

October, 2002

Page 2 - Editorial

Page 4 - Understanding the Clear/Set Procedures

Page 8 - Repairing Power Supplies

Page 14 - TechFest 3 Report

Page 16 - Global Gaming Expo Show Report

Page 18 - Starpoint at G2E

Page 19 - One Million Bill Validators for JCM

Page 20 - TransAct Announces Thermal Printer With Extended Memory
128K Memory Gives Casinos More Promotional Power

Page 22 - More G2E Snapshots

Page 24 - C-C-Cold Cathode Lights The Way To Brighter Slots

Page 26 - Plumber's Guide to Fruit Machines - Part 7

Page 29 - International View

Page 30 - Introduction to Digital Electronics - Part 2

Page 32 - Phil the Filter Capacitor
The Story of an Electrolytic Gone Bad

Page 35 - TechFest 4 Scheduled for Minnesota

Page 36 - Subscriptions and Back Issues
Order form



An Open Apology to Tulalip Casino

It is the policy of Slot Tech Magazine to correct any and all errors. In this case, it was not an error in anything that was misstated, omitted, or contrary to the facts but rather an error in judgment (my judgment) in publishing a story about some of the employees of Tulalip Casino in Marysville, Washington.

The article appeared in the February 2002 issue of Slot Tech Magazine and is entitled "Reel Women." No, I do not regret publishing an article about these female slot techs. I have met them and they deserve public recognition for their skills and dedication. However, I deeply regret publishing the interview portion of the article.

The interview was conducted by a contributing writer that was so impressed by their abilities and their positions within the casino that he felt they would be good subjects for an article. He felt comfortable with them as friends as well and, according to one of the interviewees, the feeling was mutual. Subsequent to the publication of the article, I have come to learn that during the interview, parts of the conversation that the ladies felt was supposed to have been casual banter between friends, was, in fact, transcribed and published as the interview proper.

One does not expect one's casual conversation to appear in print. Colloquialisms and casual speech are not the stuff of professionalism. They are part and parcel of the side of us that we reserve for those we know, love and



trust. And, while such comments might have been apropos as direct quotes in Time or Newsweek, I should have edited them out of this story. I apologize profoundly to those whose words were published, to the casino management and to the readers of Slot Tech Magazine.

I feel just awful that what was supposed to have been a fun experience for everyone involved, has caused such distress. The women feel betrayed, the casino management is upset and I have done a grave disservice you, the readers. You have my pledge that I will be diligent in making certain that this does not happen again in the pages of Slot Tech Magazine.

A handwritten signature in black ink that reads "Randy Fromm".

Randy Fromm
Publisher – Slot Tech Magazine

Randy Fromm's Slot Tech Magazine

Editor

Randy Fromm

Technical Writers

Dion Anderson
Bart Holden
Olson Jake
Ken Locke
Gordon Lowe
Kevin Noble
Herschel W. Peeler

Advertising Manager

Dennis Sable

Slot Tech Magazine is
published monthly by
Slot Tech Magazine
1944 Falmouth Dr.
El Cajon, CA 92020-2827
tel.619.593.6131
fax.619.593.6132
e-mail

editor@slot-techs.com
Visit the website at
slot-techs.com

SUBSCRIPTIONS

Domestic (USA)
1 year - \$60.00
2 years - \$120.00
International
1 year - \$120.00
2 years - \$240.00

copyright 2002 under the Uni-
versal Copyright Convention.
All rights reserved.

YOU ASKED... WE LISTENED.

*JCM offers new
solutions to your
currency handling needs.*

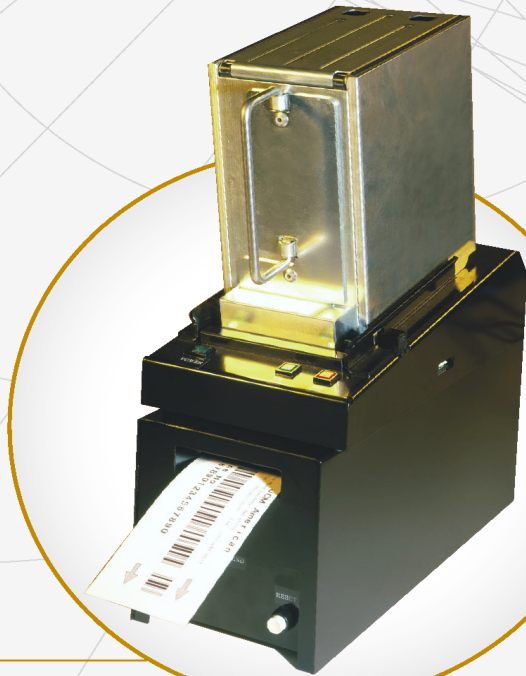


SENTRY,[™] JCM's Smart Entry

JCM's SENTRY displays acceptable bill denominations and coupons, faults, errors and cashbox status using easily identified colored LED icons. SENTRY's function and appearance enhance game appeal to the players, and maintenance for the operators.

Intelligent Cashbox System

JCM's new cash-handling system uses a memory module, reader, and printer to efficiently eliminate errors in the conventional soft count process.



SECURITY. TECHNOLOGY. SOLUTIONS.

USA

JCM American Corporation
925 Pilot Road Las Vegas, Nevada 89119
Tel: 702.651.0000 **Fax:** 702.644.5512

www.jcm-american.com
email: sales@jcm-american.com

Europe

JCM Germany GmbH,
Büttgenbachstraße 5, D-40549 Düsseldorf
Tel: +49.211.5306450 **Fax:** +49.211.53064565

www.jcm-germany.com
email: info@jcm-germany.com



Understanding the Clear/Set Procedures

By Kevin Noble



With new manufacturers beginning to enter into the market, or when the casino brings these games onto the floor, I have been on the internet asking for help to prepare myself about certain manufacturer's clear /set procedures. This also applies to existing manufacturers upgrading their software, and even when new technicians are starting out on the job.

As Slot Tech Magazine carries some articles that are technically advanced, I still like to keep things simple with the new guys in mind just starting out. I was there once, and wished one day that it was that simple.

As time goes by, and the clears and sets are done routinely, thru EPROM upgrades, theme and denomination conversions, and repair you understand the steps involved for each manufacturer's clear and set-up process. This becomes easier, the more times it is done.

gets a chance to do these set and clears because of the availability of our Electronic Gaming Officers. Currently at our site, we do not have every manufacturer, every reel or video game, but enough to give the customers a different variety such as IGT, BALLY, WILLIAMS, SIGMA, KONAMI, ANCHOR, and MIKOHN.

THE REELS

BALLY 6000

- First there are 3 levels of SafeRam clears used for both the 6000 and 5500

Complete

- erases and reformats the SafeRam
- game options are restored to factory default
- all soft meters reset to "0" including SafeRam counter
- SafeRam counter is erased
- power up with clear chips in and hold pseudo and test buttons down
- message CH C and then CL C will appear, and then all light flashing

Full

- SafeRam counter is not erased
- Game options are re-

stored to factory default

- All soft meters reset to "0"
- Power up with clear chips in and hold pseudo button down
- Message CH F and CL F will appear, and then all lights flashing

Partial

- SafeRam counter is not erased
- Game options remain the same
- All soft meters reset to "0"
- Power up with just the clear chips in
- Message CH P and CL P will appear, and then all lights flashing.

Clearing Procedure (using Mikohn SAS)

1. power machine off and remove MPU
2. r e m o v e EPROMS U28 and U43
3. install clear chip U28 and U43 in there correct locations
4. turn power on (depending on what clear procedure is needed)
5. power down and remove clear

- chips
6. reinstall original EPROMS, and power up
 7. Reels will reset, when they start to spin, close door before they stop
 8. hit change button, insert coin and BV light should come on
 9. set options

BALLY 5500

- There are also the same three levels of SafeRam clears used here instead of removing the U28 and U43; we simply jump the pins at JW 10.

Clearing Procedure

1. power machine

- off, pull out MPU
2. move JW 10 into the next position
3. turn power on (again depending what clear is needed)
4. after the clear is performed, return JW 10 to normal position
5. power up, reels will reset, set options

WILLIAMS

Clearing Procedure

1. Power down game
2. Remove CPU from tray and remove XU3
3. Install clear chip with correct denomination
4. power machine up (correct denomination will appear)
5. power game down and

- remove clear chip
6. Install your XU3 back in the socket
7. Message "clr" appears
8. If a game change is needed "6annE" appears first
9. push diagnostic button twice for game change
10. push diagnostic button once, game reboots
11. "clr" appears again, press diagnostic button again
12. reset all options

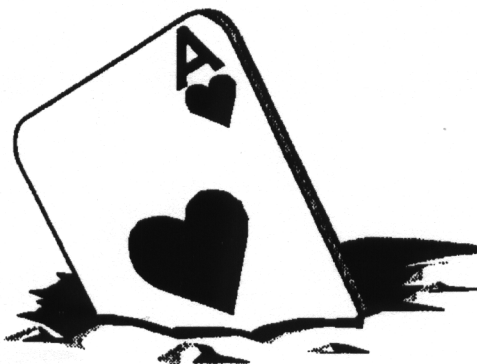
SIGMA

Clearing Procedure

1. Turn off machine
2. Turn and leave reset in "on" position
3. Depress and hold test button and turn on game

Your Future Is Our Focus at

**WHOLESALE
ELECTRONICS**



Your "Ace-in-the-Hole" for:

- Lamps, Fluorescents & Power Cords
- Semiconductors & Capacitors
- Cable Ties, Batteries & Tape
- Replacement Slot Parts
- Anti-Static Equipment
- Programming Equipment

East Coast/International

Toll Free: (800) 222-2899

Fax: (302) 328-4547

**Call Now for Our
Gaming Catalog**

West Coast

Toll Free: (800) 233-5668

Fax: (775) 826-7571



E-mail: info@wholesaleworldwide.com

www.wholesaleworldwide.com



4. Message "ALL DATA W/O SETTING WILL BE CLEARED"
5. after message is displayed release reset and test button
6. power game off and on
7. calibrate SIB board and set options

IGT / ANCHOR

Clearing Procedure Using Mikohn (SAS)

1. remove game "SP" chip
2. insert desired clear chip
3. power up, "0" appears in cp window
4. Remove clear chip and install desired "SP" chip
5. 61 code appears, press self test for three seconds
6. 61-1 appears, close door and turn reset key one time
7. 65-3 appears, turn reset key one time
8. 65-1 appears, open door and press self test for three seconds
9. wait for reels to spin, I usually set machine option now
10. Power down, install desired set chip (0091 for example)
11. 0091 appears in credit window, press self test button
12. A "0" appears, set this to 2 (SAS) using reset key
13. press self test again and set machine address to 1
14. Continue this until all options are set to your configurations (BV enable, de-

nomination, progressive)

15. Power down remove set chip, reinstall desired "SP" chip
16. Power up, 61 code appears, close door and turn reset to clear
17. Verify all options are set correctly.

Wheel of Fortune and Prize display

- The Wheel of Fortune progressive display uses the same clear and set procedure as the IGT except for a couple of added steps.
- To set the display follow steps 1 to 14
- After setting the denomination (#6), and pressing the self test button again #9 appears in the coins played window and #1 in the winners paid.

Setting the Progressive Display Option (not used as a stand-a-alone, but display only)

14. Press self test and #9 appears and #1
15. For a quarter game, (start value in the thousands column) turn the rest key four times until \$5,000.00 appears. (progressive reset amount)

16. For a dollar game, (start value in the ten thousands column) turn the reset key five times until \$10,000.00 appears.
17. press self test again #9 - 2 appears, set your maximum progressive amount
18. press self test again #9 - 3 appears, set your incrementation rate
19. press self test again #9 - 4 appears, set your current progressive amount
20. power down, remove set chip, reinstall desired "SP" chip
21. power up, 61 code appears, close door and turn reset key to clear
22. Verify all options are set correctly.

