lott.



Silco executives in front of the tournament promotional van: (l-r) Clyde Love, president, and Sonny Silverstein, board chairman; Silco's home in the background.

Monitor tester

Crim Electronics has introduced the Model VG-1 test unit for color and black & white monitors. This versatile portable video generator can be used for on-location testing or in the shop for troubleshooting all types of color or black and white monitors.

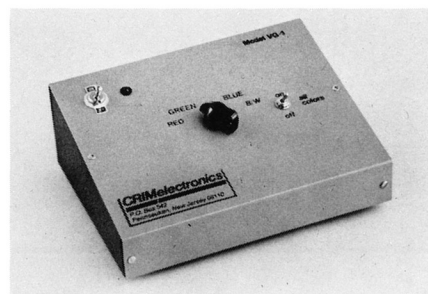
For color monitors: select a Red, Green, or Blue video pattern for isolating color problems. Select "All Colors" for a white pattern; ideal for color convergence.

Black and white: unit supplies all power, sync, and video signals to test/troubleshoot a suspect B/W monitor.

Model VG-1 comes complete with operating instructions, and video cables for direct interfacing to most all popular color and B/W monitors.

All units are guaranteed for 90 days from date of purchase. Quantity discounts are available. On prepaid orders, freight is paid by Crim Electronics.

Contact: Crim Electronics, P.O. Box 542, Pennsauken, NJ 08110; telephone 609/667-0302.

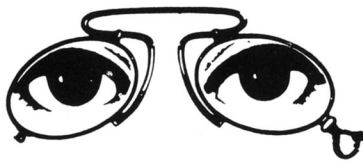


Correction

The address of A-1 Board Service and A-1 Repair Company was slightly incorrect as printed in the 1981 *Play Meter Directory Issue*. The companies' correct address is P.O. Box 312, Bogota, New Jersey 07603.

A-1's game board repair service includes pick-up and delivery of any type of electronic video or pinball circuit board. Its radio-dispatched vehicles cover the New York metro area. Service contracts are available.

Telephone: 201/692-9051. Service Manager is S. Wayne.



By Roger C. Sharpe

MARS is tested

Warrior from Northlake

APOLOGIA

Well, this column has traveled to Florida and Chicago and all around the town it seems, but not to the pages of this magazine until now. For someone who has written for the trade for over five years and for *Play Meter* for at least that long, it was with great disappointment that I learned I had missed the deadline for last issue for the column you're about to read. Although I had been very ill, I felt I had let many of you down—those, who I'd like to think, look forward and read this column every issue. I had never missed a deadline before for anything I was supposed to be writing and it upset me that it did happen.

I only hope that the problems were minimal for the staff members of *Play Meter* who have to put up with getting copy in at the last minute and for you the reader who looks forward to getting whatever information any of us writers can offer to make your job a bit easier and a bit more interesting.

My apologies, and hopefully I can last at least another five years or more bringing you information you want to read and a few minutes break from the problems and decisions of the outside world. My best to you all and on to the problem at hand.

Summer continues to heat up and so does pinball with the solid line-up of games that are being produced helping to bring back many of the fans who left the games for dead. A recent trip I had to Florida tended to confirm what I've been saying these past months when I entered one particular location and found two *Jungle Lord* right next to each other,

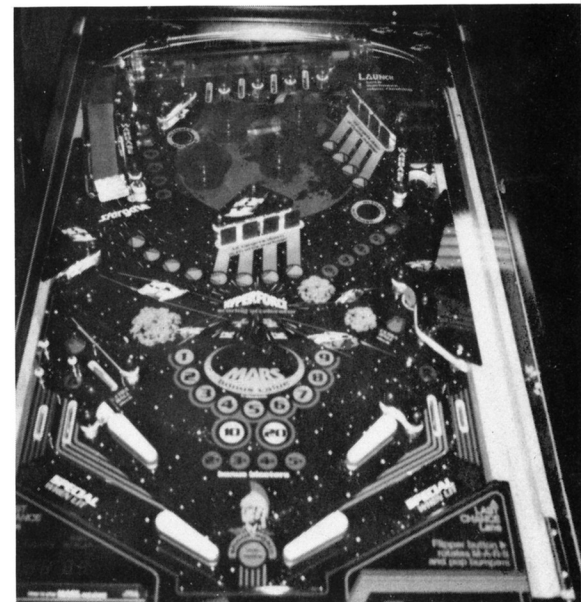
also four *Black Knights* all next to each other, two *Flash Gordons* next to each other and an assortment of other current pins all being played.

