Daktronics C-44 Drag Race Timer & Accessories

Installation, Operation Maintenance Manual

ED-7175 *Rev 11 - 25 March 2004*

Informing & Entertaining the World

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DAKTRONICS

ED-7175
P1067
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Please fill in the information below for your display; use it for reference when calling Daktronics for assistance.

Display Serial No. _____

*Display Model No.*_____

Date Installed _____

DAKTRONICS, INC.

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Section 1: Introduction

1.1 How to Use this Manual

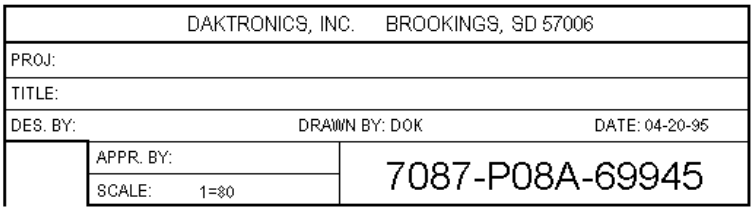
The Daktronics C-44™ timer system utilizes the latest in microprocessor technology and is designed and manufactured for reliability, easy service and long use.

This manual is designed to explain installation and operation of the Daktronics C-44 Drag Race Timer. Details for display maintenance are also given. Follow all instructions as given in the text. All instructions are given in a logical order for best installation and operation. For questions regarding the safety, installation, operation or service of this system, please refer to the telephone numbers listed on the cover page of this manual.

Important Safeguards:

1. Read and understand installation instructions before installing.
2. Do not drop the control console or allow it to get wet.
3. Opening or disassembly of equipment by non-qualified personnel can void the warranty.
4. Do not disassemble the control console or the electronic controls of the display unless you are qualified to do so and there is need for equipment to be installed or serviced or the warranty will be void.
5. Disconnect power from the unit when not in use, or when servicing**.**
6. Disconnect cables from the back of the C-44 race controller at the end of the day or when lightning is occurring in the area.
7. If field cabling is to remain connected to the isolation interface when not in use. The isolation interface should be powered down via the front panel switch and must remain plugged in to a three-conductor *earth grounded* outlet (to provide a discharge path to ground for any voltage surges picked up by field cabling).

The box below is an illustration of Daktronics drawing numbering system. The drawing number "7087-P08A-69945" is how Daktronics identifies individual drawings. This number is located in the bottom right corner of the drawing. The manual will refer to drawings by the last five digits and the letter preceding them. In the example, the drawing would be referred to as **Drawing A-69945**. All drawings referred to as such will be inserted at the *end of each section* unless otherwise specified.



1.2 C-44 Version Descriptions

C-44 Version 2.0 Enhancements

Split Tree Operation
Split tree operation allows each side to count down in its own mode. The split tree is enabled by setting up a category with split tree set on and selecting two different tree modes. Next, select the category. Both lanes will default to the 1st tree setting, but either lane can be switched to a different mode. Press <**ALT**><**F5**> to select the mode for the left lane and <**SHIFT**><**F5**> to select the mode for the right lane. The right lane tree mode will be displayed below the right lane on the C-44 monitor.

When not in a split tree mode, only one line will show below the left lane on the monitor and that will be the mode for both lanes. When in a split tree mode and if the handicap is on or if True Win is on, the timer will account for the different tree times when counting down. For example, if the dial-in times were the same or zero and there was a full tree on the left lane and a pro tree on the right lane, the left tree will start 1st and then the right tree would start after it so that both would go green at the same time. If handicap and True Win were turned off, the tree would start the countdown on both sides at the same time and the right lane would turn green before the left lane.

When using a split tree mode, the scoreboard will display an F or a P in front of the dial-in to show which mode the tree for that lane is currently in. If the mode for the tree is changed after the dial-in is displayed, then the ready key, <**F5**>, must be cycled to redisplay the new mode.

Auto Start of Tree Countdown After Cars Stage
This mode of operation can be selected under the *Configuration Settings Menu* by selecting the <**G**> item and then setting the option to On. A delay time of 2, 3, or 4 seconds can also be selected. With this option on, the tree will start to count down after the ready has been set on and both cars have staged for the selected delay time. When this option is on, the Go switch on the starter box will not be active so that the tree will not be started ahead of time by the starter's box. If sure start is on, both the pre-stage and the stage lights for both lanes must be on before the tree will start.

Auto Foul of Car for Not Staging in Time
This mode of operation can be selected under the *Configuration Settings Menu* by selecting the <**G**> item and then setting the option to On. A delay time of 5, 10, or 15 seconds can also be selected. With this option on, when one car has been properly staged for the selected delay time and the other car has not yet been staged, the tree will start to count for the staged car and the unstaged car will get a red light. The staged car will get an automatic win. The monitor and printouts will show a DNS for “Did Not Stage” for the lane that did not stage. When Sure Start is on, the car must be properly staged with both the pre-stage and stage lights for the delay time before the red light will occur.

Margin of Victory (MOV)
The Margin of Victory is the amount of time the winner crossed the finish line ahead of the car in the other lane. This time is displayed on the C-44 monitor by the MOV label. The MOV will also be printed on the time slip on the same line as the Over/Under time. The MOV is calculated by adding the elapsed time and the reaction time for each lane. If there is a handicap, that time is added to the lane that does not have the handicap and then the times are subtracted from each other to get the MOV.

There will not be a MOV displayed or printed if there was a foul, break-out or if True Win was not on.

Auto Retrieve for Next Driver
The data for the next driver can be set to retrieve automatically after the next vehicle number is entered. Press <**CTRL**><**F10**> to set the C-44 in the auto-retrieve mode and will display the word "Auto" to the right of the left lane next driver dial-in time. Press <**CTRL**><**F10**> again to set auto-retrieve to Off and the word "Auto" will be removed.

When set to Auto, the next driver's name and dial-in will be retrieved when the vehicle number is entered, if it is available.

C-44 Version 2.1
Version 2.1 corrected a problem in which reaction time being shown was wrong for the right lane if a split tree was being used and the tree-based reaction times were being used.

C-44 Version 2.2
Version 2.2 corrected a problem with single-line five-digit displays. The right lane would have both decimal points on when the reaction time was displayed. It also corrected a problem where True Win, Sure Start, and Break Out would randomly be set to Off in a category when that category was selected. Finally, it added a 0.5 second increment setting to the delay for Auto Start of the tree.

C-44 Version 2.3
Corrected time slip problem when using split tree mode.

Corrected problem with Margin of Victory being miscalculated when using tree-based reaction time and split tree.

Added information to log printer output. In dead heat races, an asterisk is printed if the winner is calculated based on speed.

C-44 Version 2.4
Corrected scoreboard problem for fixed decimal points between third and fourth digits.

C-44 Version 2.5
Made auto tree delay selections to go from 1.0 to 3.9 seconds in .1 second increments. In addition, the data timing of the tree was adjusted so it would not display out of sync compared to the old tree.

C-44 Version 2.6
Corrected problem with -.001 reaction time not showing a red light or indicating a foul on monitor.

Updated results system for CARS information.

C-44 Version 2.7
Corrected problem with erratic mph caused by turning off Isolation Interface or the 1/4 mile photocells being tripped while the timers are reset on the C-44.

Corrected auto tree so the delay timer can be reset before the tree drops as described in ***<G> Auto Tree / No Stage Foul*** in **Section 3.3**.

C-44 Version 2.8

Added a configuration item to select if tied races will be selected by reaction time or by speed.

Made Auto Tree No Stage Foul selectable from 5 to 20 seconds in 1 second increments.

Made log printout show T-S or T-R to indicate how winners of tied races are selected, by speed or reaction time.

Added configuration item in Auto Tree to enable or disable the Reset/Go switch when Auto Tree is on. If the switch is enabled and Auto Tree is on, the Reset switch will stop the tree countdown and Go will start it.

Made the Auto Tree No Stage Foul on, only if auto tree is on. If Auto Tree is turned on, it then automatically turns off DNS foul.

C-44 Version 2.9

Added a printer selection for an Epson 40 column time slip printer.

Corrected problem of Dial-ins blanking when the tree started counting.

Made the selection of tie break decision or speed or reaction time so it was saved and not altered by the category selection.

C-44 Version 3.0

Added dial-in displays for next driver.

Added use of MPH as tie breaker after ET and reaction time.

Removed extra lines from 40 column printer printout.

Made auto tree have some random time in countdown of +.1 and +.2 sec.

Made minimum time in auto tree setting change to 0.5 sec instead of 1.0 second.

Added option for time trials in category menu.

Changed so it powers up to default of Pro .4 and Full .5 tree settings.

Moved the Reset/Next function to Shift-F7 (from control-F8), so timer is not accidentally reset when trying to print with control-F8.

C-44 Version 3.1

Added a tree countdown mode for crosstalk referred to in the program as 3X mode. This mode will turn on both top amber lights at the same time and then counts each side of the tree based on its dial-in. This was also added to the category settings so it could be set for a certain category.

Added a delay setting for LED trees so the tree will act more like an incandescent tree. With LED trees the light comes on sooner and this causes the drivers to start sooner so they end up red lighting.

1.3 C-44 Computer Update

To correspond to European standards, Daktronics has replaced the C-44 with the new C-44 CE computer. This computer works the same as the C-44, but now conforms to European standards. The software on both machines is identical. Throughout this manual, references to the C-44 also apply to the C-44 CE.

Section 2: New Track Installation

2.1 Unpacking/Damage Information

Open all packages and inspect for shipping damage, such as rattles or dents. See that all equipment is included as shown on the packing slip. Report any deficiencies immediately to Daktronics, Inc. Save all packing for shipping if warranty repair or exchanging is needed. Shipping packages also work well for off-season equipment storage.

2.2 Daktronics Exchange/Repair & Return Programs

To serve customers' repair and maintenance needs, Daktronics offers both an exchange and a repair and return program. The exchange program reduces down time by providing timely replacement of key components. This service is provided to qualified customers who follow the program guidelines explained below. It is our pleasure to provide this service to ensure you get the most from your Daktronics products. Please call our Help Desk (1-877 / 605-1115) if you have any questions regarding the exchange program or any other Daktronics service.

When you call the Daktronics Help Desk, a trained service technician will work with you to solve the equipment problem. You will work together to diagnose the problem and determine which exchange replacement part to ship. If, after you make the exchange, the equipment still causes problems, please contact our Help Desk immediately.

If the replacement part fixes the problem, package the defective part in the same packaging the replacement part arrived in, fill out and attach the enclosed UPS shipping document and **RETURN THE PART TO DAKTRONICS**. (You may use the same box and packing the exchange part was sent in.) This will speed up the transaction and alleviate confusion when the failed component arrives at Daktronics. (Daktronics expects immediate return of the exchange part if it does not solve the problem.) For most equipment, you will be invoiced for the replacement part at the time it is shipped. This invoice is due when you receive it.

Daktronics reserves the right to refuse equipment that has been damaged due to acts of nature or causes other than normal wear and tear.

If the defective equipment is not shipped to Daktronics within 30 working days from the invoice date, it is assumed you are purchasing the replacement part and you will be invoiced for it. This second invoice represents the difference between the exchange price and the purchase price of the equipment. This amount is due when you receive the second invoice. If you return the exchange equipment after 30 working days from invoice date, you will be credited for the amount on the second invoice minus a 20 percent restocking fee.

To avoid a 20 percent restocking charge, please return the defective equipment within 30 days from the invoice date.

Daktronics also offers a Repair and Return program for items not subject to exchange.

Where to Send: To return parts for service, contact your local representative prior to shipment to acquire a Return Material Authorization Number (RMA#). If you have no local representative, call the Daktronics Help Desk for the RMA#. This will expedite the receiving process.

Packaging for Return: Package and pad the item well so that it will not be damaged in shipment. Electronic components such as printed circuit boards should either be installed in an enclosure or should be put in an anti-static bag before boxing. Please enclose your name, address, phone number and a clear description of symptoms.

Mail: Daktronics, Inc., Customer Service
PO Box 5128
331 32nd Avenue
Brookings, SD 57006

Phone: Daktronics Help Desk: 1-877/605-1115
or 1-605/697-4036

Customer Service Fax: 1-605-697-4444

e-mail: helpdesk@daktronics.com

2.3 Warranty

Daktronics has a one year warranty on all equipment. Daktronics reserves the option to decide what damage will be covered by the warranty. All installations must use the cables (or equivalent) specified by Daktronics. All installations must also be properly terminated and earth grounded, per Daktronics specification. **Failure to do so may void the warranty.** The owner has the responsibility of paying for shipping both to and from Daktronics. Upon expiration of warranty Daktronics provides an optional maintenance agreement that provides extended coverage of equipment. Questions concerning maintenance agreements may be directed to Daktronics via the above listed address/phone number.

2.4 Parts Identification

Identify each component of the system by using the illustrations throughout this manual. Once all parts have been identified, group the parts into logical groups for assembly. To avoid unnecessary trips down the track, organize all the equipment into separate groups, for instance: equipment used in the tower, all equipment for the start line, intermediate parts of the track, and finish line. This will organize the installation procedure so that unnecessary trips down the track are avoided.