Overview

There are still many more manufacturers out there, other procedures, older versions that I have not been exposed to, and many others that I have just plain forgotten. If anybody has any other manufacturer procedures that we could add at a later date to help new technicians, please drop me a line. If we can come up with enough material to make another list, I can pass it along to others. In another issue I hope to pass along the current video machines clears and sets used on our floor.

-Kevin Noble
Knoble@slot-techs.com

mei | cashflow™ Let The Games... Begin!

MEI keeps the money in motion!

Introducing the revolutionary new MEI CASHFLOW™ SC66 bill acceptor for optimal performance and reliability in a ticket in/ticket out environment.

Engineered for better performance.

Any bill acceptor can handle new, pristine bills. But in the real world, many bills are tattered, torn and crumpled. The MEI CASHFLOW™ SC66 handles old and new bills better than the competition.

First, we process ALL bills and bar codes so there's no frustration from your customers. Then, we put our advanced algorithms and 100Mhz processor speed to work, scanning up to 300% more of each bill than other models - accepting legitimate bills and bar codes faster, with fewer jams. This adds up to dramatically improved customer satisfaction, measurably increased cashflow and significantly reduced operating costs.

It's not just more sophisticated, it's tougher too.

It doesn't help to have the latest, most advanced bill acceptor technology in the world, if the cash-box is damaged in handling. And during transport to and from your cash room, that's exactly what can happen. That's why the MEI CASHFLOW™ SC66 is built rugged, to survive the worst day-to-day abuse and stay reliable.

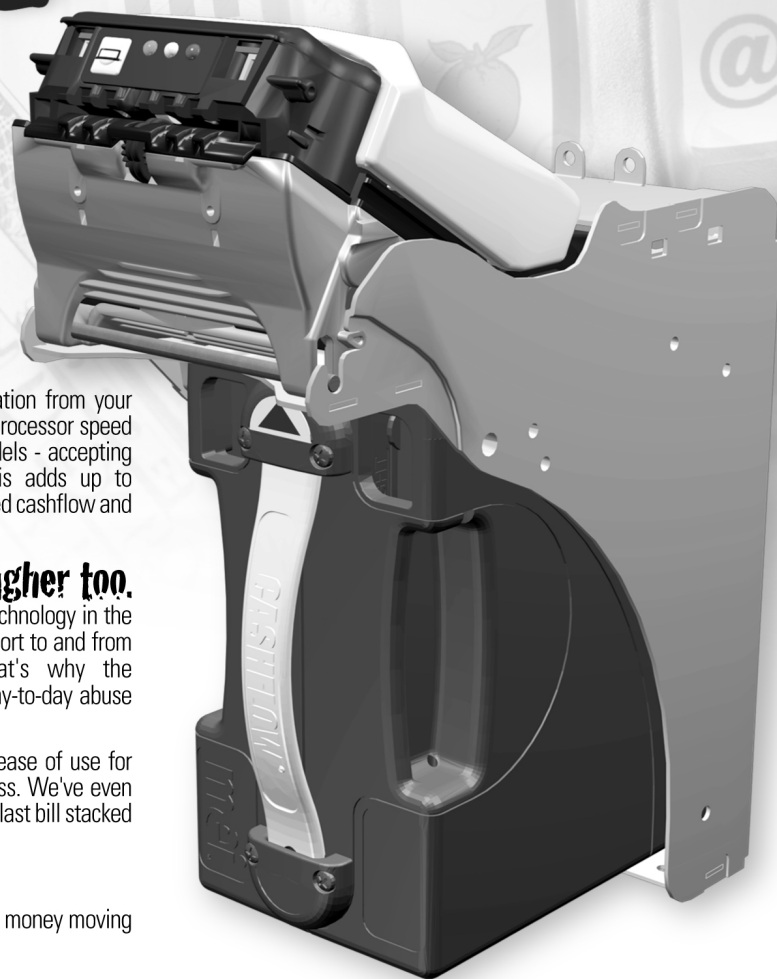
Everything about the MEI CASHFLOW™ SC66 design provides ease of use for operators, improves your cashflow and your customers' happiness. We've even incorporated the first Dispute Window in the industry to show the last bill stacked without removing the cashbox.

Call us today!

We'll demonstrate the revolutionary new features that keep your money moving and your games playing!

800-345-8215
702-597-4836 (Las Vegas)
www.meiglobal.com

© Mars, Inc. 2002



mei | cashflow™
sc66

Repairing Power Supplies

By Herschel Peeler



Power supplies are basically simple creatures. They change the AC coming out of the wall into various DC voltages the game requires. Well, that sounds simple. Sometimes they go about that in difficult ways. Let's cover the two basic types we find in the gaming industry. Cover the easiest one quickly, and spend more time on the not-so-easy. While we're at it, we'll cover typical failures and easy checks. Many of the features found in the more complex designs are easier to understand using the simpler designs first.

Linear (Analog) Supplies

These are a simple design. A

transformer drops the line voltage down to close to the desired value. A rectifier changes the AC coming out of the transformer to pulsating DC. A filter capacitor smoothes out the pulsating DC to unregulated DC. A regulator drops the voltage down to the desired voltage, and limits the current to a predictable safe value. Not much to go wrong with this design. The transformer doesn't transform. The Rectifier doesn't rectify. The filter doesn't filter. Or the Regulator doesn't regulate. Simple ohmmeter checks (make sure power is off) will tell you what went bad. When in doubt, compare readings with a known good unit.

Advantages: Low parts count. Easy to manufacture. Still quite acceptable for low current designs (less than one amp).

Disadvantages: Not very efficient. They can waste about as much energy as they supply. Any power not supplied

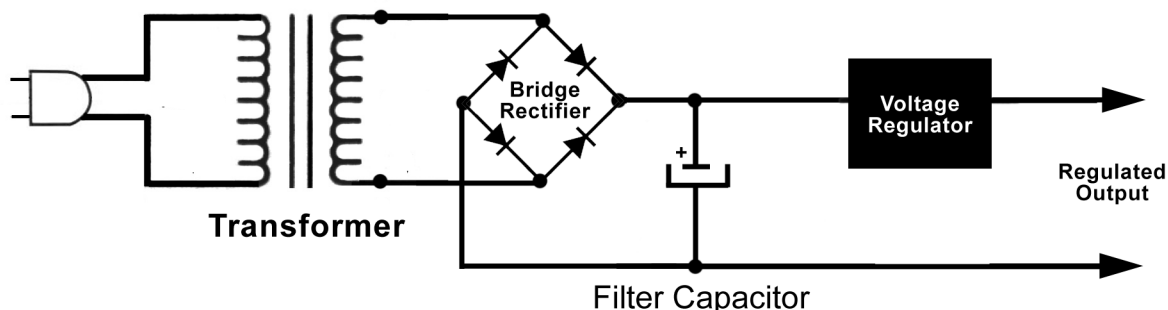
at the output must be dissipated across the regulator as wasted heat. 60 to 75% efficiency is considered an acceptable design. Huge expensive power transformer.

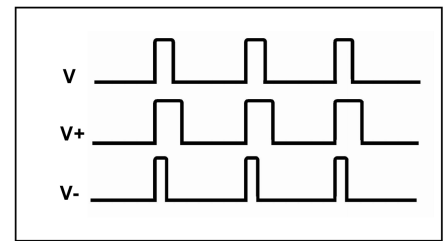
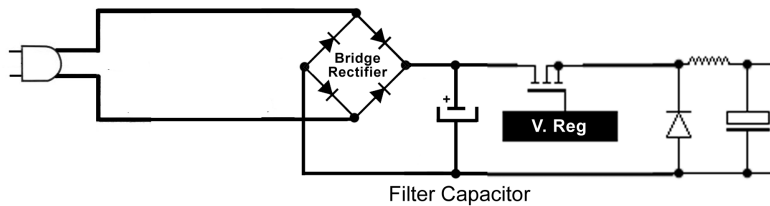
Switching Power Supplies, Simplest

This we'll spend a little more time on. All the same components can be found in a switching power supply. The circuit is just a little more complicated. In many designs, the incoming line voltage is first changed to a DC level. 150 VDC is quite common here. Be careful. This part of the circuit can be fatal.

In this design (known as a "buck" regulator) a power transistor is used to chop this high DC level into pulsating DC. Controlling this power transistor is our regulator.

There are a few different methods. We'll discuss the Pulse Width Modulation (PWM) method, just because it's easy to understand. The





width of the pulses that turn the power transistor on can be varied. The circuit is designed such that at some nominal pulse width, a desired output voltage is attained after the pulses get filtered by a filter capacitor. The wider the pulses, the higher the charge on the filter capacitor, the higher the output voltage.

Some system of feedback components sense the voltage level at the filter capacitor and inform the regulator if the voltage is higher or lower than it should be. The regulator changes the pulse width appropriately to bring the output voltage into proper range.

Advantages: No huge power transformer. Fairly efficient.

Disadvantages: No isolation is provided. The output voltage is referenced to the same ground as the AC line in. This presents a shock hazard. In the Linear design, in addition to changing the voltage level, the transformer also isolates the ground on the input circuit (Primary) from the ground on the output circuit (secondary).

This design is acceptable for one output voltage of medium current levels (2 or 3 amps) but we do not use it in the gaming industry.

Slot Tech Magazine

Ever Lost A Key?

How Long Does It Take to Change Your Locks?

With the Medeco DuraCam II you can replace the core of the lock in a matter of seconds, providing an entirely new key combination. The DuraCam II was designed to make changing out your locks quick, easy and secure.

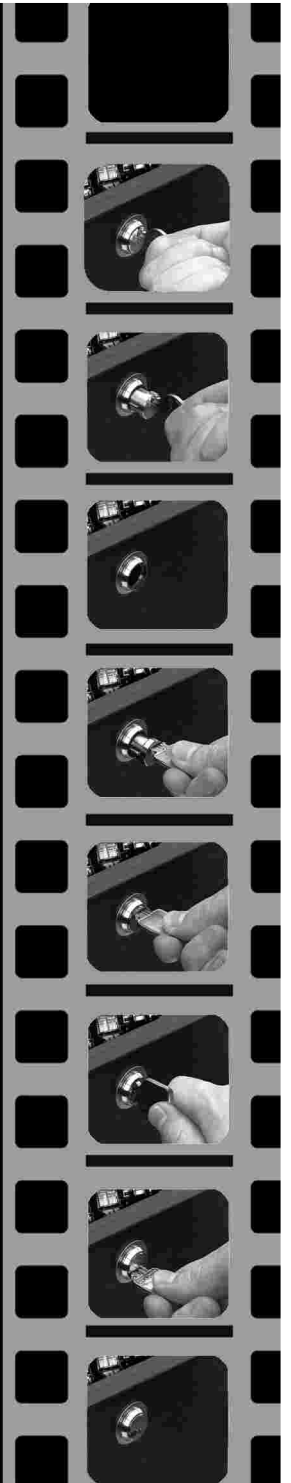
Call Medeco for a free security pack including a free sample of the removable core DuraCam II.

1-888-633-3261



medeco
HIGH SECURITY LOCKS
Strong. Secure. Solutions.