This isn't to suggest that video wasn't also getting a fair shake, because it was—with an enormous assortment of games as well as a sizeable area devoted to nothing but sit-downs. But the reaction I took away with me was that here was a place that I had visited only a few months earlier and was disappointed because pinball had really gone out the window, and suddenly there was the line-up and, more importantly, they were being played.

What some may feel is a step back, however, regarding this location, was that the pins were on five-ball play/one for a quarter. But maybe this is the way to face the still-persistent resistance in some areas to pinball, although three-ball play is really more in keeping with the way the games are being designed.

Other stops around the Fort Lauderdale area also tended to confirm that pinball was once again coming back and the new equipment (at least for this area) was definitely responsible for the return in interest. It was gratifying to see it and know that pinball is re-establishing itself in the marketplace.

Another interesting thing that may be happening, possibly as a reaction to the growing impact pinball is having, is that video may well be embarking on a new phase in development and the utilization of the available technology. As was reported some time back, Atari had unveiled a new hand-held holographic series of games for the home market and although this may not portend the direction this company or others



Gottlieb's Mars god of war

might take, it does offer some food for thought given the similarity of so many of the games in the past year.

What may be closer to the point is that I think a game such as Atari's *Warlords* may well usher in a new generation of machines, especially if the piece proves successful in the field. The pseudo three-dimensional effect that's offered isn't anything new for Atari or some other companies which tried this in the past, but it is something to consider that maybe video is ripe for a visual treatment that takes the play out of a flat plane and into something more dimensional, with more depth.

It's almost as if video might try to bring the games into a more "pinball-like" setting of three-dimensional play that has always been the classic difference between pinball and most other coin-operated machinery over the years. And so I await the fall trade show with my own expectations of video and what might well develop into a pretty good battle with the old silver ball machines.

Other bits and pieces I'd like to touch upon include a letter I recently received from someone it's always good to hear from: Louis Boasberg, who wanted to offer that *Eight Ball Deluxe* might be even better than my review rated it, since he was having such good luck with it at his location. Your points, Louis are well taken. Hopefully the other pins making their appearances will also garner the same results.

In terms of the ratings game, I feel it's only fair to offer some additional reactions to *Jungle Lord*, which has held up far better with the passage of time than I had initially felt as a player. Part of the problem may have been the pricing of the game when it first came out. Most places were going to the factory setting of one for fifty cents, two for seventy-five and so on, which I never thought the game could sustain—only because it was so complex for the first time players and did not have its share of drains which tended to diminish its appeal. And obviously some operators felt the same because I saw the game back at quarter play and began investing more time and quarters to get into the machine.

The change in price proved worthwhile at least for this writer, since it seemed a better deal and didn't tie me to the game for multiple plays unless I wanted it to by

inserting more money.

And the result is that although it takes time to get one's stride in playing the game, there are some nice shots: great reverses, strategy that can be carried out during the course of play and an involvement that makes *Jungle Lord* a far better bet than I first thought. Other players have echoed this sentiment at various locations when I've asked them their reactions to the game. So take a closer look at this double-level effort and if you already have it on location, think about what the pricing may be doing to your earnings.

With these things out of the way, it's time to get to a game that impressed and surprised me when I first saw it and didn't diminish these feelings when I played it.

Gottlieb's MARS god of war

If any company has been struggling to find itself and the direction it wants to take with pinball, it's been Gottlieb, which has slowly but surely been incorporating new features and trying to get its act together with each succeeding machine. Well, this time they've hit on the right mix and offer up a machine that's probably their strongest since *Sinbad*.

PLAYFIELD: The action begins with four top lanes (M-A-R-S) and also a right flipper control to change the lit lanes. Move down and there are four thumper bumpers in the middle with a little kick-back kicker at the right and a four-drop-target bank just in front. Over at the left is an interior lane to a kick-out hole which sends the ball back to the top lanes. Also at the left is an innovative touch that's a double-duty feature with a fronting spinner and a ramp that can lead a ball up and through a tube, similar to *Xenon's* over to that right side kick-back kicker; or, if the ramp is up, can allow a ball to pass under it and get back up to the top.