2.5 System Diagrams

Reference Drawings:

Layout w/AC cells, start line J-box & C44 CE..... **Drawing B-91012**
Field Cabling for dwg. B-91012 ..... **Drawing B-114631**

System diagrams show the complete setup for a new track. Refer to **Drawings B-91012** and **B-114631** when installing the system. Your track may have some variations from this diagram (i.e. more cable, no guard beam etc.), but basically all tracks will have this configuration. On these drawings you will find conduit sizes, cable lengths and type, as well as equipment locations for installing the system.

In addition, these diagrams can aid in removal in the off-season, emergency replacement, maintenance, safety, and security.

The following table refers to the information in **Drawing B-91012**

Infrared Photocells

Item	Part No.	#	Part No.	#	Part No.	#	Part No.
1	0A-1067-0128	11	W-1267	21	0A-1067-0108	31	Incl. w/item #28
2	**Incl. w/item #1**	12	W-1117	22	0A-1067-0111	32	A-1157
3	A-1305	13	0A-1067-0099	23	0A-1067-0064	33	0A-1081-0016
4	A-1157	14	0A-1067-0100	24	0A-1067-0065	34	Custom
5	W-1239	15	W-1399	25	0A-1067-0063	35	Custom
6	0A-1067-0076	16	0A-1067-0010	26	W-1117	36	0A-1067-0143
7	W-1266	17	0A-1081-0146	27	0A-1067-0080	37	W-1117
8	W-1266	18	W-1237	28	0A-1067-0050	38	EC-1082
9	W-1264	19	0A-1067-0107	29	W-1350	39	A-1078
10	W-1267	20	0A-1067-0071	30	A-1305	40	Custom

2.6 Location Requirements

Reference Drawings:

Field Cabling; C-44 Timer ..... **Drawing B-75554**

This section explains the equipment locations on the track for best operation. Such topics as conduit, power and electrical requirements, noise levels, and other location considerations are discussed. Daktronics recommends that these guidelines be followed as closely as possible.

Signal Conduit and Cable

All cable should be 18 awg twisted shielded pair, Beldon 8760 (Dak W-1117) unless noted. All cable should be in conduit. Refer to **Drawing B-75554** for conduit sizes and cable types.

Power

The following is a list of electrical items and their respective power requirements.

Unit Power Requirement (Watts)	
Start line outlet	100
Tower outlets	1800
C-44 console	100
Color monitor (C-44)	114
Isolation interface	30
Printer (log or time slip)	30
Time slip printer booth outlet	84
60 ft. line outlet	200
1/8th mile line outlet	30
Starters box interface	100
Color monitor (results)	102
DAKTRONICS 486DX computer	100
Three-amber tree	2000 (min 20 amps)

Electrical

All electrical equipment used in the timing system runs on standard 120 Volts AC/60 Hz.

Noise (Radio/PA)

Important: The C-44 data cables must never be run with AC (power) or PA (Public Address) cables. The data cables may cross AC or PA cables when absolutely necessary *but only at 90-degree angles*. If it is necessary to run AC or PA cables parallel to a data able, the cables must *not* be closer than 24".

In addition, care must be taken to insure that radio transmitters or television high voltage transmitters are far enough from the track to prevent noise interference. If these transmitters are close to the track, all cable must be shielded to prevent interference.

Care must be used to insure that the cable not be crimped or bent into too tight a radius. If it is necessary to put bends in conduit, they should be sweeping nineties.

Grounding

All equipment used with the timing system must be properly earth grounded. Make sure all outlets and cords are three-conductor (grounded). All extension cords or extra wiring must be three-conductor as well.

Important: Check to be sure that the service entrance (for the power) is properly earth grounded. If it is not grounded, have it properly grounded.

Isolated Power Circuits

Daktronics recommends that the control equipment (i.e. C-44 console) be on a dedicated power circuit to prevent noise interference. Air conditioners, fans, or high-powered electrical equipment may cause noise interference or a brown-out which would reset the system.

Electrical Code

The National Electrical Code and all local codes must be followed when installing electrical equipment. It is the responsibility of the installer to see that this is done. Equipment damage or personal injury can occur if these codes are not followed.

2.7 Mounting and Locating Equipment

Reference Drawing:

Isolation Inter. Encl. Detail ..... **Drawing A-56253**
Photocell Mnt. Dist. Dia. ..... **Drawing A-56354**
Starter's Box Interface ..... **Drawing A-72242**
Layout w/AC cells, st. ln. J-bx &C44CE..... **Drawing B-91012**
Field Cabling for dwg. B-91012 ..... **Drawing B-114631**

This section will explain how and where the track equipment should be mounted for a 1/8th and 1/4th mile track. The distances for track setup are national standards and should be followed.

Intermediate and Speed Trap Distances

Refer to **Drawing A-56354**. With guard beam, the start line is the guard beam line and all points should be measured from there. Without guard beam, the start line is the stage line and all points should be measured from there.

Four different speed trap lengths can be used with the C-44. Each one starts at a different point. Find the length to be used in the list below and mount the start of speed trap photocells that same distance before the finish line. General practice is to use the 66' speed trap.

Possible speed trap lengths:	2'	7-11/16"
	13'	2-3/8"
	66'	0"
	132'	0"

Burn-out Box = 90 ft. from designated box to start line.

Photocells

Roll Out- Height of the beams must be adjusted as necessary, to provide 12" of roll using standard dragster wheel/tire (22" diameter). Beam height must be low enough to accommodate clearance rulings.

Infrared Photocell Mounts

Mounting- The photocell stands can mount to either the protective guard rail or directly to a concrete surface. Ensure that the mount is level both horizontally and vertically to ensure proper photocell alignment. Photocell mounts are equipped with slots for side to side and up and down alignment.

Photocell Mounting

Mounting- Photocells with pipe mounts must be attached so the photocells are secure. The 60' photocell must be 10 1/2 inches above the crest of the track. All other interval photocells (i.e. 1/8th mile, speed trap, etc.) must be six inches above the crest of the track.

Tree Mounting Considerations

The distance from the start line to the tree must be 38 to 40 ft. The height of the tree should be 80 inches from the ground to the center of the pre-stage bulb.

Time Slip and Logging Printer Considerations

The Time Slip and logging printers will be Epson LX-300's standard. Locate the printers as shown in the system diagram (refer to **Drawing B-91012**). Care should be taken when choosing a site that can keep the printer from getting wet. The Time Slip printer cable can be routed with the finish line cable or scoreboard cables. **Note:** The E.T. printer requires two 18 awg twisted shredded pairs, Beldon 8760 (Dak W-1117). The shield should only be connected to earth in the control tower.

Starters' Box Interface Mounting

Refer to **Drawing A-72242** for an example of the starters box interface. The starters box interface has transmit and receive lines hard-wired between the starters box and isolation interfaces, and it is hardwired to the start line for the starters console. J2, located on the starters box interface, is an optional place to plug in the starters console. The starters box interface is located in the control tower as shown in **Drawings B-114631** and **B-91012**.

Isolation Interface Mounting

The isolation interface is designed with all field cabling connections made with clamping screw plugs, and all tower cabling connections made with supplied, D-type connector cables. Field equipment which must be connected to the isolation interface includes all photocells, all start-line equipment via the start line junction box, time slip printer, and ET/MPH displays.

Mounting considerations consist of access to all previously mentioned field cabling, proximity to C-44 timer (all interconnects made with standard 10' cables), position C-44 timer operator unrestricted view of isolation interface LED indicators, and adequate clearance for any high traffic areas. An ideal mounting location would allow the C-44 operator to view both the C-44 monitor and the isolation interface front panel, yet not restrict maintenance access (as depicted in **Drawing A-56253**). Refer to **Drawing B-91012** for suggested tower equipment location.

2.8 Field Wiring

Reference Drawings:

Iso. Interface Term Blk. Detail	**Drawing A-56252**
Iso. Interface Encl. Detail	**Drawing A-56253**
Start Box Int. Wiring	**Drawing A-72242**
C-44 Start Line J-Box	**Drawing A-75431**
Field Cabling; C-44 Timer	**Drawing B-75554**
Lay. w/AC clls,stlnJ-bx&C44CE	**Drawing B-91012**
Field Cabling for dwg B-91012	**Drawing B-114631**

This section pertains to the field wiring of the drag strip. The wiring will be done as follows- start line, intermediate, finish, and then tower. For all wiring, refer to the system diagram and pay close attention to the field cabling diagram **Drawing B-75554.**

When making connections, make sure all equipment power is off!

Photocell Connection: Connect all photocells (except the start line photocells) in this manner. Photocells are connected to the cables as per wiring instruction found in the power board box.

Daktronics uses only 18 awg twisted shielded cable, Beldon part #8760 (Daktronics part #W-1117) unless specified. The shield conductor provides protection from electrical noise and interference. *To provide proper protection, the shield conductor must be terminated at the isolation interface end only.* The field end of the shield should be cut back even with the outer insulation of the cable and wrapped with an electrical insulation tape. **When wiring photocells to isolation, always jumper the unused photocells from positive to negative on the isolation interface.**

Start Line/Isolation Interface Wiring

The start line wiring consists of wiring the isolation interface, the start line junction box, starter's box interface, start line photocells, and the guard beam (optional).

Cables coming into the tower should come to the isolation interface. Refer to **Drawings A-56252, A-56253, A-72242, A-75431, B-91012,** and **B-114631** to aid in wiring.

Isolation Interface to Starters Box Interface Wiring

Description	Form (I/I)*	Cable Specifications	Wire Color	To (SLI)**	Function
Isolation Interface/ Start line Interface Communications	TB 13-1	Manhattan u4473 (Dak W-1234)	Red	Trans +	Rec-P
	TB 13-2		Black	Trans -	Rec-N
	TB 13-3		Shield	Not Connected	Earth
	TB 13-4		Green	Rec +	Trans-P
	TB 13-5		White	Rec -	Trans-N
	TB 13-6		N.C.	Not Connected	Earth

*Isolation Interface **Drawing A-56252**
Start Line Interface **Drawing A-72242

Isolation Interface to Start Line J-Box

Description	From (I/I)*	Cable Specification	Wire Color	To (SLJB)**	Function
Pre-Stage Left Lane	TB7-1	Beldon 8760 (Dak W-1117)	Red	TB3-1	LPSTAGEPCL-P
	TB7-2		Black	TB3-7	LPSTAGEPCL-N
	TB7-3		Shield	No Connection	Shield-N
Stage Left Lane	TB7-4	Beldon 8760 (Dak W-1117)	Red	TB3-2	LSTAGEPCL-P
	TB7-5		Black	TB3-7	LSTAGEPCL-N
	TB7-6		Shield	No Connection	Shield-N
Guard Left Lane	TB7-7	Beldon 8760 (Dak W-1117)	Red	TB3-3	LGUARDPCL-P
	TB7-8		Black	TB3-7	LGUARDPCL-N
	TB7-9		Shield	No Connection	Shield-N
Pre-Stage Right Lane	TB1-1	Beldon 8760 (Dak W-1117)	Red	TB3-4	RPSTAGEPCL-P
	TB1-2		Black	TB3-8	RPSTAGEPCL-N
	TB1-3		Shield	No Connection	Shield-N
Stage Right Lane	TB1-4	Beldon 8760 (Dak W-1117)	Red	TB3-5	RSTAGEPCL-P
	TB1-5		Black	TB3-8	RSTAGEPCL-N
	TB1-6		Shield	No Connection	Shield-N
Guard Right Lane	TB1-7	Beldon 8760 (Dak W-1117)	Red	TB3-6	RGUARDPCL-P
	TB1-8		Black	TB3-8	RGUARDPCL-N
	TB1-9		Shield	No Connection	Shield-N
Tree Signal	TB16-1	Beldon 8760 (Dak W-1117)	Red	TB1-1	SIG3-P
	TB16-2		Black	TB1-2	SIG3-N
	TB16-3		Shield	No Connection	Shield-N

Refer to the Operational Check (**Section 2.8**) for connection and power up procedure.

*Isolation Interface
**Start Line Junction Box

Note: If field cabling for guard beam photocells is present, but guard beam photocells are not used, do not connect unused guard beam cabling to the isolation interface terminal blocks (TB7-7, TB7-8, TB7-9, LGUARDPCL, and TB1-7, TB1-8, TB1-9, RGUARDPCL).