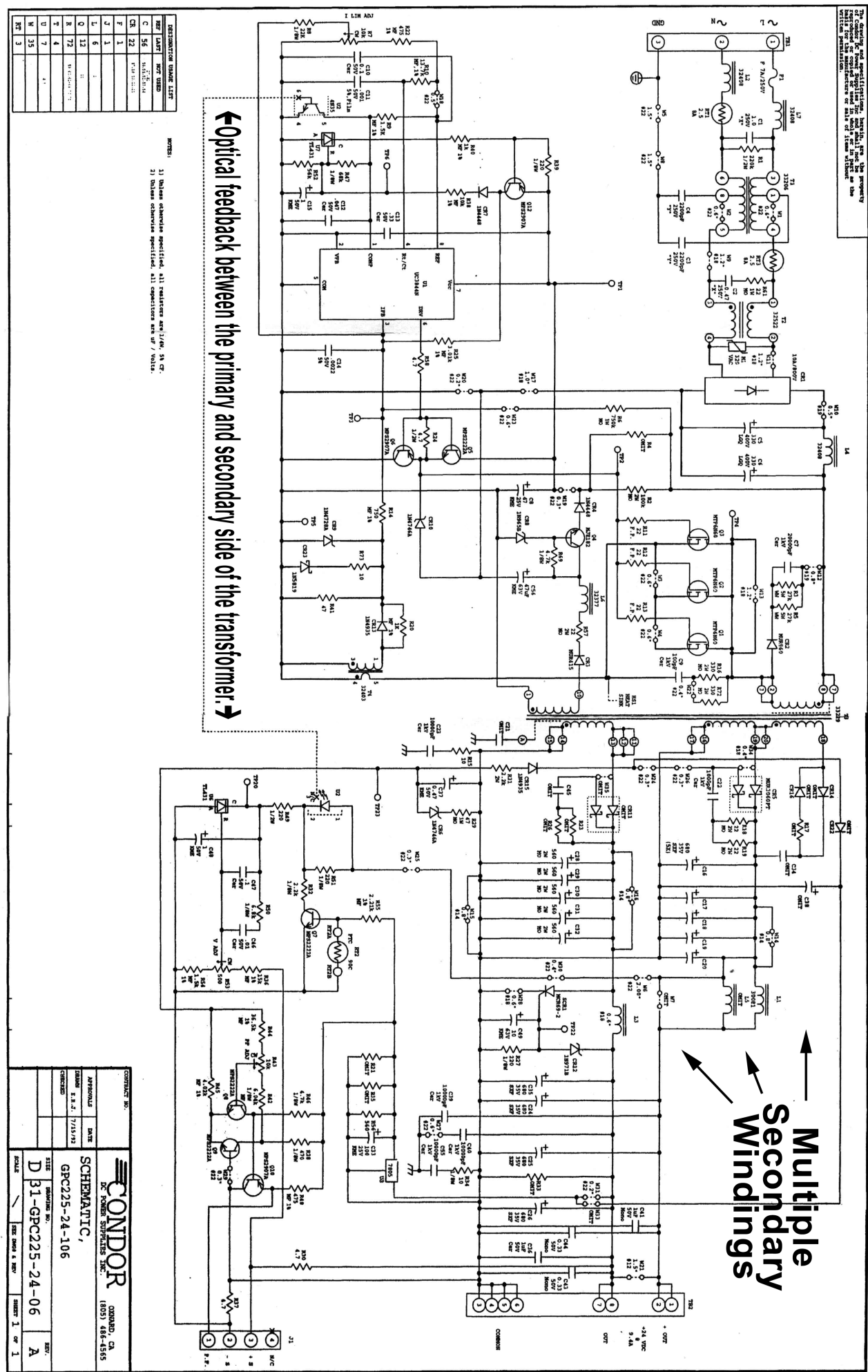
An ASSA ABLOY Group company



See drawing and specifications, pages 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Optical feedback between the primary and secondary side of the transformer.

Multiple Secondary Windings



DESIGNATION	VALUE	UNIT
R1	10K	Ω
R2	10K	Ω
R3	10K	Ω
R4	10K	Ω
R5	10K	Ω
R6	10K	Ω
R7	10K	Ω
R8	10K	Ω
R9	10K	Ω
R10	10K	Ω
R11	10K	Ω
R12	10K	Ω
R13	10K	Ω
R14	10K	Ω
R15	10K	Ω
R16	10K	Ω
R17	10K	Ω
R18	10K	Ω
R19	10K	Ω
R20	10K	Ω
R21	10K	Ω
R22	10K	Ω
R23	10K	Ω
R24	10K	Ω
R25	10K	Ω
R26	10K	Ω
R27	10K	Ω
R28	10K	Ω
R29	10K	Ω
R30	10K	Ω
R31	10K	Ω
R32	10K	Ω
R33	10K	Ω
R34	10K	Ω
R35	10K	Ω
R36	10K	Ω
R37	10K	Ω
R38	10K	Ω
R39	10K	Ω
R40	10K	Ω
R41	10K	Ω
R42	10K	Ω
R43	10K	Ω
R44	10K	Ω
R45	10K	Ω
R46	10K	Ω
R47	10K	Ω
R48	10K	Ω
R49	10K	Ω
R50	10K	Ω
R51	10K	Ω
R52	10K	Ω
R53	10K	Ω
R54	10K	Ω
R55	10K	Ω
R56	10K	Ω
R57	10K	Ω
R58	10K	Ω
R59	10K	Ω
R60	10K	Ω
R61	10K	Ω
R62	10K	Ω
R63	10K	Ω
R64	10K	Ω
R65	10K	Ω
R66	10K	Ω
R67	10K	Ω
R68	10K	Ω
R69	10K	Ω
R70	10K	Ω
R71	10K	Ω
R72	10K	Ω
R73	10K	Ω
R74	10K	Ω
R75	10K	Ω
R76	10K	Ω
R77	10K	Ω
R78	10K	Ω
R79	10K	Ω
R80	10K	Ω
R81	10K	Ω
R82	10K	Ω
R83	10K	Ω
R84	10K	Ω
R85	10K	Ω
R86	10K	Ω
R87	10K	Ω
R88	10K	Ω
R89	10K	Ω
R90	10K	Ω
R91	10K	Ω
R92	10K	Ω
R93	10K	Ω
R94	10K	Ω
R95	10K	Ω
R96	10K	Ω
R97	10K	Ω
R98	10K	Ω
R99	10K	Ω
R100	10K	Ω

DESIGNATION	VALUE	UNIT
C1	1000μF	F
C2	1000μF	F
C3	1000μF	F
C4	1000μF	F
C5	1000μF	F
C6	1000μF	F
C7	1000μF	F
C8	1000μF	F
C9	1000μF	F
C10	1000μF	F
C11	1000μF	F
C12	1000μF	F
C13	1000μF	F
C14	1000μF	F
C15	1000μF	F
C16	1000μF	F
C17	1000μF	F
C18	1000μF	F
C19	1000μF	F
C20	1000μF	F
C21	1000μF	F
C22	1000μF	F
C23	1000μF	F
C24	1000μF	F
C25	1000μF	F
C26	1000μF	F
C27	1000μF	F
C28	1000μF	F
C29	1000μF	F
C30	1000μF	F
C31	1000μF	F
C32	1000μF	F
C33	1000μF	F
C34	1000μF	F
C35	1000μF	F
C36	1000μF	F
C37	1000μF	F
C38	1000μF	F
C39	1000μF	F
C40	1000μF	F
C41	1000μF	F
C42	1000μF	F
C43	1000μF	F
C44	1000μF	F
C45	1000μF	F
C46	1000μF	F
C47	1000μF	F
C48	1000μF	F
C49	1000μF	F
C50	1000μF	F
C51	1000μF	F
C52	1000μF	F
C53	1000μF	F
C54	1000μF	F
C55	1000μF	F
C56	1000μF	F
C57	1000μF	F
C58	1000μF	F
C59	1000μF	F
C60	1000μF	F
C61	1000μF	F
C62	1000μF	F
C63	1000μF	F
C64	1000μF	F
C65	1000μF	F
C66	1000μF	F
C67	1000μF	F
C68	1000μF	F
C69	1000μF	F
C70	1000μF	F
C71	1000μF	F
C72	1000μF	F
C73	1000μF	F
C74	1000μF	F
C75	1000μF	F
C76	1000μF	F
C77	1000μF	F
C78	1000μF	F
C79	1000μF	F
C80	1000μF	F
C81	1000μF	F
C82	1000μF	F
C83	1000μF	F
C84	1000μF	F
C85	1000μF	F
C86	1000μF	F
C87	1000μF	F
C88	1000μF	F
C89	1000μF	F
C90	1000μF	F
C91	1000μF	F
C92	1000μF	F
C93	1000μF	F
C94	1000μF	F
C95	1000μF	F
C96	1000μF	F
C97	1000μF	F
C98	1000μF	F
C99	1000μF	F
C100	1000μF	F

U16.	58.	CR.
OP	7	WOLFE.

Switching Power Supplies, (More Common Designs)

In most power supplies used in gaming devices, multiple power supplies (multiple voltages) must be provided and at higher currents than those already mentioned. The process is similar, and the parts are familiar. Please refer to the power supply schematic on the following page.

Our incoming AC is rectified and filtered and still goes to the power transistor but this time it must pass through the primary winding of a transformer first. It is still chopped as before. Various secondary windings can be added to the transformer to get different voltages out. One of these voltages must provide our feedback to the regulator. But we have a problem. The secondary system is on a different ground than the primary. In most current designs an opto-coupler is used to provide feedback between the secondary and primary.

An opto-coupler is a simple creature. It is made up of a light emitting diode and a phototransistor. Light carries the signal across. Both circuits may work at different ground voltages. The more current that is passed through the LED, the brighter the light, the more the phototransistor turns on.

The secondaries of the transformer are rectified and filtered to provide the necessary voltages at the outputs.

Advantages: No large trans-

Slot Tech Magazine

Gaming Solutions From SENCORE

Sencore Analyzers Offer The Ability To Troubleshoot
Any Game, Putting You Back In The Revenue In Half The Time!



The LC103 ReZolver™ analyzes all capacitors and coils in any game's switch mode power supply (SMPS) with the push of one button. . . **IN-CIRCUIT!**

**On-Site
Training**

**Call Us About Custom On-Site Training
For Groups Of 12 Slot Techs Or More!**



The CM125 "Pix Pak"™ gets any video game monitor (RGB format) back in action faster using industry standard analyzing test signals for super-fast signal tracing and troubleshooting.



The CR7000 "BEAMRITE"™ safely analyzes all video game CRTs. Plus an exclusive reactivation feature extends CRT life for longer floor time and more revenue.

**Please contact us about
your surveillance, engineering,
and attractions test equipment needs.**

SENCORE

1-800-736-2673

www.sencore.com • e-mail: sales@sencore.com

former is required. Switching power supplies switch at much higher frequencies than linear supplies. The switching speed may be in the tens of thousands of Hertz, or even hundreds of thousands of Hertz. The higher the switching speed, the more inductance can be had with a smaller transformer. A transformer that provides five amps can now be golf ball size instead of baseball or softball size. The supply is smaller, lighter, and more efficient (typically 90% or more). This design can even be cheaper considering the cost of the transformer for a typical system.

Disadvantages: Complexity. The more parts it has, the more stuff we have to go wrong.

Editor's note: Hey, Herschel . . . It's called "Job Security."
- ed

What Goes Wrong

The transformer doesn't transform. The Rectifier doesn't rectify. The filter doesn't filter. Or the Regulator doesn't regulate. Simple ohmmeter checks (make sure power is off) will tell you what went bad. When in doubt, compare readings with a known good unit.

Electrolytic filter caps often dry out and open up, or short. "Just a little off" usually doesn't kill operation. Power transistors short, or open. Again, "just a little off" isn't what you are looking for.

Bad solder joints are always a potential problem in cir-

cuits that get hot (Power transistors, rectifier diodes, fuses, transformers).