Over at the right side is a kick-out hole just below the target bank, while the middle over has yet another four drop target bank. The bottom features a double set of flippers with the right side also having a bulls-eye target while the left side has three small posts, a short lane leading down to the top flipper, and some nudging needed to get the ball to roll down to the bottom flipper.

ANALYSIS: Gottlieb has incor-

porated a lot into *Mars* and it shows. Besides the obvious, which is the tube and also the lane-change addition, there's also multi-ball play, with either two or three balls depending upon what's hit and when, and tied into this is increased scoring during multi-ball play.

The drop target banks are the key to lighting the kick-out holes ("warbases") for the potential of locking up balls, which can be "launched" by either going up the ramp and around through the tube for that kick-back kicker, or getting the ball to land there either off the thumper bumpers or from the flippers on a fairly long shot.

What Gottlieb does differently with its multi-ball game is that here any balls locked up by a player that aren't released during that turn are drained out so the next player must start all over. And any balls locked on the last turn, which aren't released, but with the ball going out the side lanes, give the player a "last chance" to play either one or two balls for a continuation of play. It's a nice touch and, although some may say that it's the best they can do with their present system, or other less than favorable remarks, it makes the game that much more challenging for the player, which is truly the bottom-line anyway.

Taking on the rest of the machine, there is the saving grace of the double flippers which allows for some nice reverses from the top set and some good, long left-to-right and right-to-left action from the bottom set. The only problems may be a slight drain from that interior roll-down to the left side kick-out hole and also from the right side kick-out hole, but it's more a point of velocity and not so much a design characteristic.

GRAPHICS: Bally seems to be the inspiration not only for the tube on the field, but also in terms of light box treatment with Gottlieb using the *Xenon* and *Space Invaders* type of effects to full advantage for a very powerful and strong image of Mars set against some space vehicles. The graphic treatment is vivid and bold and works well here as does the playfield art and its use of reds and the dark pop of black.

PLAY: *Mars* doesn't have six-digit scoring, but does include a reset that can be programmed for the high score to date, which was started on

'Mars doesn't have six-digit scoring but does include a re-set that can be programmed for the high score to date...'

Pink Panther and mentioned in this column last time out. Once the high reaches that 980,000 and above area, the machine can automatically reset the high to around 770,000 points, which is a slight saving grace. For your limits, go with only two and in extra ball areas you should be all right with 400,000 points to start, followed by 700,000 points. On free play, depending upon your players and percentaging, try an increase of about 100,000 to 200,000 points to each limit.

PRO & CONS: Although there have been numerous conversations both with people associated with D. Gottlieb & Co. and those who are on the outside, whether it be players or operators, I can't stress enough the importance of offering lightbox scoring that approximates what can be done on the playfield, even if it's only for 10 percent of the time. Six digit scoring isn't a contemporary way to go, no matter what the obstacle from a manufacturing standpoint. The products are for the player and because of that, it's everyone's responsibility within the industry to do all that they can to serve that audience which keeps the business going. That includes operating games that are clean and well maintained, producing games that can give the player value for his money, and finally, taking the time and consideration to make sure that everything possible has been done to make each machine all that it can be whether it's a video game, pinball machine, or any other kind of arcade piece.

This is all as a preface to the fact that everything about *Mars* works, from the playfield design and integration of programming which makes this the strongest piece in years from this company, to the graphics which are remarkable for this fairly conservative and much maligned company when people on the inside talk about their artwork; but that missing digit in the backbox takes something away for the player and that's unfortunate because it could have made a total effort that much more positive.

But there is no discounting the game and the evolution Gottlieb continues to take in producing machines that hopefully will rival those made twenty years ago when the company was entering its golden age. One can only keep one's fingers crossed that it continues. Just one final word, however, is that whoever is putting the holes in the cabinets for the leg realizes that midgets don't

play the game alone and that the machines have to have a bit of height to them, which *Mars* doesn't because of a supposed mistake. So don't think there's something wrong or that Gottlieb is going in a new direction for the shorter market. They aren't.