Start Line Interface from Start Line J- Box

Description	To (SLI)*	Cable Specifications	Wire Color	From (SLJB)**	Function
Cable From SBI to SLJB for Hand-held Starters Console	+12V	Beldon 9774 (Dak W-1399)	Yel Pair 5	TB2-1	+12V-P
	L-Pro Tree		Black Pair 1	TB2-2	PROTREE light –N
	L-Ready		Red Pair 1	TB2-3	Ready light –N
	L-Times Reset		Brn Pair 6	TB2-4	Timer Reset light-N
	S-STARTGO		Blu Pair 4	TB2-5	GO/Reset switch-N
	S-EMERG		Grn Pair 3	TB2-6	Emergency switch-N
	S-SINGLE		Wht Pair 2	TB1-3	Singles/Drag switch-N
	GND		Black Pair 2	TB1-4	GND-N
	SHIELD		SHIELDS	Not Connected	EARTH

*Start Line Interface **Drawing A-72242**

Start Line J-Box **Drawing A-75431

Start Line Photocells

The cable used for connecting the start line photocells to the start line junction box (spreader cable) is pre-marked showing which photocell it connects to. Connect the cable to the photocells as marked.

Installation of the Three-Amber Tree

The Daktronics three-amber tree is totally compatible with all Daktronics C-44 race controllers. To install the three-amber tree, connect the tree cables into the connector on the bottom side of the tree. Plug the AC power cord into an outlet capable of supplying a minimum of 20 amps.

Regulations stipulate that the pre-stage bulb should be approximately 80 inches from the ground; a longer mounting pipe will be necessary in some cases.

Eight, 60-watt yellow "bug" lights should be used for the stage and pre-stage lamps. (There are two bulbs for each stage and pre-stage position to prevent confusion should one bulb burn out.) The twelve amber, four green, and four red lamps should be standard 85-watt colored flood lamps (GE part #13472 red, #13474 green, #13463 amber). These should be installed in the sockets using the supplied gasket to provide adequate bulb support and moisture protection. The gaskets should be used with the lamp sockets to seal and prevent vibration**.** The blue Sure Start lamp (if used) may be any blue-colored reflector-type bulb rated at 100 watts or less.

Due to the increased power consumption of this starting tree, it is essential that the tree be connected to a power supply sufficient to supply a minimum 20-amp current at the outlet. If the power available is insufficient, some slight dimming of the staging lamps will be noticed. This will not harm the tree, but the use of long extension cords should be avoided. Refer to **Section 4.2** for details on maintenance.

Intermediate Wiring (Optional) and Finish Line

This section consists of wiring the intermediate section of the track and the finish. This includes the 60 foot (I 1), the 330 foot (I 2), the 1/8th mile speed trap (I 3), the 1/8 mile finish, the 990 foot (I 4), and the 1/4 mile speed trap/finish.

Intermediate One, 60'- Wiring between the isolation interface and the 60' photocell J-boxes use multiple one pair shielded 18 awg cable. Plugs with clamping screws are used for connection to the isolation interface. Refer to the following connection table to assist in the installation. You may also reference the field cabling diagrams (**Drawing B-91012** and **B-114631**).

Intermediate Two, 330'- Wiring between the isolation interface and the 330' photocell J-boxes use multiple one pair shielded 18 awg cable. Plugs with clamping screws are used for connection to the isolation interface. Refer to the following connection table to assist in the installation. You may also reference the field cabling diagrams (**Drawings B-91012** and **B-114631**).

1/8 mile, 660' (Speed Trap)- Wiring between the isolation interface and the 660' speed trap photocell J-boxes use multiple one pair shielded 18 awg cable. Plugs with clamping screws are used for connection to the isolation interface. Refer to the following connection table to assist in the installation. You may also reference the field cabling diagrams (**Drawings B-91012** and **B-114631**).

Intermediate 990'- Wiring between the isolation interface and the 990' photocell J-boxes use multiple one pair shielded 18 awg cable. Plugs with clamping screws are used for connection to the isolation interface. Refer to the following connection table to assist in the installation. You may also reference the field cabling diagrams (**Drawings B-91012** and **B-114631** in **Section 2.5**).

1/4 mile, 1320' (Speed Trap)- Wiring between the isolation interface and the finish line photocell J-boxes use multiple one pair shielded 18 awg cable. Plugs with clamping screws are used for connection to the isolation interface. Refer to the following connection table to assist you in the installation. You may also reference the field cabling diagrams (**Drawings B-56301** and **B-114631**).

Description	To (I/I)*	Cable Specifications	Wire Color	From (Cell)**	Function
60N Left Lane	TB8-1	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB8-2		Black	J1-3	GND
	TB8-3		Shield	Not Connected	EARTH
60N Right Lane	TB2-1	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB2-2		Black	J1-3	GND
	TB2-3		Shield	Not Connected	EARTH
330N Left Lane	TB8-4	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB8-5		Black	J1-3	GND
	TB8-6		Shield	Not Connected	EARTH
330N Right Lane	TB2-4	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB2-5		Black	J1-3	GND
	TB2-6		Shield	Not Connected	EARTH
Start of Speed Trap #1 Left Lane (594N)***	TB9-1	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB9-2		Black	J1-3	GND
	TB9-3		Shield	Not Connected	EARTH
Start of Speed Trap #1 Right Lane (594N)***	TB3-1	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB3-2		Black	J1-3	GND
	TB3-3		Shield	Not Connected	EARTH
1/8 Mile Left Lane (660N)	TB9-4	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB9-5		Black	J1-3	GND
	TB9-6		Shield	Not Connected	EARTH

1/8 Mile Right Lane (660N)	TB3-4	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB3-5		Black	J1-3	GND
	TB3-6		Shield	Not Connected	EARTH
990N Left Lane	TB9-7	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB9-8		Black	J1-3	GND
	TB9-9		Shield	Not Connected	EARTH
990N Right Lane	TB3-7	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB3-8		Black	J1-3	GND
	TB3-9		Shield	Not Connected	EARTH
Start of Speed Trap #2 Left Lane (1254N)***	TB10-1	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB10-2		Black	J1-3	GND
	TB10-3		Shield	Not Connected	EARTH
Start of Speed Trap #2 Right Lane (1254N)***	TB4-1	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB4-2		Black	J1-3	GND
	TB4-3		Shield	Not Connected	EARTH
1/4 Mile Left Lane (1320N)	TB10-4	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB10-5		Black	J1-3	GND
	TB10-6		Shield	Not Connected	EARTH
1/4 Mile Right Lane (1320N)	TB4-4	Beldon 8760 (Dak W-1117)	Red	J1-1	SIGNAL-P
	TB4-5		Black	J1-3	GND
	TB4-6		Shield	Not Connected	EARTH

*Isolation Interface
**Intermediate/ Finish Line Photocell J-Box
*** Based on a 66 Ft Speed Trap

Time Slip Printer/Printer Interface Wiring

The Time Slip Printer is a 40 column Epson TM-4200 or an Epson LX300 (contact Daktronics for other choices or models). The Time Slip Printer is then plugged into a Printer Interface. The printer interface has a terminal block (TB1) to connect to the cable coming from the isolation interface. Refer to the following table for connecting the cable to the isolation interface. Use two, shielded 18 awg pair cables. You may also reference the field cabling diagrams (**Drawings B-91012** and **B-114631**).

Description	From (I/I)*	Cable Specification	Wire Color	To (Printer Interface)	Function
Time Slip Printer	TB14-1	Beldon 8760 (Dak W-1117)	Red	TB1-4	ETFAULT-P
	TB14-2		Black	TB1-5	ETFAULT-N
	TB14-3		Shield	Not Connected	Earth
	TB14-4	Beldon 8760 (Dak W-1117)	Red	TB1-1	ETDATA-P
	TB14-5		Black	TB1-2	ETDATA-N
	TB14-6		Shield	Not Connected	Earth

*Isolation Interface

Optional: Wiring Between the Isolation Interface and Scoreboards

Wiring between the isolation interface and the scoreboards/dial-in displays use multiple one pair 18 awg shielded cables. Refer to the following wire connection table to assist in the installation. You may also reference the field cabling diagrams (**Drawings B-91012** and **B-114631**).

Isolation Interface to Left Scoreboard Wiring List

Description	From (I/I)*	Cable Specifications	Wire Color	To (Left Scbd)	Function
Left Lane SCBD	TB15-1	Beldon 8760 (Dak W-1117)	Red	TB31-1	SIG1-P
	TB15-2		Black	TB31-2	SIG1-N
	TB15-3		Shield	Not Connected	Earth
Left Lane Dial-in Display	TB15-1	Beldon 8760 (Dak W-1117)	Red	Tip	SIG1-P
	TB15-2		Black	Ring	SIG1-N
	TB15-3		Shield	Not Connected	Earth

*Isolation Interface

Isolation Interface to Right Scoreboard Wiring List

Description	From (I/I)*	Cable Specifications	Wire Color	To (Right Scbd)	Function
Right Lane SCBD	TB15-4	Beldon 8760 (Dak W-1117)	Red	TB31-1	SIG2-P
	TB15-5		Black	TB31-2	SIG2-N
	TB15-6		Shield	Not Connected	Earth
Right Lane Dial-In Display	TB15-4	Beldon 8760 (Dak W-1117)	Red	Tip	SIG2-P
	TB15-5		Black	Ring	SIG2-N
	TB15-6		Shield	Not Connected	Earth

*Isolation Interface

2.9 Operational Check

Reference Drawing:

Printer Interface Assy. ..... **Drawing A-65810**
C-44Start Line J-Box ..... **Drawing A-75431**
Field Cabling; C-44 Timer ..... **Drawing B-114631**

During the operational check, the final connections are made on the system and preliminary tests are done to determine if all the equipment is working properly. First, the equipment in the tower is checked, then the start line, the intermediate equipment, and finally, the finish line.

Timer - Monitor - Keyboard - Isolation Interface

This section will cover the connection of the equipment in the tower. Refer to the system diagram and cabling diagram for information on the items that connect to the C-44. Refer to **Drawing A-65810** to view the back panel of the C-44.

- Connect the cable that came with the video monitor to the "VIDEO BOARD (VIDEO 1)" port on the back of the C-44. The power switch is on the lower right side of the monitor.
- Connect the cable that came with the keyboard to the "KEYBOARD" port.
- Plug the C-44 and the monitor into a tower outlet. Other equipment will be connected as the system is turned on.
- Make sure the timer and monitor are plugged in. Turn on the power to the C-44 and monitor. Check to be sure the green power LED lights up when turned on and the fan in the rear of the console is moving air. Make sure a clear picture of

the C-44 main screen appears on the monitor (Refer to **Figure 1** in **Section 3**). Some adjusting of the monitor brightness or focus may be necessary.

- Use the keyboard to type in sample drivers' names, etc. to test if the keyboard is operating properly. Next, connect the equipment using the following instructions.

- Using one of the 9-pin "D" cables, connect the isolation interface port marked “SLEB” to the C-44 port marked "COM1."
- Using the other 9-pin "D" cable, connect the isolation interface port marked "ET Printer" to the C-44 port marked "ET PRINTER (COM3)."

- Using the 15-pin "D" cable, connect the isolation interface port marked "DISPLAY" to the port marked "DISPLAY TRANSMITTER (DISPLAY1)."

- Using the two 37-pin "D" cables, connect the isolation interface ports marked "LEFT PHOTOCELLS" and "RIGHT PHOTOCELLS" to the C-44 ports marked "PHOTOCELL BOARD #1 LEFT LANE (PHOTO1)" and "PHOTOCELL BOARD #2 RIGHT LANE (PHOTO2)" respectively.

- Connect the logging printer cable into the port marked "LOGGING PRINTER (LPT1)" on the back of the C-44; connect the other end to the logging printer. Refer to the printer user’s manual for instructions on how to insert the paper (8 1/2" by 11" white paper with tear-off edges should be used).

- *Optional:* If a results system is being used, connect the results system cable to the port marked "RESULTS (COM2)" on the back of the C-44 and the serial port of the results computer.

- For best results in protecting against glitches in the timing system, it is recommended that a UPS power supply be attached to the timer and results computer. For areas with irregular power supplies, a line voltage regulator is recommended in conjunction with the UPS.

Timer - Start Line - Emergency

Connecting the starter’s box interface and start line junction box (Refer to **Drawing A-75431**).

- Plug in the power cord to starter’s box interface.

- Connect the cable on the starter’s console into the connector on the start line junction box.

- The cable for connecting the start line junction box to the start line photocells is a pre-marked spreader cable. Connect the start line photocell cable into the military connector on the back of the start line junction box.

Emergency

To activate the emergency light, press the <**F9**> key while holding down the <**CTRL**> key on the C-44 keyboard. Check to make sure that the red tree light comes on and that the C-44 screen shows the emergency sign. Turn off Emergency by pressing <**CTRL**><**F9**> a second time and reset the timer <**SHIFT**><**F7**>. Check the emergency switch on the starter’s console. The emergency setting on the C-44 and the emergency

switch on the starter's console must be off to reset the timer. The switch on the starter's console marked emergency also turns the lights on and off.

Switch both to emergency mode. Test to be sure that the starter's console cannot reset the tree while the emergency light is on. Turn off the emergency switch on the starter's console. Now test the C-44 to make sure it cannot reset the timers. Now turn both switches off and check to be sure the timer can be reset by the C-44.

Start Line Photocell Check

Use the photocell check function that is built into the isolation interface to check the operation of the start line photocells. Refer to ***Photocell Check*** in **3.2** for instructions on the use of the photocell check function.