Don't let the fact that you don't have a schematic scare you away from attempting repairs. Most of the time the problem can be found with a calm confident mind and an ohmmeter. When in doubt, compare readings with a good unit.

Suggestions

Start with a close visual once-over. Are there any signs of excessive heat or damage? Bad solder joints? Burned or cracked components?

If you are going to apply power to a power supply you are testing; all power supplies, especially switching types, should be powered through an isolation transformer, and from a fused source (not a wall outlet). If you plug an unknown power supply straight into a wall socket, fused at 15 or 20 amps at the breaker, you can dissipate 2400 watts (120 V x 20 Amps) before the circuit breaker blows. We're talking pyrotechnics and smoke generators here, folks. For safety's sake, use a current limited source and isolated grounds.

If you draw excessive current, the typical problems are few. Shorted power transistors, shorted filter capacitors, that sort of thing. Again you are looking for something that is drastically wrong, not "just a little off".

If it doesn't draw excessive current, but doesn't output

a voltage, look for an open circuit. Look for an open power transistor, open transformer, open trace on the board, and I'm sorry I have to mention it, open fuse. Not all fuses are tubes of glass. Get yourself an Allied catalog and look at what shapes and sizes fuses come in these days. That's not a plug for Allied. They are just readily available. Integrated circuits are often high points of failure. The actual transistor inside an IC may be micron size. It doesn't take much for an IC to go bad. (Not so with discrete components.)

If it just "works weird" you may be in for some serious troubleshooting. The output may measure close to its proper DC voltage, but what does it look like if you put the meter on AC volts? Excessive ripple can be caused by open (dried out) filter capacitors.

Key questions for such troubleshooting can narrow your search. What specifically is wrong? What parts do that function? Is the switching regulator oscillating? (Bad IC) Is the regulator getting its reference voltage and power? The regulator IC must get power from the primary side of the supply for the circuit to start up. Is the IC getting power?

Once you find the bad part you have to ask yourself the next question. Is this the problem or just the result of another problem? Capacitors fail spontaneously. Semiconductors may not. If you've ever sat through one of my

semiconductor classes, you have seen how much stress a diode or transistor can take beyond their rated values before giving up and dying. Most designers give themselves a lot of room for stress before failure.

Working Without a Schematic

Sit down with a good unit and a cup of coffee, and make note of what voltages are normal on a good unit and/or what resistances to ground are normal. Taking readings with your meter set to "diode test" are also useful when looking for bad semiconductors.

When in doubt, change it. For the most part, components are cheaper than sending the unit out for repair, or just buying a new

one (some people don't even want to repair their units any more).

Know when to stop troubleshooting. If the value of the assembly is less than \$100, it doesn't take long before your time exceeds the cost of repairs. There are exceptions here. If you are in Las Vegas, call the factory and have them put a unit in a taxi and deliver it to you. If you are in An Jung ni, South Korea, (or Porterville, California) you may want to spend more time troubleshooting.

If you have a box full of these suckers, scrap the troublemakers for parts to fix others. You get rid of your headaches and save the company money on repair parts.

Keep a book of symptoms and solutions. In this indus-

try, there are no such things as unique problems. If you encounter a problem, I can almost guarantee that you will see it again, or at least somebody has. Go to "www.delphiforums.com" and look for "slot techs". You will find others in the same world in which you live. You are not alone.

Don't be afraid to call the manufacturer. Call the game manufacturer, as well as the manufacturer of the unit itself. See if they have a web site.

Above all, don't forget the "float test". Take it out to the lake and throw it in the deep end. If it floats it was a bad one, and you don't need to go get it.

Herschel Peeler
hpeeler@slot-techs.com



INNOVATIVE • GLOBAL • EXPERIENCE • DEPENDABLE • INNOVATIVE • GLOBAL • EXP

SOLUTIONS

SPIN

COLLECT

MAX BET

SELECT LINES

Innovation Your Players Touch.

For more than a decade, MicroTouch™ touch solutions have helped establish players' preference for touch games, while providing game manufacturers the reliability they require to help keep their machines operating around the clock.

Find out about how our *brilliant solutions with a human touch* benefit game makers around the world at our interactive website...www.3Mtouch.com/info/st

MicroTouch

3M Innovation

© 3M 2002 MicroTouch is a registered trademark of 3M.

TechFest 3 Held in Las Vegas

How Much Did They Learn in 3 Days?

Slot techs from across the continental United States joined the gaming industry's top engineers, technicians, technical writers and instructors for three days of technical seminars and presentations at TechFest 3. The event was held at the Boardwalk Hotel & Casino in Las Vegas, Nevada.

TechFest 3 featured presentations from:

Asahi Seiko
Coin Mechanisms, Inc.
Seiko (printers)
MEI
3M Touchsystems
Sencore
Ceronix

TechFest 4 is planned for Grand Casino, Mille Lacs in Minnesota. The dates are October 22nd - 24th, 2002.



George Hoehne, product manager for Coin Mechanisms, Inc., demonstrates the use of their diagnostic software.



TechFest attendees included: Bryan Hunter, Bob Coleman, Carter Yarborough, Paul Swank, Sycuan Casino, Bobby Mansion, Donald Knight, LA Slot Machine Co., Inc., Danny Thompson, Ray Jones, Argosy Casino, Dion Anderson, Circus, Reno, Ram Nand, Seth Noble, Chinook Winds Casino, Arden Alpers, Little Six Casino, Chris Wilkes, Motor City Casino, Ray Romero, Jason Hartman, Kerry Morrison, Lucky Eagle Casino Paul L. Martin, Slot World Casino

Raymond Rivera, Jackpot Junction Casino, Darryl Cameron, Ken Jahnke, Bay Mills Resort & Casino, Charlie Hart, Casino Sault Ste. Marie, Dennis Timothy, Nelson Ashkewe, Ben Ferdinand, Casino Rama, Jason Halstead, Kenneth Kipp, Elias Moses, Clearwater River Casino, Jay Ellenberger, Vikki Howell, Yakama Nation Legends Casino, Robert Downes, Ron Blank, Desert Diamond Casino, Shannon Covert, Adrian Andrews, Spirit Mountain Casino, Wilbur Thomas, The Gillmann

Group, Edwin Green, Terry Kratz, Sac and Fox Casino, Robert Clay, Larry Mason, Bonanza Casino, Paul Haws, John Green, Fort McDowell Casino, Jesse Medina, Trump Casino Hotel, Monti Marrufo, Gerardo Moreno, Tim McKenny, Gila River Casino, Madilenia Baker, Sky Ute Casino, Shane Johnston, Marquette Ojibwa Casino, Lawrence Budreau, Ojibwa Casino Resort, Ruben Rubalcava, Charles Carver, Robinson Rancheria Bingo & Casino.

Ceronix engineer Ramiro Limon presents a vast array of troubleshooting tricks for Ceronix monitors. This seminar was worth its weight in gold (what does a seminar weigh, anyway?).



MEI's Steve Marsh provides attendees with an in-depth look at the ZT1200 bill validator. A closed-circuit video camera provided close-ups of the details while Steve discussed maintenance and repair.

Advanced Electronic Systems' Jackie Wallenburg shows off MEI's new CashFlow SC66 at TechFest 3. Attendees were treated to a sneak-peak at the new device. AESI was the sponsor of TechFest 3 and represents MEI as well as Kortek monitors, Seiko printers, Starpoint (reels, buttons and other controls) and a host of other products. Visit their website at gamingstuff.com.



Slot Tech Magazine salutes *Advanced Electronic Systems, Inc.* and thanks them for their sponsorship of TechFest 3

New Event Sees Tremendous Growth In Just Two Years

Editors note: Slot Tech Magazine's special focus is not on the games themselves but rather on the technology that goes into making them the sophisticated, state-of-the-art machines that they are today. In that regard, you will not see reviews of the hundreds of new games displayed at the Global Gaming Expo. I'll leave that up to the my fellow trade journalists at magazines like InterGaming, Global Gaming Business, Gaming Products & Services, Indian Gaming Magazine and the flock of publications from Gem Communications. These are all fine magazines and I encourage you all to subscribe to them. Here, then, is a quick snapshot of what I found at the show that makes things tick.

- ed



One company in all the world stands out with the most experience in the field of providing PCB systems for slot machines. A fixture at the London show for donkey's years, Heber's Derek Russan and Richard Placito demonstrated some of their remarkable systems.

With 616 exhibiting companies and 8,183 attendees visiting the Las Vegas Convention Center on its first official day, Global Gaming Expo (G2E) show managers reported a successful grand opening for the leading trade event for the worldwide gaming community. Organized by the American Gaming Association (AGA) and Reed Exhibitions, G2E hosted the dynamic gaming industry during its exhibition held September 17-19, 2002.

In just two years since the event's inception, the G2E exhibition floor has expanded from 375 companies comprising 133,330 square feet last year to 616 exhibits encompassing 190,400 square feet. Preliminary figures indicate day one attendance at 8,183, compared to 5,996 on opening day at the event's launch in October 2001. As the doors to the exhibit hall opened, thousands of gaming industry buyers from commercial casinos, Native American casinos and other gaming venues from around the world converged on the booths of hundreds of suppliers including all leading gaming manufacturers.

"G2E's aisles were completely packed, and crowds filled nearly all of today's conference



Sencore's Don Multerer proudly shows some of their test equipment to Black Hawk Casino's slot floor supervisor, Jason Czito.



The most gregarious couple in the gaming industry, monitor mavin Don Whitaker and his wife Kay are caught in the act of cracking up at the Ceronix booth.



Christopher Shol and Marlene Schade of Durel Corporation show off their giant electroluminescent panel, free-standing sign.



Every slot machine needs a base. Sky Ute slot technician Madilenia Baker pauses at the Great American Base Company with el jeffe, slot technical manager Jim Blosser. On the left is marketing director William Knoll. That's designer Jason Radziszewski on the right.



Wells-Gardner's Vice President of Sales (and my longtime buddy) Marty Glazman poses next to their latest digital monitor with sales administrator Kimberly Slowik

sessions,” said Frank J. Fahrenkopf, Jr., president and CEO, American Gaming Association. “As gaming continues its expansion as a leading form of entertainment, so does the need for a premier venue that supports buying and selling activity for the industry. Judg-

ing by the number of participants here today on both buy and supply sides, an event like G2E is critical for all gaming professionals.”

Show managers also note that preliminary pre-registration reports prior to the show indi-

cated that 16% of pre-registrants are internationals, while 45% of the remaining 84% of the domestic pre-registrants reside in regions from outside the greater Nevada area.

AG&E Sales Locations:

CALIFORNIA

Phone: 800-352-3837
Fax: 760-251-2714

FLORIDA

2046 McKinley Street
Hollywood, FL 33020
Phone: 954-922-9952
Fax: 954-922-1855

ILLINOIS

9500 W. 55th Street, Suite A
McCook, IL 60525
Corporate Phone: 708-290-2100
Corporate Fax: 708-290-2200
Sales Phone: 888-438-6299
Sales Fax: 815-248-4395

LAS VEGAS

6255 McLeod Drive, Suite 20
Las Vegas, NV 89120
Phone: 702-798-5752
Fax: 702-798-5762
800-727-6807

RENO & NORTHERN CALIFORNIA

Phone: 775-786-8112
Fax: 775-786-5446
800-722-0635

NEW JERSEY

202 West Parkway Drive
Egg Harbor Twp., NJ 08234
Phone: 609-383-9970
Fax: 609-383-9971
800-890-9298



AMERICAN GAMING AND ELECTRONICS

**We Are Known
By The Company We Keep**



Providing Quality Parts & Service to Over 500 Casinos Nationwide
Visit us on the web at www.age-gaming.com

Starpoint at G2E

Leading the way at the Starpoint stand at this year's G2E were the 12RMS reel mechanism and the SEC (Starpoint Electronic Counter) - two very different products with the shared aim of improving slot machine security. Completely new for 2002 were the additions to the Series 2 and LED push button ranges.