RATING:####

And that's it for this time, which is a bit later than it should be. But I'm back on track and have all sorts of news to tell next time regarding a recent trip to Chicago, a visit to a few of the companies, and what the

rumor mills are saying as the design program works its way up to the AMOA crescendo. Plus, some observations about the recently held Consumer Electronics Show, what the companies of that industry are doing, and how they might have an impact on future efforts of the coin-machine industry. Also some words about the newest pins, including multi-level games, not so multi-level games, a wide-body, and some just plain, old-fashioned good down home pinball that doesn't have the glitz and glitter. Until then, be well and prosper. ●

ADVERTISEMENT

OPERATORS! MECHANICS!

The rapid evolution of the electronic hardware in today's games has caused a great need for a practical working knowledge of current systems. As a result, scheduled classes at **San Diego Arcade School** have been filled to capacity as far as two months in advance.

Rather than run two classes per month in San Diego, I feel it would serve the industry better to bring the Arcade School to the students.

There are now two Arcade Schools. The original **San Diego Arcade School**, and a new school in Dallas, Texas. Both schools will offer the same highly effective course of study that takes the student through a practical look at today's games, how they work and how to fix them.

Both courses run six days, Monday through Saturday. The tuition fee is \$400.00. This includes all books and classroom materials.

The **Dallas Arcade School** is led by Nathan Bush. Nathan is a well known service technician from the Dallas area. His outstanding abilities led to him being chosen as *Play Meter* magazine's Coinman of the Month in July, 1977.

For further information about the Arcade Schools, drop us a line or give us a call at either location.

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ADVERTISEMENT



Half the time to cover the table

Fastfelt, a new pool table recovering kit, features pre-cut, pre-formed felt to make re-felting jobs easier and faster than the traditional method. Each *Fastfelt* kit includes pre-cut bed felt, pre-cut and pre-formed rail felts, and an adhesive spot.



With the kit, recovering a typical pool table takes about half the time compared to the old method, according to the manufacturer, Par Products of Klemme, Iowa. The kit is specifically designed to fit six-, seven-, and eight-foot models of Valley, U.S. Billiards, and Tournament brand pool tables.

The felt rail strips in each kit save time because they come pre-cut with sewn ends formed to fit tightly over the wood rail strips. This eliminates cutting each of the felt strips, and eliminates cutting and stretching the ends to fit smoothly onto the rail. The bed felt in each kit is also pre-cut to save even more cutting time.

The standard *Fastfelt* kit includes 20-ounce bed felt and operators can specify either Mail or Charles House cloth. Rail felt strips and bed felt can also be ordered separately.

Fastfelt kits and more information are available from Par Products, 101 East Main Street, Klemme, Iowa 50449; phone 515-587-2460.



100-legged video game

A snaking centipede that winds through a treacherous mushroom field, a space spider, a flea and a poisonous scorpion are the dangerous targets in Atari's new *Centipede* video game.

Play action features include an Atari Trak-Ball controlled shooting device, continuous firing capability, and full color video graphics that change completely with each level of play.

The object in this high-tension game is to shoot and destroy the centipede and its carnivorous allies, as they advance through a field of mushrooms, without being struck

back by the centipede or other monsters.

In announcing the new release, Frank Ballouz, vice president of marketing for Atari's Coin-op Division, said: "Like many of Atari's recent successful games, *Centipede* is easy to learn, but very hard to really master. It's an attention-getting new theme with game play that requires faster reflexes and provides increasing challenge as the game progresses. Test results have shown a very high level of play and replay. *Centipede* is going to eat up a lot of coins."

As soon as the player's game is activated, the first centipede begins its path through the mushroom field. The Trak-Ball controlled gun can be positioned up or down and side-to-side. Players must destroy mushrooms to get a clean shot at the centipede and other targets.

When the centipede runs into a mushroom, it turns and moves down another row. If one of the segments is hit, the centipede splits into two bodies and keeps coming. If the centipede or any portion reaches the bottom of the screen, it turns back and heads up the screen.

If the entire centipede reaches the bottom of the screen, its tail segment will be released as a new head. As the game progresses, heads will appear more frequently. When an entire centipede is destroyed, the playfield changes color and a new, faster centipede starts up the top. The centipede from then on will alternately move fast or slow.

To add challenge, a "spider" moves across the playfield and can destroy the player as well as any mushrooms it passes over. A "flea" also hops across the screen bombarding the player and leaving mushrooms in its wake. And a deadly "scorpion" poisons any mushrooms it touches. The centipede is also poisoned if it contacts a contaminated mushroom, causing it to head directly at the player.