Timer - Intermediate Photocell Check

Test the operation of the intermediate photocells and light sources. Use the photocells check function as in ***Photocell Check*** in **3.2.**

Timer - Win Lights - Finish Line Photocell Check

Use the Win Lights diagnostics function that is built into the C-44 to test the optional Win Lights. Refer to **<Ctrl-W> Win Light Diagnostics** in **Section 3.3** for instructions.

Use the photocell check function again to check the operation of the finish line photocells. Now all photocells should be operational.

Printers

Before each race, ensure that the printers and timer are connected. Make sure both printers are on and on-line. Check to be sure both printers are enabled. If "off" shows up by either Log or Time Slip, refer to ***System Configuration Settings*** in **Section 3.3** on enabling them. If "not ready" shows up by Log or Time Slip, something is not working right from the computer to the printer.

Scoreboards (Optional)

Use the scoreboard diagnostics function that is built into the C-44 to test the operation of the scoreboards. Refer to **<Ctrl-S> Scoreboard Diagnostics** in **Section 3.3** for instructions on the use of the scoreboard diagnostics function.

Final Testing

Finally, drive a car down the track at constant speed and check the operation of the entire system. Verify the accuracy of the times that are returned as well as the speeds.

2.10 Sighting Infrared Photocells

Follow the photocell alignment procedures that come with the photocells.

Section 3: C-44 Race Timer Operation

3.1 General Operation

Access to all of the race controller's functions is through the function keys (<**F1**> through <**F12**>) located along the top edge of the keyboard. Many of the function keys have more than one purpose, which are accessed by using the function keys in conjunction with the <**SHIFT**>, <**CTRL**>, or <**ALT**> keys. A table of all functions (**Figure 7**) is given in ***Help Screen*** in **Section 3.3** of this manual, or can be viewed from the race controller by pressing the <**F6**> key (Help Screen).

Keystroke sequences associated with functions are given in parentheses throughout this manual. If a function key is listed by itself, such as <**F1**>, that means that the **<F1>** key alone is used to access that function. If a function key is listed with another key, such as <**SHIFT**><**F1**>, the **<SHIFT>** key must be *held down* while the **<F1>** key is momentarily depressed.

3.2 C-44 Race Controller Functions

Reference Drawing:

Starter's Console..... **Drawing A-57318**

Power Button

The power button used to supply main power to the unit, is on the front of the C-44 race controller. When the unit is connected to a proper power source and the switch is on, the power LED will be illuminated.

When the system is powered up, the monitor should display the following screen (Refer to **Figure 1**). **Note:** Some systems may be configured differently when powered up, therefore each screen may show some subtle differences to the one shown here. It should, however, be very close.

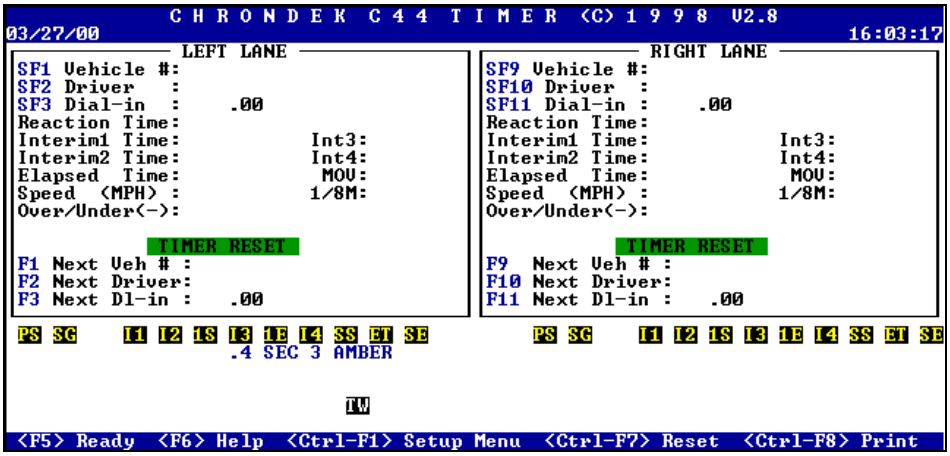


Figure 1: *C-44 Main Screen*

Entering Dial-ins

Entering dial-ins is just like entering numbers on a calculator. Just type in the number, leading and trailing 0's are put in automatically. However, the decimal point *must* be

entered by the user. There is also a maximum of two digits before and after the decimal point. After entering the dial-in press the <**ENTER**> key.

Timers Reset

To reset the timers, use one of three possible keystroke combinations depending on the desired reset options:

1. <**CTRL**><**F6**> is used to reset the timers for both lanes only.
2. <**SHIFT**><**F7**> is used to reset the timers for both lanes *and* move the next driver information to current.
3. <**CTRL**><**F8>** is used to reset the timers for both lanes *and* move the next driver information to current *and* cause the tower log printer and time slip printer to output preceding race information. When both timers are reset, a timers reset light on the starter's console will be illuminated, and a timer reset message will appear for each lane on the monitor.

Tree Countdown Modes

<ALT><F5> is used to select the tree countdown mode. The selected countdown mode will alternate between full tree and pro tree with each press of <**ALT**><**F5**>. The countdown sequence and rate that are currently active are displayed below the left lane portion of the main screen. This gives the operator constant verification of the countdown mode. If the selected category has split tree *on*, the countdown mode of the right lane will display below the right lane. The keystroke <**SHIFT**><**F5**> will alternate the countdown mode for the right lane when in split tree and <**ALT**><**F5**> will change the left lane. The exact countdown rate used is selected by pressing <**CTRL**><**F1**> to get the *Setup Parameters Menu*, followed by <**C**> to access the *Tree Countdown Mode* feature (Refer to **Figure 9** in **Section 3.3**).

Sure Start

<**ALT**><**F6**> will put the timer in sure start mode. When in this mode, a foul will be generated if a vehicle was not pre-staged at the instant the starter's switch was thrown to *GO*. This feature allows a track operator to enforce the *no deep staging* rule.

When sure start is activated, the blue bulb on the starting tree between the stage lights will be on, and "*SS*" is displayed in the lower left portion of the main screen. If <**ALT**><**F6**> is pressed a second time, the sure start is turned off, the blue bulb is no longer illuminated, and the *SS* indicator is off.

True Win/Breakout

The keystroke combination <**ALT**><**F7**> activates the True Win function and causes "TW" to be displayed in the lower left portion of the main screen. The True Win function allows the winner of a race to be determined based on the following factors.

A. General disqualifications (entered manually by the operator)
B. Crossing a lane boundary line (entered manually by the operator)
C. A foul (red light)
D. Crossing the finish line first
E. Not finishing the course (entered manually by the operator)

If True Win is activated, the Breakout function can be selected by pressing <**ALT**><**F8**>. Breakout is activated and "BO" is displayed in the lower center portion of the main screen, this allows the inclusion of E.T. breakouts into the determination of a winner. When both True Win and Breakout are activated, the following factors are used to determine the true winner:

1. **General Disqualifications (DSQ)-** Disqualifications are infractions manually entered by the operator <**ALT**><**F1**> (left lane) or <**ALT**><**F9**> (right lane). These include unsportsmanlike conduct, intentional delay of run, and others as determined by the officials. The C-44 handles DSQ's in the following way. If one driver is disqualified, the other driver automatically receives the win. If both drivers are disqualified, the driver with the least severe infraction wins the race. To determine the severity of an infraction, see the race officials. Infractions may be canceled manually by the operator: <**ALT**><**F4**> (left lane) or <**ALT**><**F12**> (right lane).

2. **Crossing Lane Boundary Lines (OB)-** Leaving lane boundary lines is an infraction of the rules. If the operator is notified that a driver has left the driving lane, the operator enters an out-of-bounds (OB) <**ALT**><**F2**> (left lane) or <**ALT**><**F10**> (right lane). The driver who leaves the driving lane is disqualified, the other driver automatically wins *even if his or her car leaves the driving lane during the remainder of the race, unless a more severe infraction occurs.*

3. **Fouls (red lights)-** A foul (or red light) is caused when a driver crosses the starting line before the green light is on (negative reaction time). The C-44 automatically senses a foul, if one has occurred. When a foul does occur, the driver who fouled is disqualified and the other driver receives the win. If both drivers foul, the driver who fouled first loses the race. **Note:** When Sure Start is active *and* both drivers foul, both are disqualified in accordance with the *no deep staging* rule mentioned earlier.

4. **E.T. Breakouts-** A breakout occurs when the driver beats his or her respective dial-in. The C-44 automatically detects breakouts. When a breakout occurs, the driver who "broke-out" is disqualified and the other driver receives the win. If both drivers breakout, the driver who "broke out" by the least amount of time receives the win. If both breakouts are equal the driver that crossed the finish line first is the winner.

5. **Which Vehicle Crossed the Finish Line First-** The C-44 automatically determines which driver finishes the race first. This determination is used to decide the winner when two drivers have equal dial-ins and no other infractions occur, or when a double breakout of equal time occurs.

6. **Not Finishing the Course (DNF)-** If a driver does not finish the course, the C-44 operator manually enters a did-not-finish (DNF): <**ALT**><**F3**> (left lane) or <**ALT**><**F11**> (right lane). The driver who did not finish the race loses the race. If both drivers do not finish, both drivers are given losses.

   Both True Win and Breakout are deactivated by pressing their respective keystroke combinations a second time.

Emergency

<**CTRL**><**F9**> will activate the flashing red lights on the tree and inhibit any countdown of the tree. An emergency message on the monitor will also flash. Press <**CTRL**><**F9**> a second time to deactivate the emergency mode.

There is also an emergency switch on the starter's console (**Drawing A-57318**), which will also activate the emergency mode. The emergency mode will remain active until both the keyboard select on the C-44 and the switch on the control box are off.

Altitude Adjustment

An Introduction to Altitude Adjustment

Many race car engines run better, and consequently the cars move faster, when the air available to the engine is denser. In general, cars will run faster at sea-level tracks than at high elevation tracks such as in "mile high" Denver. The drag racing industry has developed lists of altitude correction factors that can be used to adjust E.T. and MPH values for races that are run at various altitudes. The basic concept is to adjust the E.T. and MPH values that are experienced at the higher elevation tracks to sea-level values so that all results can be directly compared.

In the past, the E.T. and MPH values had to be manually adjusted using the altitude correction factor when preparing a timer for a race or verifying the results. The altitude adjustment feature of the C-44 timer allows this operation to be performed automatically by the timer to prevent errors and allow quicker verification of race results. The C-44 also allows the automatic altitude adjustment function to be quickly switched off if manual calculations are desired or if the altitude correction factors are not used for some races.

The C-44 system allows three sets of adjustment factors to be entered by the operator. Each set contains one factor for adjusting the E.T. and one factor for adjusting the MPH. This allows different categories of classes to have different adjustment factors pre-entered and quickly available for each race. The determination and accuracy of the actual factors used are the responsibility of the track operator and the track's sanctioning body.

Altitude Adjustment Example

Figure 2 shows the results of a race that was run using the altitude adjustment factors of the C-44.

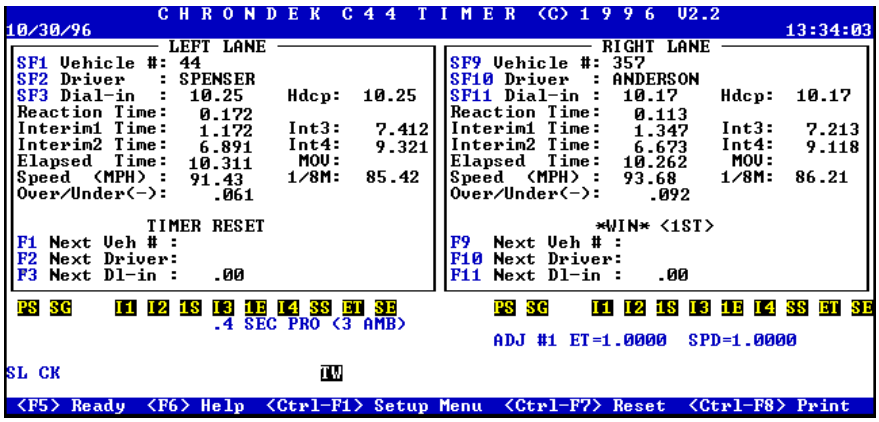


Figure 2: *Altitude Adjustment Example*

1. Notice at the bottom of the screen: Altitude adjustment feature is turned on ("ADJ"). Adjustment factor set #1 is selected. This factor set has an E.T. factor = 1.0000 and speed factor = 1.0000.

2. Dial-ins were entered as *sea-level* dial-ins. Dial-ins of 10.25 for the left lane and 10.17 for the right lane were entered.

3. The C-44 automatically divides the *sea-level* dial-in by the E.T. adjustment factor to produce an actual (at altitude) elapsed time value that will be used to

determine the tree handicap. This *at altitude* elapsed time value is shown on the screen after the word "Hdcp" for each lane.