12RMS reel mechanism

Based on well-proven technology, the Starpoint 12RMS reel mechanism has been designed to protect slot machines against tampering and attempts to defraud. It includes a printed band that utilizes fine position sensing technology to quickly detect any movement of the reel by external forces.

Starpoint Electronic Counter

Also offering improved security for the slot floor is the Starpoint Electronic Counter (SEC) which links directly into the machine electronics to give tamperproof records of coin-in and coin-out functions. The SEC is able to provide read-outs from up to 31 memory areas with individual counters stored in EPROM, so a single SEC unit can replace multiple mechanical meters. Text messages and numerical data are displayed via the unit's seven digit LCD, with full programmability from the host machine.

A unique finger print code allows the machine to detect any meter changes and to prevent operation if the meter is not present. The SEC has a clock serial interface designed to work on existing meter ports for ease of integration in both new machines and for retrofit. By utilizing the latest solid-state technology, the SEC avoids the reliability problems and service call-outs which can be experienced with mechanical counting devices.

NEW!

Fast-fit connector for push buttons New to the Series 2 push button range is the One Piece Connector (developed in conjunction with

AGI) - a "fast-fix" option in which all spade terminals are housed in a single molded connector head. This makes fitting of the push button a one-fix operation and, as the number of connections is 75% less than for a traditional push button, the assembly times for the machine can be reduced significantly. In addition, as there is only one way of making the connection, the assembly will be "right first time" without the risk of re-work in the factory or inaccurate refitting when the machine is in operation.

This brings the number of push button connector options to three: traditional spade connector, Starpoint's



Starpoint manufactures a unique line of controls, reels and other mechanisms. Starpoint's Colin Crossman and production manager Karl Roberts were on hand to answer questions about the units.

AT Connector or the new One Piece Connector. As the front bezel dimensions of the Series 2 push button remain exactly the same, the One Piece Connector can be used for both new builds and for retrofitting within existing cabinets (subject to the appropriate loom design and switch/lampholder).

LED Starpoint also exhibited its range of LED (light emitting diode) push buttons. A newly-launched push button variant is the larger rectangular push button developed

in response to demand from designers of casino-style machines. Since their launch in 2000, LED illuminated push buttons have become a popular option with machine designers and manufacturers due to their almost infinite reliability. The use of solid-state technology eliminates the need to change bulbs once the machine is in operation, removing the costs of service and maintenance, as well as extending the push button's useful life.

Always firm favorites on the casino slot floor, Starpoint's range of game devices were also on show, including the internationally recognized tumbling dice products and disc range.

Starpoint exhibited alongside PAL, the distributor of the Starpoint range in the USA. More information from Colin Crossman at Starpoint: Tel: (44) 208 391 7700 Fax: (44) 208 391 7760 Email: ccrossman@starpoint.uk.com

JCM Toasts 1,000,000th Bill Validator

In the 1990's JCM introduced the side-mount bill acceptors into the gaming industry. Years later, they introduced the gaming industry to the embedded bill acceptor.



JCM sponsored the new products showcase at G2E, where showgoers could browse a selection of new products from various manufacturers.



"In our own way, we believe that we have helped revolutionize the slot industry and have revolutionized slot play," said JCM spokesman Tom Nugent. "In fact, with the introduction of a bill validator into the gaming device, many properties have increased their drop by over eighty percent."

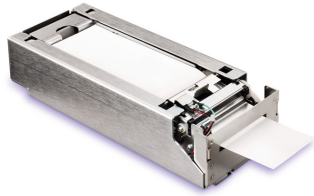
"We are pleased to announce this week that JCM has shipped over a million bill validators into the North American gaming environment," continued Nugent.

JCM calculates that the value of the currency that has passed through their bill validators now exceeds 150 trillion dollars.

"JCM is just getting started," concluded Nugent.

TransAct Announces Industry's First Casino Thermal Printer With Extended Memory

128K Memory Gives Casinos More Promotional Power



TransAct Technologies Incorporated announced the industry's first casino thermal printer with extended memory at the recently held Global Gaming Expo in Las Vegas. With its new memory option, TransAct's Ithaca® brand Model 850 printer will feature 128K in storage space, which will allow casinos to have up to ten full ticket-sized coupons embedded in the memory of the printer. More than ten coupons can be stored by using smaller images. The Ithaca Model 850 thermal printer designed for cashless gaming, was introduced in 2001.

Bart C. Shuldman, Chairman, CEO and President of TransAct Technologies, said, "Our Ithaca Model 850 casino thermal printer with the new extended memory feature is a very compelling offering for any casino operator. By leveraging the use of the printer in the slot machine, the casinos can offer coupons and promotional tickets to reward frequent slot players and to attract new ones. The extended memory will provide casinos, slot machine manufacturers and slot systems providers with capacity for ten different types of coupon/promotional offers for storage in

the printer, giving them the increased flexibility they need to provide more effective targeted offers."

The new printer provides the advantage of downloading and storing promotional images to the printer's non-volatile memory. Once supported by the host system, images stored in this way can quickly and easily be updated and refreshed to keep current with changing resort events and promotions. The extended memory option will be available for units produced beginning in January 2003.

"Coinless slot machines are the wave of the future in gaming. When designing the Series 800, we addressed all of the industry's demands, including ticket jamming, regulatory compliance, accuracy and downtime," said Shuldman. "The Ithaca Model 850 configured with the extended memory affords ca-

sinos the extra flexibility to customize and deliver a wide range of personalized messages," he continued.

Tickets taken prematurely is a leading cause of ticket errors in casinos. The Ithaca Model 850, as well as the other models in the 800 series, print so quickly - 5ips - that players literally do not



On the show floor at the Global Gaming Expo are Andrew J. Reason, vice president, EMEA sales (UK), Dennis Salmela, senior technical support technician, and Jim Stetson, executive vice president, sales & marketing. I had a chance to work with Dennis at a sort of "Mini-TechFest" in Billings, Montana recently, where he gave a nice presentation on printer repair. The Ithaca printer is popular in that part of the country.

have time to take the ticket before it is printed. These printers deliver high quality, sharp vertical and horizontal thermal printing of text, bar-codes, graphics and lines, and prints onto "dollar bill" sized tickets, which are compatible with bill acceptors.

The Series 800 printers feature a conveniently designed pull-up release, which provides casino operators with easy access to the printhead and the straight, open paper path. This improves reliability and eliminates downtime. The compact design of the printers allows them to fit into every style and size slot machine.

For further information, visit TransAct's web site located at www.transact-tech.com.

To Hear Clearly, Big Ears Aren't Necessary...

Busy slot managers:

Easily get two-way radio accessories that are just right for your staff, from durable lightweight headsets with coil cord connections to heavy duty microphones—all with connectors that fit your equipment.



Receive a free microphone on any order of 10 or more*

the **right** accessories are



EASY-TO-GET WIRELESS

"Your Wireless Accessory Warehouse"

(858) 486-9859

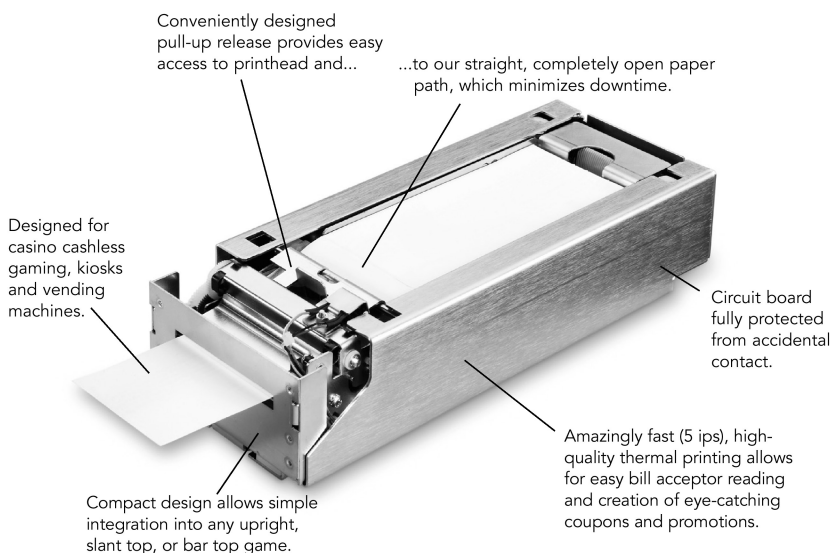
www.EasyToGetWireless.com/casino

*To take advantage of special offer, refer to promotional code "J3C" when placing your order. This offer cannot be combined with any other offer or discount. Offer expires 12/31/02.



**Fits any slot machine.
Extremely fast. Amazing print quality.
Can you say triple jackpot?**

850 850 850



© 2002 TransAct Technologies, Inc. All rights reserved. Patent pending.

Simply put, you win. Thanks to exhaustive research and testing, the Ithaca Model 850 answers the exact needs of casino operators around the world. For example, tickets taken prematurely are a leading cause of ticket errors—the Model 850 prints so quickly, players don't have time to take the ticket before it's fully printed. The Model 850 is even flexible enough to integrate into any existing machine. Looking for speed, reliability and worry-free operation? Don't chance it. Call us.

For specs, ticket samples, or to arrange a demo, call 1.877.7ithaca (1.877.748.4222) or surf www.transact-tech.com.

ithaca
a product of TRANSACT

Bet on the Ithaca® Model 850 thermal ticket printer.

Snaps from G2E



Happ Controls is always a "Happ"ening place at trade shows like G2E. Their wide-open booth gave technicians and engineers a chance to get all "touchy-feely" with hundreds of products and replacement components.



Richard Farrah's Vegas-Based team at electronic component supplier Kiesub Electronics.



MEI's Neil Young demonstrates their new Cashflow SC66 technology to the competition, Tom Stroyek, regional general manager for rival bill validator company, Global Payment Technologies.



Entropy manufactures a variety of peripheral devices. At G2E they were specializing in LCD flat panel displays. That's Fred Kesselman on the left, Sera Peconio, and Entropy president, Jeff Blair.



WICO



Noritake's Sadanobu "Tommy" Hisatomi and Motohisa "Moto" Isaka showed their interesting line of display products.



Advanced Electronic Systems, Inc. hosted this swank affair at the top of the Mandalay Bay Resort and Casino in cooperation with Seiko, MEI and Kortek.



Phil Cochran of Brown Manufacturing shows off their slot base, featuring replaceable panels



Kobetron



Arthur Wu of Neo Tec monitors



A familiar name in monitors that may be new to many in gaming, Pentranic's VP John Cierpiak stops for a quick snapshot with Technical Manager Harry Clarke.

C-C-Cold Cathode Lights The Way To Brighter Slots

Miniature cold cathode fluorescent lamps (CCFL) are the preferred solution for illuminating large display areas, backlighting liquid crystal displays, or satisfying extremely long life expectancy requirements. They are vibration and shock resistant, offer variable levels of brightness, and are very energy efficient with low power consumption. The relative newness of miniature fluorescent lamps has resulted in a lack of industry standard sizes and electrical specifications. The careful designer must obtain complete performance specifications on both the lamp and inverter to correctly determine critical factors affecting brightness, heat, light uniformity, spectral output and the battery life of the host device.