Operator options include 2, 3, 4, or 5 selectable game "lives," 4 adjustable bonus "life" score levels, 4 language and 256 coinage options for maximum location versatility.

Centipede is available in standard upright, space-saving "mini" Cabaret and new 19 inch cocktail

cabinets with a limited quantity of 13 inch models also available.

Don't wink an eye

Gametronix International, Inc. has introduced the *Split Second 2*, a 2-player version of the original electronic reflex testing game *Split Second*.

One or two players can play. The first quarter resets the first player's 4-digit LED display. The game then waits five seconds for the second player's coin before starting the competition. The microprocessor-based circuitry is programmed to start each of five separate plays at completely random times.

Both displays start simultaneously counting in milliseconds. Players push their hand-held stop buttons the instant they see the displays light up and immediately receive a reaction-time score. A score of 0.178, for example, indicates that it took the player 178 thousandths of a second to respond to the stimulus of the LED starting to count. Each player's score is displayed for a few seconds between plays.

After the fifth play, the microprocessor adds up the five individual times and displays each player's total reaction time. The player can check his score against a humorous chart of reaction times rated from "Impossible" to "Deceased." Total scores flash to attract attention until the next coins are deposited. The average playing time is about one minute. If a player tries to anticipate the start he is subject to an automatic half-second (0.500) penalty for "jumping the gun."

"People really get hooked on this game," said Gametronix president Thomas Sweningson. "You play against yourself (you always feel you can do better the next time), and you play against your friends—perhaps to see who buys the next round. Play is especially brisk where operators and location owners display the colorful write-on 'WIN' wall poster that comes with each game. Prizes (*Split/Second* Champ T-shirts, caps, etc.) can be awarded for the week's fastest time. I don't know of a more

promotable game anywhere."

Split/Second 2 features \$350 coin box capacity, and all-metal construction with solid metal end castings and display bezels. The game is secured by means of a flexible stainless steel armored power cable (12 volts DC) that is anchored to the underside of a bar with a solid metal cable clamp and two heavy wood screws. A wall-mount bracket and free standing pedestal are also available.

An electronic coin counter that reads out on one of the digital displays can keep track of the number of coins played. The game is also designed with battery back-up to hold the count in memory if power is temporarily interrupted. A built-in battery charger circuit keeps the nickel-cadmium batteries charged at all times.

For the *Split/Second 2* distributor in the local area, contact Gametronix International, Inc., 8053 Bloomington Freeway, Suite 121, Minneapolis, MN 55420; telephone 612/884-5922.

New Deco game appears

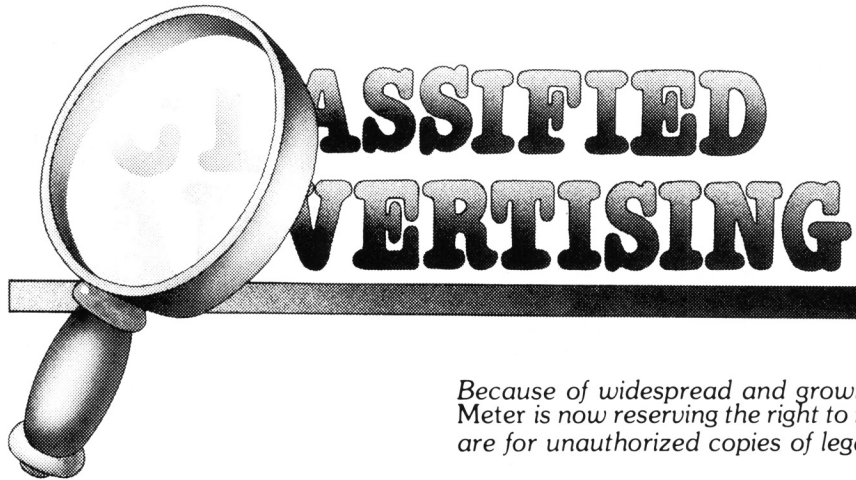
The new video game *Lock 'n' Chase* has joined the lineup available in Data East Corporation's Deco Cassette System.

The player's comic creature "Lupin" tries to elude chasing "Super D" opponent characters on the video screen. A button on the play panel closes shutters which shut out the Super Ds. Using two shutters at once, the player traps the pursuers and wins bonus points: 200 for one Super D; 300 for two; 1,000 for three; and 2,000 points for locking up four.