4. As the race is run, the C-44 multiplies the actual measured *at altitude* times by the E.T. adjustment factor to produce the *sea-level* times for:
- Reaction Time
- Interim 1 Time
- Interim 2 Time
- Interim 3 Time
- Interim 4 Time
- Final E.T.

5. The actual *at altitude* MPH which is calculated in the speed trap by the C-44 is multiplied by the MPH adjustment factor to produce *sea-level* MPH.

6. Note that all the times and MPH shown on the monitor, scoreboard, and printouts are *sea-level* values. Most drivers and spectators are familiar with the sea-level values which are also listed in most racing publications.

7. Note that the values in the E.T. printout (**Figure 3**) are marked with **A1** to show that they are sea-level values that have been calculated from the actual *at altitude* values using altitude adjustment factor #1. This is also true for the log slip (Refer to **Figure 4**).

Figure 5 shows the results of an identical race that was run without using the altitude adjustment feature.

Note: The dial-ins were manually adjusted before being entered. The times and MPH shown are the actual unadjusted *at altitude* values that were read by the C-44 timer.

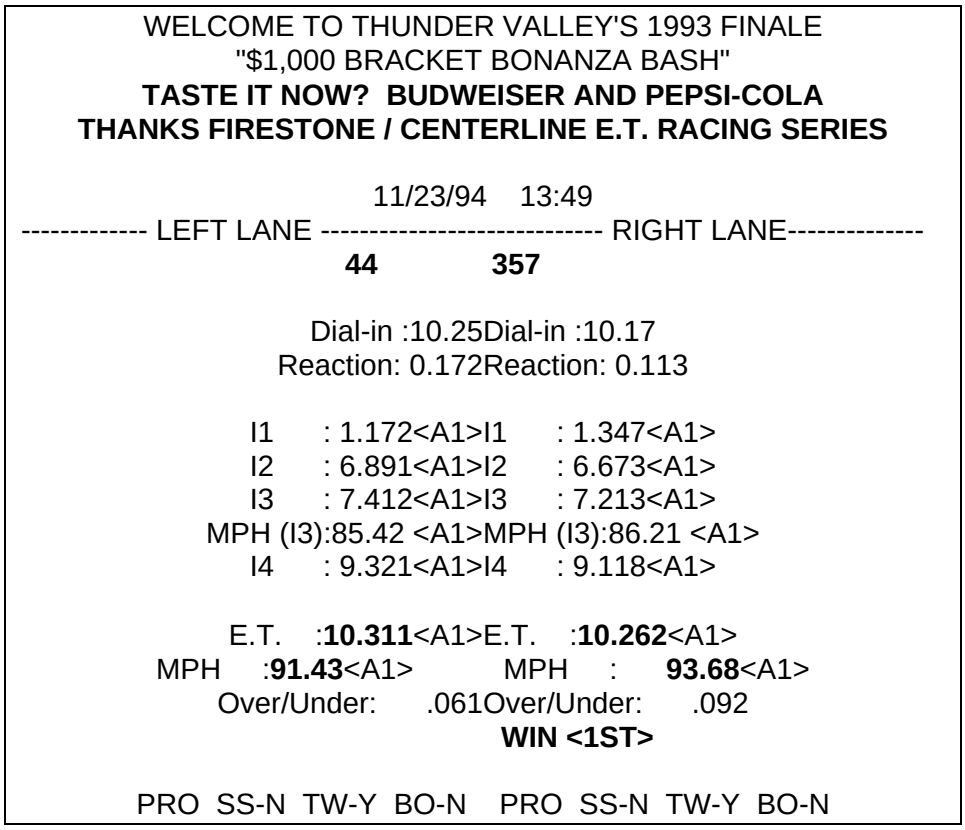


Figure 3: *Time Slip Printout Showing Adjustment Factors*

CATEGORY #1
ELIMINATION ROUND

8/13/93 13:45

	Time	Vehicle Number	-DI--	--RT--	--I1--	--I2--	--I3--	--S1--	--I4--	--ET--	--SP--	--O/U--	Results	Infractions	
L	13:49	44	10.25	.172	1.172	6.891	7.412	85.42	9.321	10.311	91.43	.061			A1
R	13:49	357	10.17	.113	1.347	6.673	7.213	86.21	9.118	10.262	93.68	.092	WIN (1st)		A1

L-FULL R-FULL S.S.-N T.W.-Y B.O.-N

Figure 4: *Log Printout Showing Adjustment Factors*

A sometimes confusing effect of altitude adjustment corrections on handicap calculations can also be shown with this example.

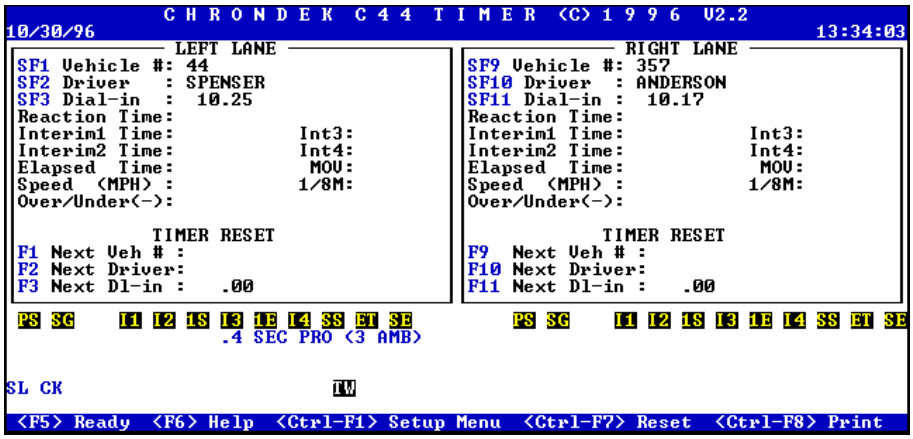


Figure 5: *Identical Race as in Figure 2, but without Altitude Adjustment*

If the cars had been racing at an actual sea-level track with dial-ins of 10.25 and 10.17 respectively, the handicap would be 10.25 - 10.17 = 0.08 seconds. The concept of altitude corrections assumes that both cars in the race will be affected to the same percentage by the thinner air *at altitude*. Thus, both cars' E.T.'s are adjusted by the same altitude factor. The *altitude* E.T.'s are thus 10.41 and 10.32 respectively.

A fair race based on the altitude corrections concept, therefore, requires that the resulting handicap at altitude will be 10.41 - 10.32 = 0.09 seconds.

Using Altitude Adjustment

To set the race controller for altitude adjustment, press <**CTRL**><**F1**> to get the *Setup Parameters menu*, followed by <**A**> to access the *Altitude Adjustment Factors*. The <**TAB**> or <**ENTER**> key is used to move the highlight bar to the *Altitude Adjustment On:__* line. Press the <**SPACE BAR**> to alternate between Yes and No. Similarly, the Factor # can be selected by moving to the *Factor: __* line and pressing the <**SPACE BAR**> until the desired number is displayed.

Once the factor sets have been preset (Refer to **<*A*> *Altitude Adjustment Factors*** in **Section 3.3**), they can be selected as described above. The current selection of adjustment factors is displayed on the monitor. Also, an A1, A2, or A3 will be printed on the time slip to indicate which adjustment factor set has been selected.

Using Dial-ins With Adjustment Factors

When a dial-in is entered, it is assumed to be a *sea-level* dial-in. This usually comes from a published index or, in the case of E.T. racing, from the time slip of an earlier altitude-adjusted time trial run.

For the tree handicap countdown, the *sea-level* dial-in that is entered for each lane is divided by the current E.T. adjustment factor to give the proper handicap difference based on the two cars performance *at altitude*. This insures a properly matched handicap race. Since the E.T. used to determine breakouts is a *sea-level* E.T., it is compared to the *sea-level* dial-in to determine if a breakout has occurred.

Note: The system does not allow any dial-in's greater than 99.99. Therefore, if an adjusted dial-in figures to be greater than 99.99, the originally entered dial-in will be used for the tree handicap.

Reaction Timer

All reaction times are calculated from the start of the green light. A *perfect* reaction time occurs when a car leaves the start line exactly as the green lamp lights. Negative or red light reaction times are calculated *backwards* from the beginning of the green light. Refer to **Figure 27** in **Section 3.3** for information on how the reaction time can be displayed.

Printers

The log printer and time slip printer may be enabled and disabled (Refer to **<*L*> *Tower Log Printer*** and **<*P*> *Time Slip Printer*** in **Section 3.3**). If a printer is turned off or not ready, the monitor will display a message to that effect in the lower right hand corner of the screen. If a printer is off, the C-44 race controller will store a limited number of race results (approximately 15). When the printer is once again enabled, the stored information will automatically be printed out. Always verify that the printer is powered up and all printer cables are connected correctly.

Reset Win Light

Press <**CTRL**><**F5**> to turn off all of the spectator Win Lights on the finish line scoreboards. These lights will also automatically turn off after a preset amount of time. This preset amount of time (selected manually by the operator) is called the Win Light Format (W on the parameter setup menu, refer to **<*W*> *Win Light Format*** in **Section 3.3**). The Win Light Format can be set to either 5, 10, or 15 seconds.

Photocell Check

The push-to-test photocells switch on the lower right corner of the isolation interface makes the photocells less sensitive, in order to verify that the cells are properly aligned.

If all the photocells are aligned properly, the letters denoting each cell will not appear on the bottom of the screen and the corresponding LED's on the isolation interface will be lit. If a cell is not properly aligned or it is not working properly (i.e. the cell is not receiving power) the letters for that cell will show up on the screen after the button is pressed. If this occurs, these particular cells should be checked before the system is used.

Margin of Victory (MOV)

The Margin of Victory is the time between when the first car crosses the finish line until the second car crosses. This time is displayed on the C-44 monitor on the track side of the car that finishes first. This time is calculated by adding the reaction time to the elapsed times for each lane and then adding any handicap time to the opposite lane. The times are then subtracted to get the margin of victory. MOV is not displayed if there is a Foul, a Breakout, or if True Win is off.

3.3 Additional Functions

Help Screen

The following illustration depicts the help screen that is called up on the monitor when <**F6**> is pressed.

It is recommended that this page be reproduced and posted for the operator's use.

Additional function descriptions appear on the following pages.

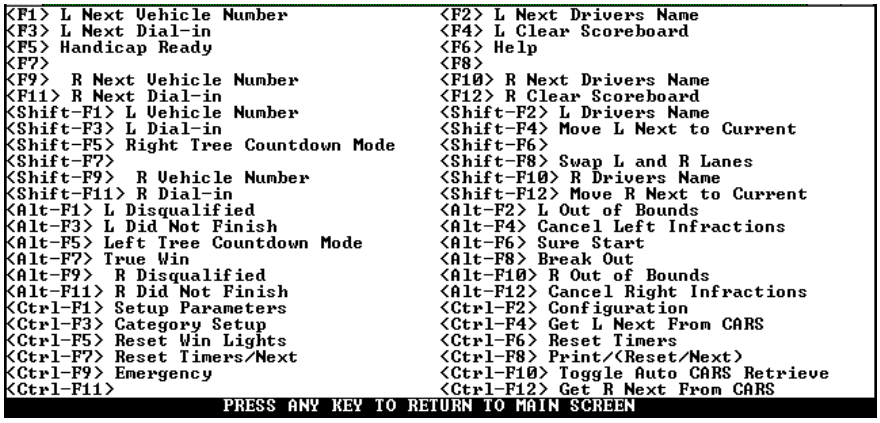


Figure 6: *C-44 Help Screen*

Setup Parameters Menu

The *Setup Parameters Menu* <**CTRL**><**F1**>, illustrated below, is used to configure the system before racing begins.

To select an item from the *Setup Parameters Menu*, press the key or key combination in brackets <>. Following is a description of each of the options in the menu.

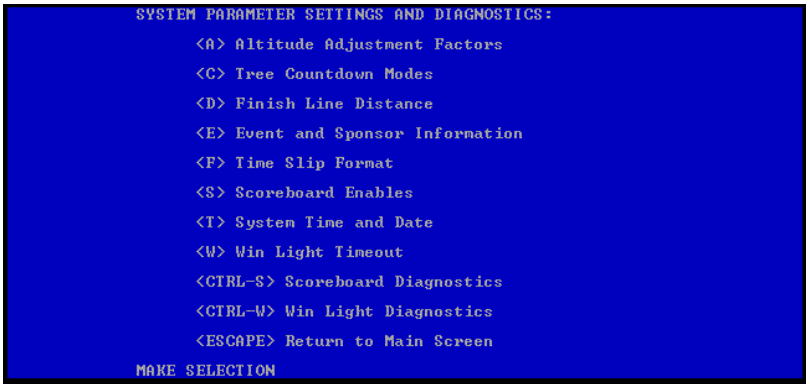


Figure 7: *Setup Parameters Screen*

<A> Altitude Adjustment Factors

The **A** option on the *Setup Parameters Menu* is chosen when altitude adjustment factors will be used. Type the E.T. factor for the first set in a fixed decimal point format.