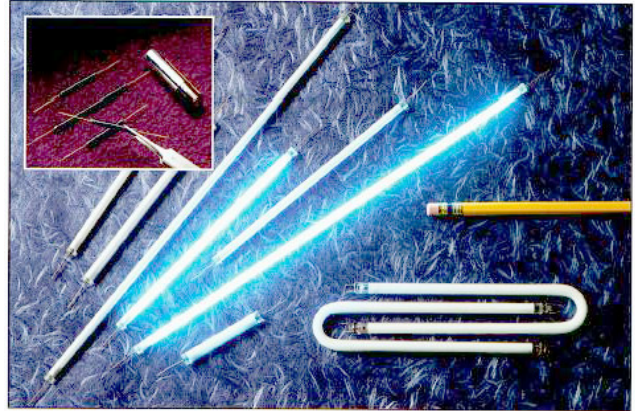
Cold cathode lamps enjoy the broadest application range among the various miniature fluorescent lamp

types and configurations offered by JKL, and are available in the greatest variety of diameters and lengths.

Measuring from just 1/8" (3mm) in diameter, in lengths ranging from 1" to 15" (25mm to 360mm), these versatile lamps have a typical life expectancy of 20,000 hours at design current drive. A very low heat generation of only 10 to 15 degrees C above ambient, combined with very stable electrical and optical characteristics, makes miniature fluorescent lamps an ideal choice for a variety of applications. These range from solar powered exterior lighting and backlighting vending machine product displays to uniform illumination of laptop computer screens.

How They Work

All cold cathode fluorescent lamps operate on AC. They are low-pressure discharge lamps, filled with a noble gas (typically argon) and a small amount of mercury in a phosphorous-coated tube. By changing the phosphor coating inside the lamp, a broad range of colors, as well as true ultraviolet, can be produced.

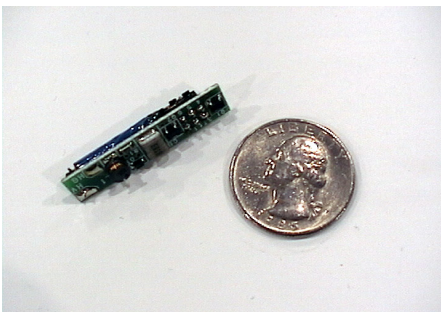


It is important to note that some environmental programs prohibit use of components containing mercury, which could affect using CCFL lamps.

These lamps often operate at high voltages. Because they are often used in applications that are DC dominant, they must be equipped with a DC to AC inverter, commercially available in 6, 12 and 24 Volts DC and often costing as much or more than the light source itself. In high volume applications, inverters should be incorporated directly into the PC board, reducing cost and permitting the energizing of multiple lamps.

Design Trade-Offs

Operating a CCFL lamp on DC current causes the mercury to begin depositing on to an electrode within the bulb, creating a loss of available mercury vapor, a darkening at the lamp ends and an overall reduction in brightness.



Teeny-weenie inverters power small, cold cathode lamps



Customer Service Manager Donald Sonntag of JKL (Pacoima, CA) demonstrated a variety of interesting new lamp products, including some remarkable cold cathode miniature lamps and teeny-tiny, itty-bitty inverters.

Most inverters which power these lamps operate at very high frequencies to assure uniform light output over the entire length of the lamp. This may cause problems with other electronic circuits in close proximity. Electromagnetic interference created by inverters can be easily solved with appropriate EMI shielding.

Equally important, correctly matching of lamp and inverter is critical in achieving maximum efficiency. Not using the correct inverter drastically reduces lamp life, affects start-up and impairs the steady output of light. This can also affect battery endurance and the useful operating time of portable electronics and computers.

Understanding Lamp Life

The lifetime rating for a miniature fluorescent lamp is defined as "the point at which a lamp's initial emitted brightness or uniformity is reduced by 50%." Brightness can be enhanced by increasing (over-driving) lamp current, but will result in reduced lamp life and increased operating temperature. Overdriving seldom results in catastrophic lamp failure, but does cause noticeable degradation in output.

CCFL lamps typically operate from 300 to 800VAC, de-

pending on lamp length. This is much higher than other light sources, but overall power consumption is much lower.

Lamp Operating Temperatures

The optimum ambient temperature range for CCFL efficiency and brightness is 25 to 40°C. Operating temperature is extremely important. The colder the temperature, the lower the brightness and the greater the voltage requirement to turn on the lamp.

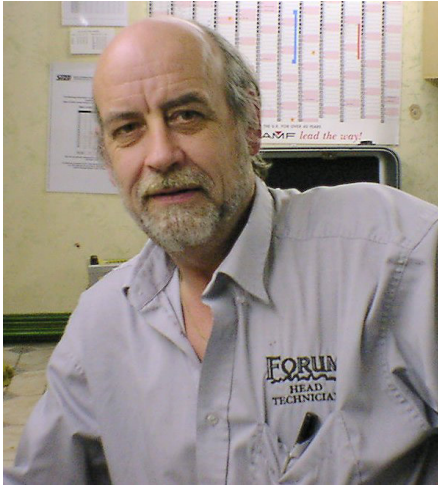
These lamps can operate at temperatures from 5 to 50 degrees C, but performance is drastically affected at both ends of this range. Heaters may be used in extremely cold applications, but remember that light output is temperature dependant and CCFL lamps are more suitable for moderate operating environments.



Cold cathode lamps were also shown by CI Innovations, Inc. (Yorba Linda, CA) Harry Iverson is shown holding their nifty replacement tube for reel slot illumination, replacing the old, hot cathode fluorescents. That's Jacob Cole on the right.

A Plumber's Guide to Fruit Machines - Part 7

By Gordon Lowe



Section 4a. Power Supplies

There are few, if any, comparisons between different AWP manufacturers' power supplies. In fact, large differences will be found within the range of any one manufacturer as power requirements have increased over the years with more lamps or features, more sound effects, more reels and so on. Because of the extensive range that will be found, I will cover only those that are most common, showing the types of problems that arise and help identify the cause.

Section 4b. Voltages Found.

Before proceeding, it wants stating that not all the following voltages will be found on all power supplies. Variations abound dependant upon the requirements of a particular machine.

+5 volt: Required by nearly all microprocessor boards to supply the logic circuitry that is the heart of the machine. Without this, nothing will operate.

+12 volt: Again, used by the MPU circuitry. Also commonly the validator supply, reel stepper motor supply and sound amplification. It is sometimes used as a source for the +5 volt where the +12 volt is dropped and regulated on the MPU and there is no +5 volt direct from the power supply.

50 volt AC or DC: Main supply for the operation of payout solenoids

34 - 48 volt: Used to drive the multiplexed lamps. Note that this is not the voltage that the actual bulbs operate at (this is usually 12 volt) but due to the configuration (a lamp "matrix" is used to drive a large number of bulbs) this is the initial supply voltage.

-5 or -12 volt: commonly used for dataport connection.

Other voltages and slight variances other than those quoted are commonplace and these are intended only as a guide. Closer examination of technical manuals supplied with a specific machine will show exact requirements.

Fuse protection of individual circuits will be found in all cases. The importance of using the correct fuse cannot be over emphasised, particularly the use of 'Fast Blow' and 'Anti-Surge' fuses where recommended. For example, the

50 volt AC circuit will often found to be protected by a 5 amp anti-surge fuse. Using a fast blow as a substitution will usually result in the fuse continually blowing without any apparent reason.

AC is "alternating current" - the same as found arriving at the 13amp mains sockets used to supply all our electricity requirements. For electronic circuitry, this must be converted by the use of diodes to DC or "direct current." Both types of current are usually required in AWP's, the AC being used for fluorescent lighting, solenoids and the main supply for the PSU. DC is used for all the electronics and is the result of what is known as "rectification."

Use of a digital multimeter is a necessity when attempting to repair these units. There are many inexpensive meters available complete with instructions, the only criteria being that you know how to check voltages. A meter that has a "diode test" facility is very important.

What follows is a more detailed description along with common faults of individual power supplies that you may come across.

Section 4c. Barcrest MPU4

Probably the most straight

forward of PSU (abbreviation for power supply unit) The 50 volt AC is obtained direct from the transformer, a 7.5 amp anti-surge fuse protects the Tx (another abbreviation found on circuit diagrams, meaning transformer) no problems here.

12 volt DC is obtained via a bridge rectifier identified as DB2. This component will occasionally fail, going short circuit internally. It will show up as the fuse on this circuit blowing immediately on connection of the mains supply, even without the PSU being connected up to the host machine.

The output from this goes to a smoothing capacitor, C2. This is the most common device to fail on this unit, resulting in the machine failing to reset among other faults. Easily identified as requiring replacement by examining the plastic wrapping encasing it. If it has shrunk back or the plastic on the end has bubbled up, replace it.

The 34 volt lamp supply is fed from DB1 and capacitor C1, with exactly the same component failure comments as made for the 12 volt apply. Faults will show up on the lamps display in this case.

Section 4d. Project procon(r) & procon plus(r) Similar in design to the Barcrest PSU with component failure following the same lines, although capacitor failure is not so obvious. One peculiarity I have found with this particular power supply, a faulty capacitor C3 can result in the host machine robbing coins,

hire the best slot techs

- Database of over 17,000 employees seeking gaming/hospitality industry careers
- Over 2500 unique visitors daily
- Used by over 150 Gaming Companies
- Mass email candidates with the click of a button

Casino Careers attracts experienced personnel by:

- Advertising in national & international gaming & trade magazines
- Exhibiting at major Gaming Tradeshows
- Publicizing its recruitment services & career opportunities on over 450 web sites
- Cross-posting on job boards like Monster, Careerbuilder and Operation IT

*Recognized as one of the
"Top 20 Most Innovative Gaming Products of 2002"*



*For experienced employees
in Gaming, Hospitality,
IT, HR, Marketing, F&B
... we are your resource!*

Visit us at the Global Gaming Expo (G2E) - Booth 1270

CASINOCAREERS

O N L I N E

www.casinocareers.com

609-653-2242 | info@casinocareers.com

that is to say it will accept the coins but will not give any credit.

Section 4e. JPM MPS1 & MPS2

Found on a wide range of older AWP's, this unit was produced with variations known as red label, blue label, orange label and yellow label. Differing in internal design, these are all compatible with one exception: the earliest version (red label) is unsuitable for later machines.

Probably the most common failure will be the 5 volt supply. First of all, try shorting out the trimmer. A short piece of linking wire will do. This simple trick will cure 90% of faults on the 5 volt line. You can replace the trimmer if you feel so inclined, but it is not necessary. If this does not cure the fault, try changing the LM723 voltage regulator, IC1.

All comments made about the 5 volt supply on this unit also apply with the 12 volt line, the voltage regulator in this case being IC2, again a LM723 device.

A note worth making, on the yellow & orange versions, do not forget to check the internal fuses that will not be seen until the unit is dismantled for repair.

Section 4f. Maygay (older versions)

The older versions were not really up to the job when machine conversions were involved. This can be improved by adding a second power

supply (one of the universal switched mode type readily available) and wiring the 5 volt output from this in parallel with the existing 5 volt on the Maygay.

A common fault, capacitor C7 (value 33,000uf 16 volt) can cause reel bounce, whereby the reels do not stop in their correct position cleanly. Other reel problems can also quite often be blamed on this capacitor being faulty.

Section 4g. Electrocoin

The "Switched Mode" power supply found fitted internally is the most likely part to fail, resulting in the machine resetting or erratic operation. The subject of SMPS repair was covered in the February and March, 2002 issues of Slot Tech Magazine. Note: it will be found on some units that when fitting one of the switched modes obtained from one of the named suppliers, that the minus 12 volt is absent. Unless the host machine is operating with a 'Data Retrieval Unit' (which requires this voltage) then the loss of this supply will in no way affect the machine's operation.