Meanwhile, the player picks up "gold coins" through the maze. When he has gathered all of these, he gets out of the maze through flashing "exit" doors.

The interchangeable Deco game system for *Lock 'n' Chase* comes complete with stick-on graphics. The standard Data East upright cabinet for the Deco systems becomes a new game with the *Lock 'n' Chase* graphics applied.





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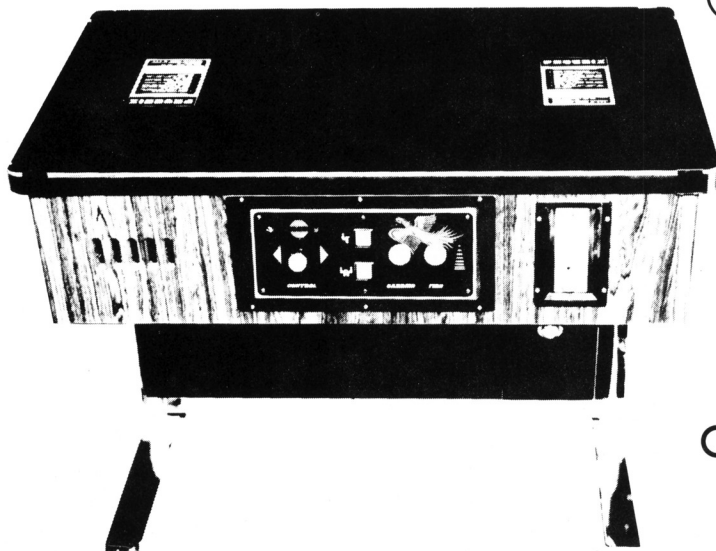


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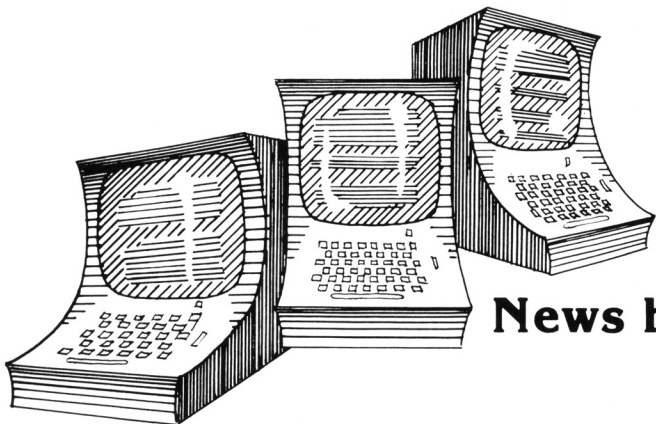
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News briefs...news briefs...news b

.....An executive director has been appointed by the recently established distributors' association. Ed Doris, a 20-year veteran of Rock-Ola Manufacturing Corp., will be the new chief staffer for the Amusement and Vending Machine Distributors Association. An office for AVMDA will be established in Chicago in the O'Hare area.....

.....Cinematronics, Inc. held an open house for the trade on June 12 at the 78,000 square foot plant nearing completion and located near Cinematronics' previous facility.....

.....Universal USA has completed the production run of Space Panic video game which has given the producer its largest numbers in sales to date. Universal's President Paul Jacobs said the next game from the Santa Clara, California plant will be called Cosmic Avenger, which was being sample tested in June and which would ship in late July.....

.....Atari was holding a new product showing for the coin-op trade on June 15, 16, and 17 in San Francisco, Chicago, and New York. Object of the attention: the new Atari video Centipede. (For details of the game's play, see "New Products" in this issue.).....

.....Corporate promotions and additions were announced at Bally Manufacturing in June, linked with a prediction that a new surge in games development is in the offing for the manufacturer. John A. Britz was elevated to chief executive officer of Bally. Details will follow in Play Meter.....

.....A new toll-free 800 service line has been established by Coin Acceptors, Inc. of St. Louis for customer calls to the factory: 1-800-325-2646.....

.....Hastings Distributing Co., Inc. in Milwaukee, Wisconsin, has been appointed a distributor for Dynamo's pool and foosball tables.....