Be careful: Be sure the factor is entered correctly (i.e. make sure the E.T. factor is entered as 0.9xxx and not as 9.xxxx). By using the space bar and backspace key, the operator can move around within the factor itself to make sure it is correct.

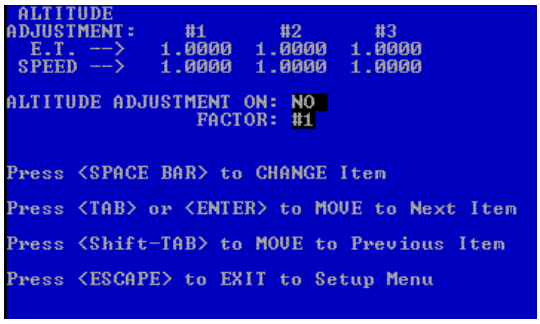


Figure 8: *Altitude Adjustment*

There are three sets of adjustment factors available, each set containing one (1) factor for adjusting the E.T.'s and one (1) factor for adjusting the speed. Use the tab or enter key to move from the E.T. factor to the next set, after the first factor is correctly entered.

Continue to make entries until all the desired factors have been entered. If no entry is needed, just use the tab key to move to the next factor. **Note:** Although three sets of factors are available, it is not necessary to use them all. If only one set is needed, just enter that set and leave the others alone.

When all factors have been entered, press the <**ESC**> key to return to the *Setup menu.*

<C> Tree Countdown Modes

There are many possible combinations of sequences and rates of countdown for the tree. The following is a list of available sequences and rates. They can be used in any combination. The tree delay is used to select a delay for the use of LED trees. It can be set from .00 to .05. If no delay is needed it should be set to .00.

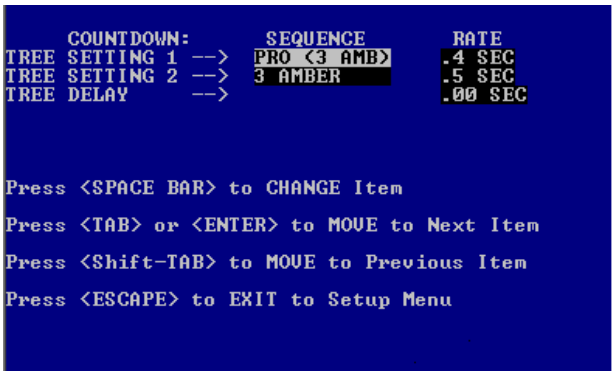


Figure 9: *Combinations*

Pro Tree Sequences	Rates
Instant Green	.2 sec
Pro (1 amber)	.3 sec
Pro (3 amber)	.4 sec
	.5 sec

Full Tree Sequences	Rates
2 amber	.2 sec
3 amber	.3 sec
5 amber	.4 sec
3x amber	.5 sec

<D> Finish Line Distance

Option **D** is used to select the track length that the timer will be configured for. The user may specify a finish distance of:

- 1/4 mile
- 1/8 mile

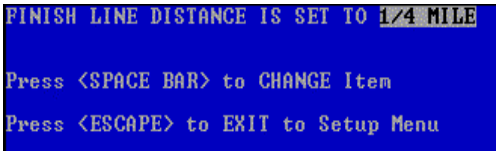


Figure 10: *Finish Line Distance*

<E> Event and Sponsor Information

From this menu, the track name, event name, and two sponsor ad lines are entered.

All information entered in this fashion will be printed on each time slip. An example of the time slip printout can be seen in **Figure 11**.

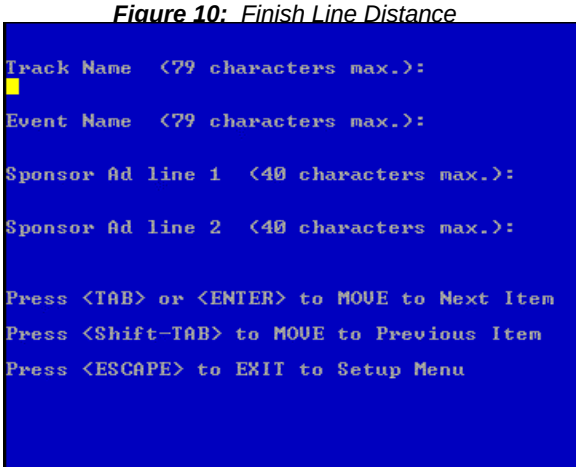


Figure 11: *Time Slip Information*

<F> Time Slip Format

Option **F** is used to change the format of the time slips. The user has three formats to choose from:

- Print two dual lane time slips.
- Print two single lane time slips.
- Print one dual lane time slip.

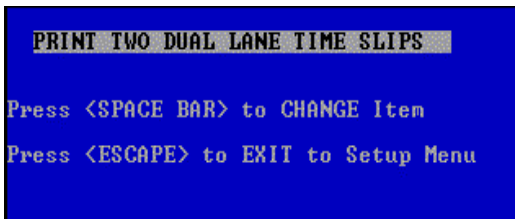


Figure 12: *Change Format*

<S> Set Scoreboard Enables

Option **S** is used to configure the displays, and enable or disable the two scoreboards located at the finish line.

A particular time or value will be displayed only when a *Y* appears below it. Move the highlight bar to the value that needs to be changed and press the <**SPACE BAR**>. The display will alternate between *Y* and *N*. Similarly, the right and left displays can be enabled or disabled by using the <**SPACE BAR**> to select On or Off. Positioning the highlight bar under BRT and selecting [N] will cause the displays to operate in a dimmed mode. Select [Y] to disable the dimming effect.

Figure 13: *Configuration*

<T> System Time and Date

Current system time and date are saved by the C-44 when power is removed. In the event that the operator wishes to correct or change these settings this option may be used to insure that all printouts have accurate time and dates.

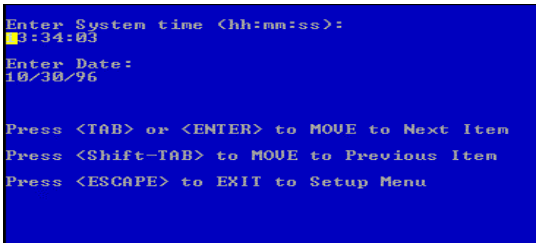


Figure 14: *Time and Date*

<W> Win Light Format

The Win Light timeout can be set to either 5, 10, or 15 seconds.

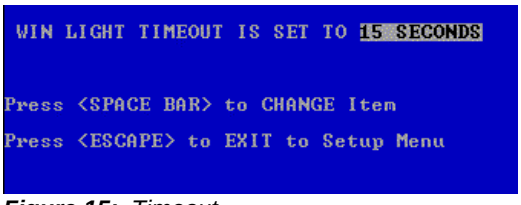


Figure 15: *Timeout*

<Ctrl-S> Scoreboard Diagnostics

To activate the scoreboard diagnostics program press <**CTRL**><**S**>**.** The screen will show the numbers that are being sent to the respective fields on the scoreboard. If there are parts of a number that are not lighting, either a bulb has to be replaced or the scoreboard is not functioning properly. Refer to the scoreboard user's manual for instructions on troubleshooting.

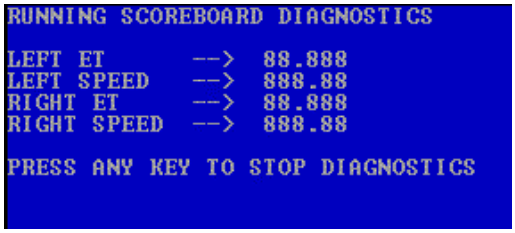


Figure 16: *Diagnostics*

<Ctrl-W> Win Light Diagnostics

The Win Light diagnostics program can be activated by pressing <**CTRL**><**W**>. The screen will show the sequence that the Win Lights should follow when they light. If a Win Light does not light, either a bulb has to be replaced or the Win Lights are not functioning properly. Refer to the scoreboard user's manual for instructions on troubleshooting the scoreboard.

Figure 17: *Win Light Diagnostics*

System Configuration Settings

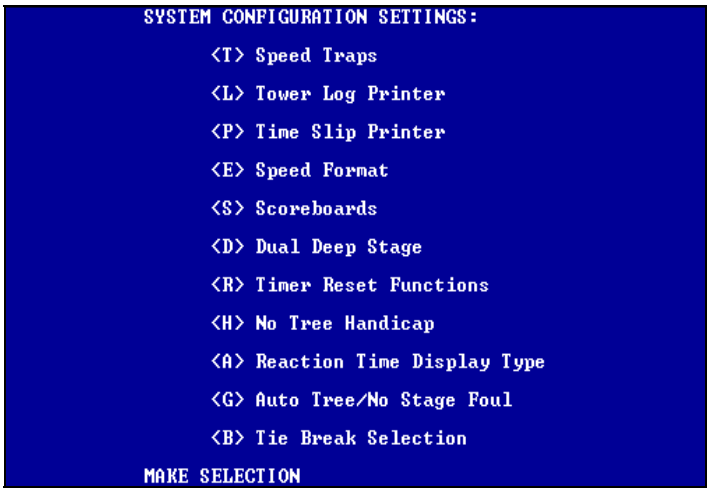


Figure 18: *System Configuration Screen*

The *Configuration Menu* <**CTRL**><**F2**>, illustrated here, contains basic system options that are to be set prior to racing.
To select an item from the *System Configuration Menu*, press the key in brackets <>. Following is a description of each of the options in the menu.

<T> Speed Traps

Option **T** is used to specify speed trap lengths for both the interim 3 and finish line speed traps. The operator may select from:

- 2.64 FT
- 13.2 FT
- 66.0 FT
- 132.0 FT

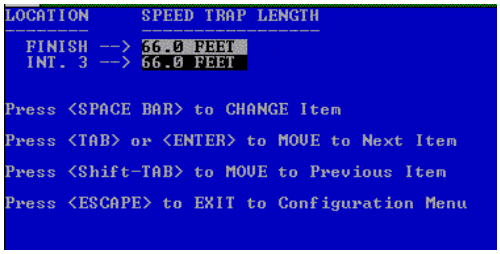


Figure 19: *Speed Traps*

<L> Tower Log Printer

Option **L** is used to specify the tower log printer type. The user may select either Epson or C Itoh. This option is also used to enable the tower log printer by selecting Yes. Epson printers are the only printers available from Daktronics.

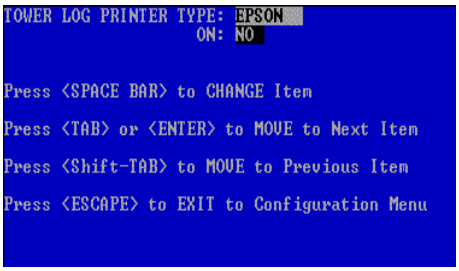


Figure 20: *Log Printer*

<P> Time Slip Printer

Option **P** is used to specify the time slip printer type. The user may select either Epson, C Itoh, or EP40 (EP40 option is for the TM-4200 40 column printer only). This option is also used to enable the time slip printer by setting the *on* line to Yes.

Figure 21: *Time Slip Printer*

<E> Speed Format

Option **E** is used to select speed format. The user may select either MPH or KPH.

Figure 22: *Speed Format*

<S> Scoreboards

Option **S** is used to specify scoreboard type. The user may select from either single line or double line.

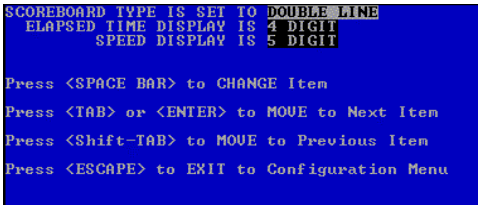


Figure 23: *Scoreboard Type*

<D> Dual Deep Stage

Option **D** is used to enable and disable the dual deep stage rule in the C-44 configuration. With this option enabled and the sure start function on, the C-44 will indicate a foul even if the other lane has fouled already.

Figure 24: *Dual Deep Stage*

<R> Timer Reset Functions

Option **R** is used to configure the timer reset functions.

When the auto timer reset is off, the starter cannot reset the timer using the starter's console box. If it is on, the starter can reset the timer at any time with the starter's console box.

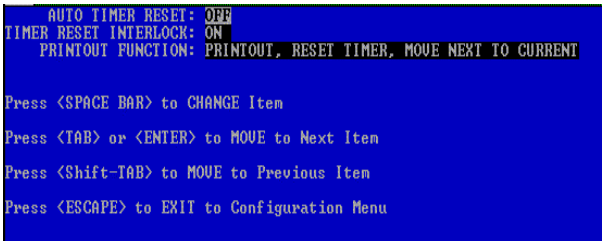


Figure 25: *Timer Reset*

The timer reset interlock function will work only if the auto timer reset is set to Off. When the timer reset interlock is set to Off, the starter can activate the tree at any time. If it is on, the starter must wait until the timer has been reset by the C-44 operator before starting the tree countdown.