Section 4h. Ace - System SP.ACE

Although it is what I would consider to be a reliable unit, failure of the voltage regulators and transistors does occur. This can easily be verified by the use of the multimeter. The right hand connection should be a stable voltage. For example, a 7812 device should meter at 12

volt, a 7805 at 5 volt, and a 7912 at minus 12 volt.

Should this not be the case, then verify the input voltage to the device. This should be higher than the required output. For example, a 7812 would require a voltage of between 15 and 24 volts on the input. If the input is correct and the output is not, change it.

Summary All the power supplies listed above are from the less recent of machines, and are the ones most likely to fail for the reasons stated. It is to the manufacturers' credit that equipment now leaving the production lines have a much higher degree of reliability in this area.

A faulty power supply can be the direct cause of faults throughout a machine, from reels to lighting, from coin acceptance to coin payout. If in doubt try a known working PSU in the faulty machine. Do not fit a suspect PSU into good machine. If the PSU is giving out an excessive voltage for some reason, damage can be caused to the microprocessor unit, not so easily repaired.

It is not within the scope of this article to detail every power supply available, but from the information I have given above, it is hoped an insight into the basic operation and repair of these units has been given. Once again I would reiterate, if in doubt, give the manufacturer a phone call and ask for technical advice.

- Gordon Lowe
glowe@slot-techs.com
October, 2002

By Martin Dempsey

Red Hits Out With Its Best Shot

Red Gaming is delighted to announce the launch of its latest £25 AWP - Big Shot. Designed for arcades, LBOs and single sites, Big Shot is the latest concept from Red Gaming, designed with a fair-ground flavour which incorporates new and exciting features, such as Cashpot, hidden bonuses and other attractions.

Steve Wooding, Director of Sales at Red Gaming comments: "Our in-house development team has worked hard to create a game full of intrigue and with the ability to hold players' fascination. Big Shot has received positive feedback during testing and we are confident it will be a BIG success!"

Big Shot is presented in the aubergine New Genesis cabinet and will be shown at Preview by Red Gaming on the Crown and Deith stands. For further information please contact Clare McMillan / Sam Drakeford @ MediaWorks. Tel: + 44 (0)113 234 5600. Fax: + 44 (0)113 234 5601. Email: pr@mediaworkscccl.com

Comar Purchases 100% IGT For Spain

The Spanish casino operator, Comar, has reinforced its commitment to purchase 100% IGT machines with a recent order for machines to be installed throughout Spain.

Six of Comar's operations - Casino Atlántico, Casino Sardinero, Casino de Salamanca, Casino Bahía de Cádiz, Casino León, and Casino Zaragoza - have installed recently approved iGame-Plus' game themes Little Green Men, Double Diamond 2000 and Leopard Spots.

Spain's large video poker playing public will enjoy more of their favourite Triple Play Draw Poker machines, as a full 50% of the order was devoted to satisfying this market segment. The popular multi-hand, multi-game machine features three poker hands per game and a wide selection of the games poker players demand.

Comar, already the largest casino group in Spain with



10 licenses, started out in the late '70s as an AWP operator, then moved on to open its first casino in 1987. But big things were in Comar's future, and this year alone, it opened Casino Zaragoza, Casino de Leon and Casino de Salamanca.

For further information contact Karen Thompson. Phone +31 23 568 7100.

Email

Karen.Thompson@igt.com

Maygay Clued-Up With Interactive Voice Game

Maygay is shortly due to unveil its first interactive voice SWP game, in a tie-up with games giant Hasbro and speech recognition specialists Eckoh Technologies. This initial product is based upon the classic murder mystery board game, Cluedo, and features the distinctive voice of 'Doctor Who' actor Tom Baker.

Eckoh Technologies, whose clients include Centrica, Cartoon Network and Virgin





Mobile, has developed and will host the game which is entitled "Cluedo On the Phone". Eckoh is also responsible for placing the product with both mobile and fixed line telecom operators. Maygay has provided question formulation services, statistical software support and game testing, and income is derived through revenue sharing with the other partners. In keeping with traditional SWP games, "Cluedo

On the Phone" will operate on 30% payout, with players enjoying a one-in-eight chance of an instant win.

This is the first step for us in a series of games, and the future really is bright, and the future really is pay-to-play prize games across multiple platforms." For further information, please contact NICK HARDY. Direct Tel: +44 1902 792 320. E-mail: nick@maygay.com

Support your slot techs by subscribing to Slot Tech Magazine



visit the website at slot-techs.com

Slot Tech Electronics 101

Introduction to Digital Electronics Part 3

Here's a troubleshooting tip that can be a real timesaver. In general, the output of one integrated circuit will be connected to the inputs of a number of other ICs. This common connection between circuits is called a "node." One of the most common IC failures is a shorted input or output. The input or output shorts almost directly to ground, bringing anything connected to it down to a logic low or, in some cases, dragging logic levels down into the gray area. The shorted input or output prevents that node from ever achieving a logic high.

It's generally pretty easy to find the shorted node. It will be stuck low or you will see

it attempt to toggle from low to high but it never achieves a full "high." Instead, it toggles from a low to the gray area or from a low to a level that doesn't even exceed .8 volt, the upper threshold for a legitimate "low" logic level.

But how can you tell which IC is actually bad? All of the IC pins connected to the bad node will have identical signals on them when examined with an oscilloscope or logic probe. Likewise, if you try to use an ohmmeter to find the short, all pins on that node will show the exact same short circuit.

Many technicians use a technique called "clip & lift" to pinpoint the cause of the shorted node. First, the out-

put pin is cut or unsoldered (in the case of a surface-mount device or SMD) and lifted slightly off the surface of the printed circuit board. This isolates the output IC from all the inputs that it's driving. If the output pin now tests good (goes to a logic high when it's supposed to) the problem lies in one of the other ICs on the shorted node. Each input pin on the node is then isolated one at a time until the shorted input is located. The short can be verified, power-off, with a digital multimeter. Once the bad IC has been replaced, the lifted pins are pushed back down and soldered to the PCB.

Even if you're armed with a schematic diagram, locating

and isolating all the pins on a node can be a time-consuming process. Without a schematic, it can be very frustrating as well, following traces all over the board in an effort to track down the shorted chip. In a multi-layer PCB, it's damned-near impossible to do without spend huge amounts of time on the project.

I discovered this trick by accident as I was trying to develop a fast way to find a single shorted IC on a common node, without having to have a detailed knowledge of digital electronics. My original idea was to inject a DC voltage into the shorted node at one end of the PCB and use a digital multimeter to measure tiny differences in voltage at each pin on the node. I was going to use something known as "IR Drop" to locate the short. IR Drop is a part of Ohm's Law that states that the voltage drop in a circuit is equal to the current, multiplied by the resistance. I was going to depend on the printed circuit traces themselves to provide the resistance, and the enormous current (due to the shorted node) to provide a decent voltage drop. The lowest voltage was to have indicated the location of the shorted pin.

I used a 6-volt battery as my DC source. To limit the current, I used a 10-ohm, 5-watt resistor in series with the battery. I prefer to use a battery for this test because it

has a limited output current and it's a completely isolated source. However, I have no doubt that the +5 volt output of a power supply would work fine as well.

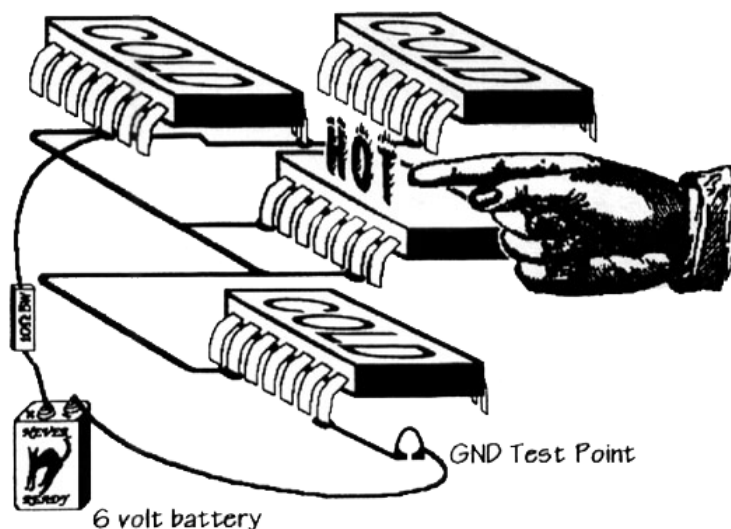
I found the bad IC all right, but not by measuring the voltage as planned. I found the bad IC because the damned thing nearly burned my hand when I touched it. It was hot, Hot, HOT! Since current will only flow through the short and not through any other connection on the node, the other integrated circuits will remain cold. Only the bad chip will get hot.

Connect the battery as shown in the illustration.

Radio Shack has some clip leads that will enable you to connect directly to one of the pins on the shorted node. Since we're not really going to measure the IR Drop, it does not matter to which pin you connect. Any pin on the shorted node will do nicely. Remember, only the shorted pin will actually draw current and get hot.

It's a pretty cool trick that you may not have to use often but when you need to find a single shorted node, it can be a real timesaver.

- Slot Tech Magazine



To locate the bad integrated circuit, connect the six-volt battery as shown. Connect the negative terminal of the battery to any convenient ground (such as a ground test point) and connect the positive terminal of the battery through a 10 Ω , 5 watt resistor to one of the IC pins on the shorted node. Use your finger to feel each chip that shares the common, shorted node (or all the chips on the PCB, for that matter). The IC with the shorted node will get hot to the touch while the others remain cool.

Phil the Filter Capacitor

The Story of an Electrolytic Gone Bad

Some capacitors can cause really weird symptoms when they fail in a video slot monitor. This is the story of one such capacitor; the story of Phil the Filter Capacitor.

Life's not easy for Phil. He lives in Monitorville, in one of the apartments at the Raster Scan housing complex. All of the structures at Raster Scan are pretty much the same, although each was built by a different manufacturer. Ceronix House sits next to the Wells-Gardner Apartments. Just down the street, stands Pentranic Place. The Kortek Kondominiums share a block with Neo-Tec Village and the Tatung Towers.

At one time or another, Phil has lived in each of these places only to find himself stuck living next door to the noisiest neighbor in Monitorville: Spike, the drummer for a heavy metal band called the Horizontal Output Transistor.

Poor Phil! When the Horizontal Output Transistor plays, Spike pounds out a steady beat, thousands of times each second. Some call it music but to Phil, it's just noise. In a song called "Super-VGA" the beat goes on at over 35kHz!

The noise generated by the Horizontal Output Transistor whacks against poor Phil and, because his feet are soldered to the floor of his apartment, he's forced to absorb it. Eventually, Phil the Filter Capacitor goes deaf and loses his ability to absorb the noise. Without Phil, the noise then spreads to the rest of Monitorville and the entire complex is affected.

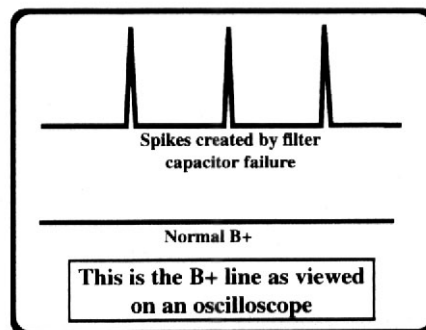
Voltage Spikes

Okay, here's the real deal. The main power supply in a monitor is around +77 to +136 volts DC (depending on the manufacturer and model). The really hip and cool technicians refer to this as the B+. The noise generated by the horizontal output transistor (and the rest of the horizontal output circuit in a monitor) takes the form of huge voltage spikes that can easily reach +160 volts or more. Since the horizontal output stage of a monitor is directly powered by the B+, these voltage spikes will travel along with the B+ to other circuits and can really mess up the monitor!