.....Jack's Amusement Company of El Dorado, Arkansas has been appointed distributor of Stern Electronics' Seeburg phonograph line, according to Tom Campbell, director of marketing at Stern.

Stern's new association with the Arkansas distributor is effective immediately, according to Campbell.....

.....New retrofittable kits designed to enhance game play visibility for operators' Asteroids Deluxe and Warlords upright games are now available free through Atari's Customer Service Department.

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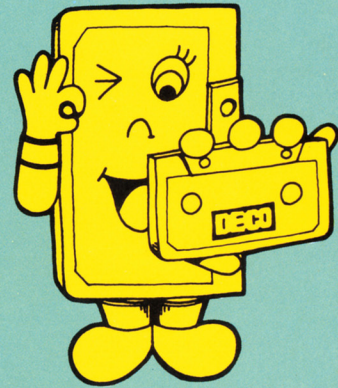
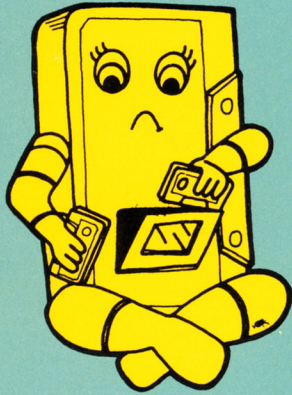
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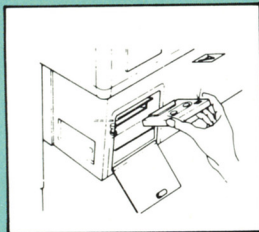
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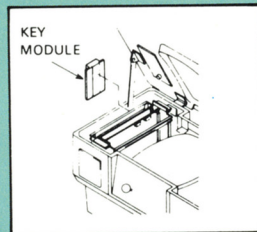
Simply change the cassettes and key modules.



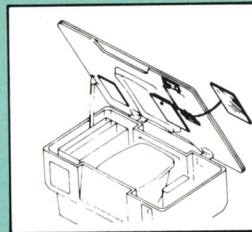
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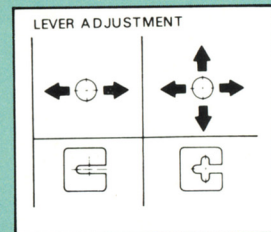
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replace explanation panel.



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PUSH RED BUTTON
TO CLOSE SHUTTER BEHIND LUPIN

1 DODGE SUPER Ds

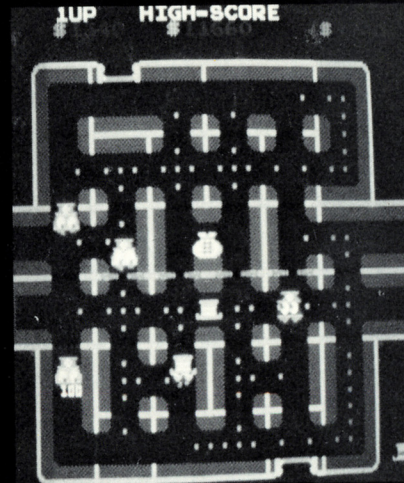
① **● WATCH OUT / PUSH SHUTTER BUTTON NOW LOCK UP SUPER Ds**

② **● WHEW! THAT WAS CLOSE**

2. LOCK UP SUPER Ds

① **● QUICK, CLOSE SHUTTER BEHIND LUPIN**

② **● HAHA! GOT YOU TWO! ? BONUS**



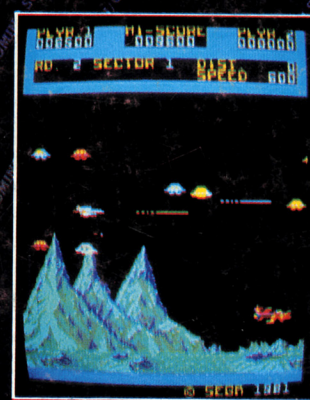
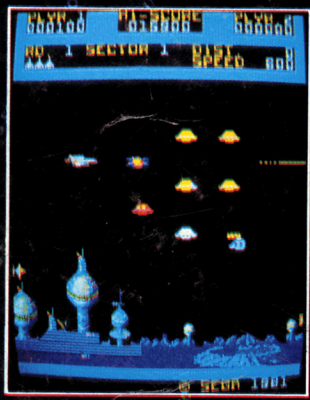
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