The printout function determines how the C-44 will work after a race is finished and a printout is made. The user may select either:

- Printout only, or
- Printout reset timer move next vehicle# to current

<H> No Tree Handicap

When No Tree Handicap is off, the timer will use the dial-ins to get a handicap and the tree will count down using the handicap.

When No Tree Handicap is on, the timer will not use a handicap unless True Win is set On.

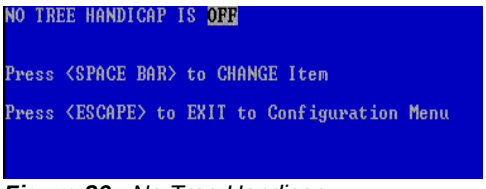


Figure 26: *No Tree Handicap*

<A> Reaction Time Display Type

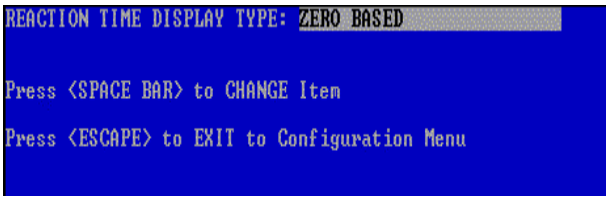


Figure 27: *Reaction Time Display*

Option A is used to specify a zero-based reaction time or a countdown rate-based reaction time. With the tree countdown rate-based reaction time, a perfect reaction time corresponds to the tree countdown rate currently selected. For example, with a 0.3 sec countdown rate selected, the perfect reaction time would be 0.300 sec. With zero-based reaction time selected, a perfect reaction time would be 0.000 sec.

<G> Auto Tree / No Stage Foul

When auto start of tree is on, the timer waits for the ready key <**F5**> to be pressed and then waits for both lanes to be properly staged. Once both lanes are properly staged, and the delay timer is started.

When the delay time has been reached, the tree countdown will be started. Burnouts can be done by leaving Ready off until the racers are ready to stage. If a single car is running on one lane, switch on the Starter's Console the Drags switch to Singles, then switch the Go switch to Go. When you do this, there is **NO** delay as the tree counts down right away, so it effectively disables the auto tree for that single race until the Starter's Console is switched back to Drags.

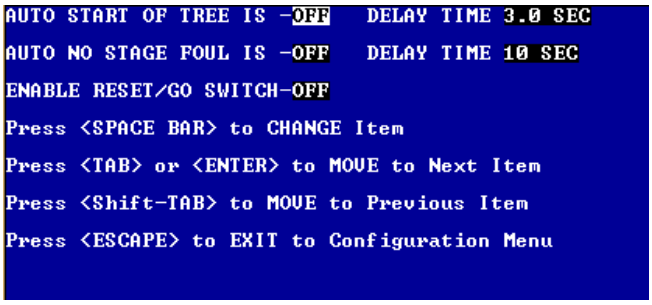


Figure 28: *Auto Start of Tree*

If something happens when both lanes are staged, and the Ready key is pressed to stop the delay timer, <**CTRL**><**F6**> must be pressed to reset the delay timer before the Ready key is pressed again.

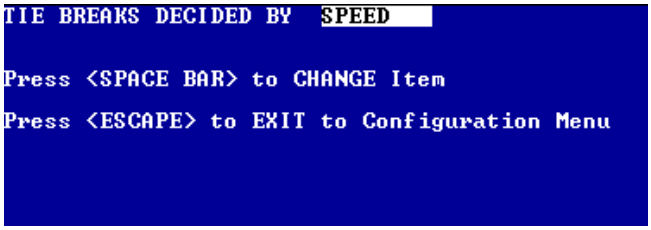
The delay time for auto start can be set for 1.0 to 3.9 seconds in .1-second increments.

When Auto No Stage Foul is on, if one lane stages and the other lane does not stage within the delay time, the tree will start its countdown for the staged lane and the other lane will get a DNS foul (Did Not Stage). The staged lane gets the automatic win. When this is set to off, the No Stage Foul will not operate. If auto tree is off, the Auto No Stage Foul is automatically turned off.

The delay time for No Stage Foul can be set from 5 to 20 seconds in 1 second increments. The Enable Reset/Go switch allows you to use the starters console for the auto tree. If set to ON, the operator has to press the <**F5**> key to ready the auto tree, except the tree will not begin it's countdown until the starter's console is

switched to GO. That will start the delay tree countdown. Moving the switch to Reset will stop the countdown at any time. If switched to off, the auto tree will function normal using only the <**F5**> key

<B> Tie Break Selection



This function allows you to decide the outcome of tie-run races. The races can be decided by the speed of the racers, or the best reaction time can be used to decide the winner.

Figure 29: *Tie Break Selection*

Category Settings

The *Category Menu* <**CTRL**><**F3**>**,** illustrated below, allows the operator to preset system parameters for up to 32 individual race categories.

During race operation the pre-selected settings may be enabled simply by activating the proper category. Following is a description of each menu option.

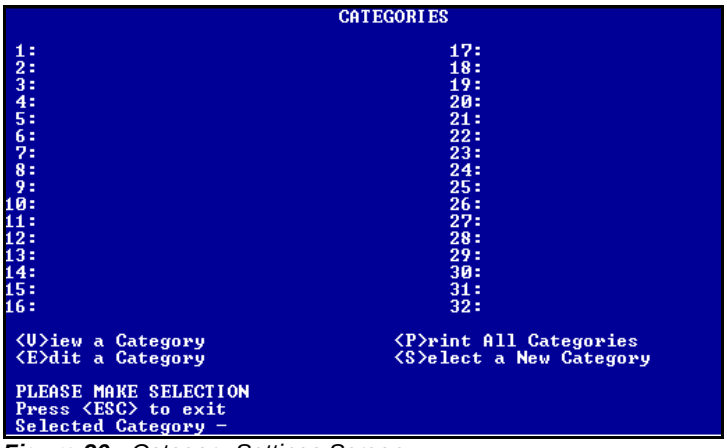


Figure 30: *Category Settings Screen*

<V> View

To view the settings for an individual category, press <**V**> followed by the desired category number then <**ENTER**>. Press any key to return to the *Category Menu*. (Refer to **Figure 30.**)

<E> Edit

Press <**E**> to edit a category or begin a new category. Enter the number of the category to be edited then <**ENTER**>. The current settings for that category will be displayed. Individual items will be highlighted as they are selected for editing. To advance to the next item, press <**ENTER**> or <**TAB**>. Press the <**SPACE BAR**> to toggle the item through all possible settings. Press <**ESC**> at any time to save the settings and return to the *Category Menu*.

Items which may be configured in the edit screen are described below.

Title- Category names are typed in via the keyboard. This allows the operator the flexibility to customize category settings for any type of event.

Altitude Adjustment On- Setting this option to Yes will enable the altitude adjustment function when the category is selected.

Factor- When altitude adjustment is enabled, one of three altitude adjustment factors may be selected (the operator may configure the individual factors as described in <***A***> ***Altitude Adjustment Factors*** in **Section 3.3**).

Finish Line Distance- Race distance may be set to either 1/4 mile or 1/8 mile.

Split Tree- Selecting *on* for Split Tree will allow the selection of different tree modes for each lane.

Tree Setting 1- To configure the tree choose a tree countdown mode and rate:

Pro Instant Green
Pro (1 Amber)
Pro (3 Amber)
Full 2 Amber
Full 3 Amber
Full 5 Amber
Full 3x Amber

.2 second
.3 second
.4 second
.5 second

Tree Setting 2- This second tree setting is for use with Split Tree and will be the opposite of the first setting. If the first setting is Pro the second tree setting will be Full. The one exception is if full 3x amber is selected the other tree will be full 3 amber.

The following 3 choices (**Sure Start**, **True Win**, and **Break Out**) are configured separately for the qualification round and the elimination round.

Sure Start- To enable the sure start function for the category, select On. Select Off to disable it.

True Win- To enable the true win function for the category, select On. Select Off to disable it.

Break Out- To enable the breakout function for the category, select On. Select Off to disable it.

Automatic Dial-in- To automate dial-in entry for those categories which require all drivers to post the same specific dial-in, select Yes.

Value- The operator may enter the desired dial-in value to be used when the automatic dial-in function is enabled. This dial-in value will be assigned to all drivers when the category is selected.

The remaining choices allow the operator to select which split times and/or speeds are to be displayed on the scoreboards and are configured separately for the qualification round and the elimination round. To select a particular item to be displayed, set the block below the item to Y. All items that are set to N will not appear on the scoreboards, but are recorded and displayed on the control console monitor.

RT	Reaction time	**ET**	Elapsed time
I1	Intermediate 1 time	**DI**	Dial-in
I2	Intermediate 2 time	**S1**	Speed at 1/8 mile (if applicable)
I3	Intermediate 3 time	**SP**	Speed at the finish line
I4	Intermediate 4 time		

<P> Print

Press <**P**> to create a printout of all 32 categories. This reference will be printed on the tower log printer.

<S> Select

To select a category press <**S**> followed by the number of the desired category, then <**ENTER**>. Choose either <**Q**> for qualification round or <**E**> for elimination round. When a category has been selected, all system settings assigned to the selected category will become active. In addition, the title and the round type will appear at the bottom of the main screen, and the tower log printer will print a heading indicating the category number, round type and date/time of selection (refer to **Figure 31**). Press <**ESC**> to return to the main screen.

CATEGORY SETTINGS 01/28/94

---Title---	--Alt Adj--	--Fact--	--Tree---	--Rate--	-Auto D.I.--	-Value--	--Qual Rnd-	-SS-	-TW-	-BO-	-Elim Rnd-	-SS-	-TW-	-BO-
SUPER PRO	YES	#3	FULL 5 AMBER	.2 SEC	YES	10.11		ON	ON	ON		OFF	OFF	OFF
			PRO (3 AMB)	.4 SEC										
	NO	#1	PRO (3 AMB)	.4SEC	NO	.00		OFF	ON	OFF		OFF	OFF	OFF
TOP FUEL	YES	#1	PRO (3 AMB)	.4 SEC	YES	10.11		ON	ON	OFF		OFF	OFF	OFF
	NO	#1	PRO (3 AMB)	.4 SEC	NO	.00		OFF	ON	OFF		OFF	OFF	OFF
CATEGORY #5	NO	#1	full 2 AMBER	.5 SEC	YES	10.11		ON	ON	OFF		OFF	OFF	OFF
TOP COMP	YES	#1	PRO (3 AMB)	.4 SEC	YES	10.11		ON	ON	OFF		OFF	OFF	OFF

Figure 31: *Category Selection*

CATEGORY SETTINGS 01/28/94

---Title---	- Qual Rnd -	--RT--	-I1	-I2	-I3	-I4	-ET	-D1	-S1	-SP	--Elim Rnd--	-RT	-I1	I2	-I3	-I4	-ET	-D1	-S1	-SP	-FINISH DISTANCE-
SUPER PRO		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	N	N	Y	N	1/8 MILE
		N	N	N	N	N	Y	Y	N	Y		N	N	N	N	N	Y	Y	N	Y	1/4 MILE
TOP FUEL		N	Y	N	Y	N	N	Y	Y	N		Y	Y	N	Y	N	N	N	N	N	1/4 MILE
		N	N	N	N	N	Y	Y	N	Y		N	N	N	N	N	Y	Y	N	Y	1/4 MILE
CATEGORY #5		Y	Y	Y	Y	N	Y	Y	N	Y		N	N	N	N	N	Y	Y	N	Y	1/4 MILE
TOP COMP		N	Y	N	Y	N	N	Y	Y	N		Y	Y	N	Y	N	N	N	N	N	1/4 MILE

Figure 32: *Category Settings Printout*

Race Operation

Race-to-race operation consists of the operator entering the vehicle numbers and dial-ins (if needed) for each lane. If dial-ins are used, Ready <**F5**> should be pressed to indicate to the starter that the dial-ins are entered. Doing this will also display the dial-ins on the scoreboards, if present and enabled. In addition, the Win Lights will be reset.

By using the function keys as shown next to the drivers' names, vehicle numbers and dial-in times on the main screen, the respective data can be entered. For example, pressing

<**SHIFT**><**F1**> will allow the left lane's vehicle number to be typed in. Once the number, name, or time have been typed in, it must be entered by pressing <**ENTER**>. Refer to the help screen at the front of **Section 3.3** for the proper keystrokes.

Infractions

Driver infractions (such as out of bounds, disqualified, etc.) are entered using the <**ALT**> key in conjunction with one of the function keys. Please refer to the help screen at the beginning of **Section 3.3** of this manual for the proper keystrokes.

Guard Beam Option Use

This section only pertains to tracks using the guard beam option. Once the guard beam is installed, it can help enforce the no deep staging rule. The guard beam line is used as the starting line and any car that stages too deeply will set off the guard beam and will be disqualified from the race.