One symptom of this capacitor going bad can be black or dark areas on the screen. These generally take the form of ragged, unstable vertical bars (jail bars) that will usually appear at the left edge of the screen. They often will appear most pronounced at the far left edge of the screen and will fade to invisibility toward the right edge of the screen where the picture will appear perfectly normal.

This is where Phil the Filter Capacitor comes in. Phil's job is to filter out the voltage spikes to prevent them from affecting the rest of the monitor circuits. A filter capacitor does this by absorbing the spikes, passing them to ground. A capacitor with this function is also known as a bypass capacitor.



ADVERTISEMENT



Randy Fromm's Casino School

On-Site Technician training

Randy Fromm's Casino School is a practical, no-nonsense look at how gaming machines work and how to repair them when they don't. **No previous knowledge of electronics is required** to get the most out of the school. The Casino School is geared for those who want to learn how to fix gaming devices without having to learn complex electronic theory or purchase expensive test equipment.

Be prepared for six hours of accelerated learning each day. Class begins at 9:00 am sharp each day and continues until 4:00 pm. The Casino School provides each student with reference materials and troubleshooting guides that will be valuable aids for repairing equipment on location and in the shop.

Students learn how to work with:



THE DIGITAL MULTIMETER

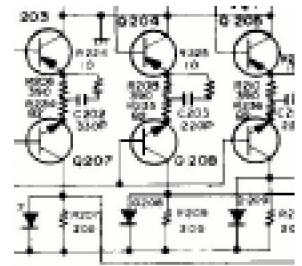
This relatively inexpensive piece of test equipment is easy to operate. Casino School students learn to use the digital multimeter to perform tests and measurements that will pinpoint the cause of a failure down to a single component.

ELECTRONIC COMPONENTS

The individual components used in games are introduced. Parts such as resistors, capacitors, diodes, potentiometers and transistors are covered individually. Students learn how the components work and how to test them using the meter.

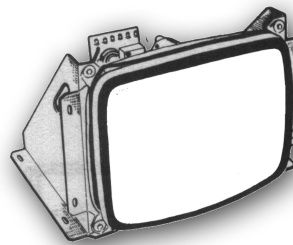
SCHEMATIC DIAGRAMS

Schematic diagrams are the "blueprints" for electronics. Learning to read schematics is easy once you know how the parts work!



POWER SUPPLIES

Power supply failure is a common complaint in many different types of systems.. Power supply failures are discussed during the class, along with shortcuts for troubleshooting and repairing them.



MONITOR REPAIR

The monitors used in video slots are designed for quick, easy, and safe repair. Students will learn the theory of operation of all types of monitors and how to repair monitors down to the component level. Of course, monitor safety will also be discussed.

You do not have to send your slot techs to Las Vegas or Atlantic City for training. The Casino School brings the training to you. Contact Randy Fromm's Casino School today to reserve a date for your tech school

**Randy Fromm's Casino School 1944 Falmouth Dr. El Cajon, CA 92020-2827
tel.619.593.6131 fax.619.593.6132 e-mail CasinoSchool@slot-techs.com
For a complete brochure, visit the website at: slot-techs.com**

When this capacitor fails, the voltage spikes are delivered, full force, to the rest of the monitor circuits, including the video circuits. The symptoms will vary between monitors but there are some common things to look for.

One symptom of this capacitor going bad can be black or dark areas on the screen. These generally take the form of ragged, unstable vertical bars (jail bars) that will usually appear at the left edge of the screen. They often will appear most pronounced at the far left edge of the screen and will fade to invisibility toward the right edge of the screen where the picture will appear perfectly normal.

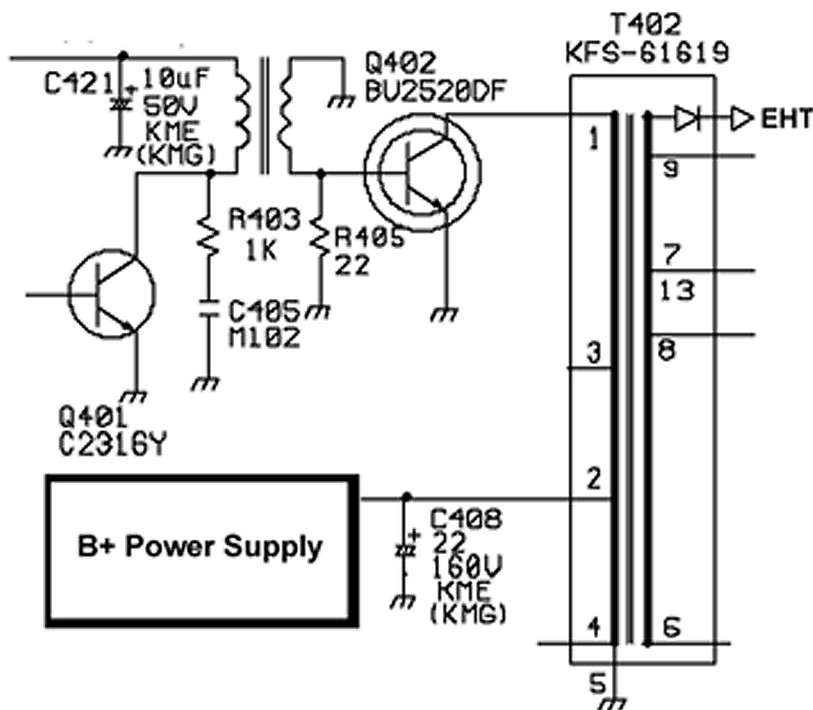
Another symptom may be an image that looks dim, as if the CRT is beginning to wear out or needs rejuvenation. In other cases, the monitor will shut down completely. In this case, the huge voltage spike actually trips the monitor's x-ray protector circuit. When the x-ray protector circuit activates, it shuts down the horizontal oscillator circuit which, in turn, kills the horizontal output and, of course, the high voltage.

Phil can be identified on the schematic diagram pretty easily once you know what to look for. Find the horizontal output transistor on the schematic diagram. The collector of the transistor will be connected to one end of a wind-

ing (the primary winding) on the flyback transformer. The other end of the winding (the far end, NOT the tap in the middle of the winding) is connected to the B+. Trace this B+ wire back toward the power supply. The first electrolytic capacitor connected to this wire will be Phil the Filter Capacitor. The value will be probably be 47uf @ 160 VDC but it may be in the range of 22 – 100 uf. It is not necessary to use the exact same value as a replacement. Any capacitor in this role can be replaced with a 47uf or 100uf capacitor with a voltage rating of 160 volts or higher.

As a kind of a bonus, this capacitor often looks visually bad when it fails. The top of the capacitor may "dome" or the plastic shrink-wrap that covers the body of the capacitor may have shrunk back, exposing the entire top of the capacitor. In some cases, the rubber plug in the bottom of the capacitor may be bulging out. This, of course, is often difficult to see unless you unsolder and remove the capacitor. At that point, it will become obvious. This capacitor is often, though not always, located near the flyback transformer.

This capacitor should be replaced with a high quality, high temperature (105 degree) low-ESR capacitor for longest life expectancy. If you're lookin' for job security, use a cheap, 85-degree capacitor as a replacement and it'll be back on the bench again in six months.



In this example taken from a Kortek monitor, Phil the Filter Capacitor is C408. When this capacitor fails, it can cause a dim picture or no picture at all

- Slot Tech Magazine

Make plans today to join the gaming industry's top engineers, technicians, technical writers and instructors for 3 days of technical seminars and presentations that will enhance your performance as a technician and dramatically increase your value to your employer.

TechFest 4 will be held October 22 -24, 2002 at the Grand Casino Mille Lacs in Onamia, Minnesota. Registration fee is \$390.00 per person and includes lunch each day.

This is a technical presentation. The TechFest is geared for working slot techs and technical managers who are looking for a way to make a dramatic improvement in their understanding of video slot monitors, touchscreens, bill validators, hoppers and more with no-nonsense technical presentations from:

- Asahi Seiko - Coin Hoppers
- Coin Mechanisms, Inc. - Coin Comparitors
- Mars - Bill Validators
- 3M Touchsystems - Touchscreens
- Sencore - Test Equipment
- JCM Bill Validators

- PLUS - A special instructional series on video slot monitor repair presented by Randy Fromm



BE A BETTER SLOT TECH

Come and spend 3 days at TechFest. With engineering and technical representatives on hand from the gaming industry's leading suppliers of touchscreens, bill validators, coin comparitors, hoppers

and monitors, YOU have a chance to ask about YOUR problems. You have a chance to get REAL answers to your questions, face-to-face with some of the most qualified technical experts in the industry.

TechFest is for slot techs of all skill levels, from novice techs who want to learn the basics of BV and hopper maintenance to advanced techs that need to brush up on monitor repair.

Schedule of Events

Tuesday, October 22nd, 2002

9:00 am - 12:00pm
How Monitors Work - Part 1
Theory of Operation - Beginning level

1:15pm - 3:15pm
Asahi Seiko - Hopper troubleshooting and repair

3:30pm - 5:30pm
3M Touchsystems - Touchscreen Technology

Wednesday, October 23rd, 2002

9:00 am - 12:00pm
How Monitors Work - Part 2
Narrow Down the Problem - Intermediate Level

1:15pm - 3:15pm
Mars Electronics, Inc. - BV troubleshooting and repair

3:30pm - 5:30pm
Coin Mechanisms, Inc. - Coin Comparitor technology and repair

Thursday, October 24th, 2002

9:00 am - 12:00pm
How Monitors Work - Part 3
Circuit Analysis and Component Level Troubleshooting - Advanced Level

1:15pm - 3:15pm
Sencore - Monitor Troubleshooting and Repair - Using sophisticated test equipment to speed through monitor repairs

3:30pm - 5:30pm
JCM Bill Validator Troubleshooting and Repair



Visit the website at slot-techs.com
for more information

**Space is limited
Register today!**

Subscriptions & Back Issues

Why back issues of Slot Tech Magazine are important to own . . .

Slot Tech Magazine is strictly technical. As such, the magazine's contents are not time critical. The repair information and technical data contained in past issues is just as valid today as it was the day it was published.

Additionally, current and future articles more-or-less assume that readers are already familiar with what has been covered in past issues. This editorial policy assures that Slot Tech Magazine's contributing writers are not limited to "writing down" to the level of a novice technician but are free to continue to produce the most comprehensive technical articles in the gaming industry.



Randy Fromm's

Slot Tech Magazine is published monthly by:

Slot Tech Magazine

1944 Falmouth Dr.

El Cajon, CA 92020-2827

tel.619.593.6131

fax.619.593.6132

e-mail editor@slot-techs.com

Subscription rates:

Domestic (USA)

1 year - \$60.00

2 years - \$120.00

International

1 year - \$120.00

2 years - \$240.00

Back Issues

All single issues of Slot Tech Magazine are \$10.00/ea.

For further details on the contents of each issue, please refer to the website at slot-techs.com

☐ May, 2001

☐ June, 2001

☐ July, 2001

☐ August, 2001

☐ September, 2001

☐ October, 2001

☐ November, 2001

☐ December, 2001

☐ January, 2002

☐ February, 2002

☐ March, 2002

☐ April, 2002

☐ May, 2002

☐ June, 2002

☐ July, 2002

☐ August, 2002

☐ September, 2002

Company Name _____

Contact _____

Address _____

Address _____

City _____ State/Prov. _____

Country _____ Zip/Postal Code _____

Telephone _____ Fax _____

E-mail _____

Type of card: ☐ American Express

☐ Discover

☐ MasterCard

☐ Visa

☐ 1 year subscription, domestic

☐ 1 year subscription, foreign

☐ 2 year subscription, domestic

☐ 2 year subscription, foreign

Account Number: _____

Expiration Date: _____