Results System Option: Daktronics Automated Results System (CARS)

The Daktronics Automated Results System (CARS) can be ordered as an option. This program can perform many important tasks for the announcer and tower personnel. CARS can be used in conjunction with the C-44 timer and receive race information, and relay that information to the announcer. National and track records are kept. Permanent event information can also be kept. Ladder charts, pairings and qualifying orders can be generated and printed, and much more.

When CARS is used with the C-44, the next driver name and dial-in can be retrieved from CARS after the next vehicle number is entered. This is done for the left lane by pressing <**CTRL**><**F4**>, and the right lane <**CTRL**><**F12**>. Auto retrieval from CARS after the entering of next vehicle number can also be enabled by pressing <**CTRL**><**F10**>. The word “Auto” will show on the monitor to the right of the left lane *Next Dial-in*, when enabled. Press the <**CTRL**><**F10**> keys to toggle it On/Off.

Section 4: Maintenance & Troubleshooting

IMPORTANT NOTES:

1. **Disconnect power before any repair or maintenance work is done on the display!**
2. **Any access to internal display electronics must be made by qualified service personnel.**
3. **Disconnect power when the display is not in use.**

4.1 Troubleshooting the System

Reference Drawing:

Display Transmitter Card..... **Drawing A-55998**

Two basic diagnostics programs come with the C-44. These programs help to locate minor problems with the system. The scoreboard diagnostics program will test all the lit digits on a scoreboard to determine if they are all lighting. The Win Light diagnostics program will determine if all the Win Lights are operating properly.

Scoreboard Diagnostics: To activate the scoreboard diagnostics program press <**CTRL**><**F1**> followed by <**CTRL**><**S**>. The screen will show the numbers that are being sent to the respective fields on the scoreboard. If there are parts of a number that are not lighting, either a bulb has to be replaced or something is wrong with the scoreboard. Refer to the scoreboard user's manual for instructions on how to change a bulb.

Win Light Diagnostics: To activate the Win Light diagnostics program press <**CTRL**><**F1**> followed by <**CTRL**><**W**>. The screen will show the sequence that the Win Lights should follow when they light. If a Win Light does not light, either a bulb has to be replaced or something is wrong with the board. Refer to the scoreboard maintenance and troubleshooting manual for instructions on how to change a bulb.

Exit to DOS: The key combination <**CTRL**><**F1**> followed by <**CTRL**><**O**> will allow the operator to exit the C-44 race timing program should it become necessary to perform any DOS commands. **Note:** Exiting the timing program in this manner will end the current timing session and is intended to aid troubleshooting efforts as directed by Daktronics customer service.

P.C. Fails to Boot Correctly: If the P.C. fails to boot or boot correctly, verify all cable connections. Try to reboot the P.C. using the power switch. If this fails to start it correctly, try powering down the isolation interface, and then try to power up the P.C. The isolation interface may be sending a signal back to the P.C. that is confusing the start-up sequence. *If this procedure fails to work, contact a technician at Daktronics prior to continuing trouble-shooting.*

If there are any other problems with the C-44 system (that cannot be solved with the troubleshooting hints below) contact the Daktronics customer service department. Phone 1-877 / 605-1115.

Tree Problems

Symptom/Condition	Possible Cause/Remedy
Tree does not light at all	• Check power and fuse to tree • Check power to isolation interface • Check bottom left corner of screen for SLCK • If SLCK is there, check power to starter's box interface • Check SBI to see if 3 LED's are lit, Trans and Rec leads from SBI to isolation interface may be switched • Check SBI Trans and Rec LED's on isolation interface • Check communications cable which transmits data from C-44 to SLEB
Bulb in tree not lit	• Change bulb • Check socket and wiring • Change driver board
Bulb in tree stays lit	• Change driver board
Tree Flickers	• Check Grounding wires in Start line Box

Printer Problems

Symptom/Condition	Possible cause/remedy
Printer not working	• Check to see if printer is enabled at C-44 • Check power and connectors • Check to see if printer select light is lit
If Log printer	• Check communications cable which sends data to log printer
If E.T. printer	• Check time slip printer interface LED's • Check E.T. printer data LED on isolation interface • Check E.T. printer fault LED on isolation interface • Check communications cable which sends data to E.T. printer

Display Problems

Symptom/Condition	Possible Cause/Remedy
No display at scoreboards	• Enabled in C-44 *Configuration Menu*? • Check power to isolation interface and displays • Check display transmitter board In C-44, **(Drawing A-55998)** which sends data to displays via isolation interface. • Check for + 12VDC on signal input of driver.
Dial-ins not showing	• In the scoreboard enable mode, was a Y placed in the dial-in? • Is the F5 key being depressed?

Photocell Problems

Symptom/Condition	Possible Cause/Remedy
All	• Check power to isolation interface • Check field and logic +5V LEDs on isolation interface
All in one lane	• Exchange photocell board • Swap PC board around to see if problem moves to other side. (make sure to change dip switches)
Individual	• Check to see if square lights on the monitor main screen • Check red photocell LED on isolation interface • Realign photocell • Change photocell • Check photocell wiring for shorts or opens • Wire any unused photocells together at the isolation interface.

Monitor Problems

Symptom/Condition	Possible cause/remedy
Nothing appears on monitor	• Check monitor connection • Check power to C-44 • Depress the reset switch • Check video port.

Isolation Interface Problems

Symptom/Condition	Possible cause/remedy
No LED's lit	• Check power to isolation interface • Check front panel fuse
No photocell LED's lit	• +5v field and +5v logic LED's lit? • Check field wiring plugs

4.2 Maintenance

Always disconnect the system when it is not in use. Damage due to power surges and lightning strikes can be significantly reduced by disconnection and storage of field control equipment between events. Tower equipment should be powered down and if possible, removed from signal wiring coming from the field.

Note: If field cabling is to remain connected to the isolation interface when not in use, the isolation interface should be powered down via the front panel switch and must remain plugged in to a three-conductor *earth grounded* outlet (to provide a discharge path to ground for any voltage surges picked up by field cabling).

To prevent poor electrical contact due to corrosion on field control equipment connectors (tree, photocells, start line electronics box, etc.), application of a silicon based lubricant (Daktronics part # **LU-1002**) to terminals and connector pins is advised.

Tree Maintenance: All the electronics needed to operate the starting tree are located inside the tree on one or two printed circuit boards. It may be interchanged with one from the spare parts kit if any troubles occur.

Note: Before opening the tree, make sure that the power cord has been removed from its outlet.

To replace the boards inside the tree, first remove the front cover by removing the eight screws securing it to the tree. Then, remove the single screw at the top of the board and remove it by pulling it straight out of its socket. Install the new board by reversing the procedure. *Be sure to reinstall the screw* holding the PC board in place before plugging the tree back in.

A 20-amp fuse is located at the rear of the tree. If it blows repeatedly, *do not* change the rating. There is a problem with the PC boards or internal wiring.

4.3 Replacement Parts

A complete list of replacement parts can be ordered for faulty or damaged equipment from Daktronics (refer to **Section 2.2**).

To reduce the chance of the C-44 system becoming inoperable because of damaged or faulty equipment, Daktronics recommends the following spare parts.

Infrared Track

Quantity	Description	Part No.
1	Infrared reflective block	0A-1067-0111
1	AC Infrared Emitter	0A-1067-0064
1	AC Infrared Receiver	0A-1067-0065
1	Photocell III board	0P-1067-0019
1	Printer interface	0P-1067-0018
1	Start/Finish board	0P-1067-0003
1	Starter's console	0A-1067-0010
1	Transmitter board	0P-1079-0001
1	Tree driver	0A-1033-0107
1	Isolation Interface	0A-1067-0075
1	Infrared retro-reflective, AC w/XLR disconnect	0A-1067-0063
1	Scoreboard Driver	0A-1033-0122

Appendix A: Infrared Photocells

A-1 Introduction to Infrared Photocells

Reference Drawings:

Infrared; Emitter/Receiver w/Stand 100 ..... **Drawing A-47264**
Infrared Cell; Emitter/Rec. w/Stand 60 ..... **Drawing A-47265**
Drag Strip-Infrared Cabling Diagram..... **Drawing A-56251**
Dual Lane Drag Strip w/C44 ..... **Drawing B-91012**
Field Cabling; Per Dwg. B-91012..... **Drawing B-114631**

Drawing B-91012 shows a cabling diagram of a typical drag strip using infrared photocells. It is intended to be a guide in locating and running cables to the photocells.

Drawing B-114631 shows the cabling connections.

The terminology “Emitter” and “Receiver” are used with the opposed beam photocells. (Light is emitted from one and received into another unit.) The term Emitter/Receiver is used with the retro-reflective type photocell. (A photocell which lights from the Emitter is reflected back to the Receiver. Both Emitter and Receiver are inside the same unit.)

Details of the different infrared photocells and their mountings are given for reference, **Drawings A-47264,** and **A-47265**.

Notes About the "Effective Beam"
The size of the lens of the emitter and receiver of an opposed sensor pair determines the size of the pair's effective beam. The effective beam may be pictured as a rod that connects the profile of the emitter lens to the profile of the receiver lens. The effective beam is the "working" part of the photoelectric beam; it is the portion of the beam which must be completely interrupted in order for an object to be reliably sensed. It should not be confused with the actual radiation pattern of the emitter, or with the field of view of the receiver. The effective beam size of a photocell pair is one inch in diameter.

Notes About the LED Indicator
An exclusive built-in feature that permits optimum alignment and continuous monitoring of the photoelectric system. The red receiver LED indicator is on when the receiver *sees* the modulated light from the emitter LED and off when the beam is broken. In addition, a low frequency pulse rate is superimposed on the LED indicator. When alignment is marginal, the pulse rate will be about once per second (indicating an excess gain of 1). As alignment is improved, the pulse rate increases, indicating increased excess gain. Optimum sensor alignment is indicated by the fastest pulse rate.

This feature also signals when maintenance is needed. Any pulse rate less than two or three beats per second indicates marginal performance, even though the units are still functioning properly. Whenever the pulse rate is slow, the lenses should be cleaned and/or the alignment checked.

If the alignment indicator on the receiver appears to be on steadily with no pulsing evident, it is actually pulsing at a rate that is too fast to be seen. A *steadily on* LED indicates an excess gain of at least 20x.

At ranges within a few feet, the power of opposed scanner blocks makes alignment simple. However, even at short range, it may be important to optimize alignment, especially if high excess gain is needed to *burn through* dirt, dust, steam, etc.

The best way to align a receiver to its emitter at short range is to drastically reduce the strength of the light signal. This is easily accomplished by placing a diffuser, such as a sheet of paper or light colored masking tape, in front of the emitter and/or receiver lens.

The following sections have been divided into the two types of photocells used.

A.2 Installation and Alignment; Opposed Beam Infrared Photocells

Opposed (*beam break*) sensing which is used at the start line results in the most reliable sensing system. Opposed sensing is the most efficient sensing mode, and offers the highest level of optical energy to overcome lens contamination and sensor misalignment. The effective range for *opposed beam* photocells is approximately 75 feet.

For alignment:

1. Begin with the emitter mounted securely in place. At ranges up to a few feet, the receiver may simply be mounted using line-of-sight alignment. At distances beyond a few feet, loosely mount the receiver opposite the emitter, leaving a means for movement.

2. If sensing is to be at an exact location, tie a string around the emitter at the center of its lens and extend it to the center of the receiver lens to make certain that the center of the beam will intersect the sensing point.

3. Apply power to the emitter and receiver power blocks. The alignment indicating device LED on the receiver should now be on (steadily or pulsing).

4. If the indicator LED is on steadily, place a diffusing material (paper, tape, etc) in front of the lens of the emitter and/or receiver. Use enough thickness to cause the receiver LED to pulse at an easily countable rate (one to five beats per second). Now move the receiver up/down/left/right (include rotation) to try to increase the pulse rate. Secure the receiver in the position where the pulse rate is fastest, or in the center of the area where the alignment LED is on steadily.

5. Increase the receiver sensitivity to maximum. The sensitivity control, located under the white nylon access screw next to the indicator LED, is a 15-turn potentiometer clutched at both ends of rotation. To increase receiver sensitivity, turn the control clockwise with a small flat-blade screwdriver.

6. Place the object to be detected at the sensing position. If the receiver alignment LED goes off, alignment is complete.

   Note: If the receiver alignment LED does not go off when the object is in place at the sensing position, the reason may be one or both of the following.

   A. **Flooding:** A portion of the effective beam may be passing around one or both sides of the object. Move the object back and forth to locate the center of the beam.
   B. **Burn-through:** If the object is non-metallic or has thin walls, there may be too much light energy for the object to completely block. With the object in place in

the sensing position, decrease the sensitivity adjustment (CCW rotation) until the receiver indicator LED goes off, plus two more full turns. Remove the object and confirm that the LED indicator comes on and is pulsing more than two beats per second.

A.3 Installation and Alignment Retro-reflective Photocells

Retro-reflective mode photoelectric sensing is ideal for off-start-line applications where opposed mode sensing would be the first choice, but where sensing is from only one side. *Retro* is the most popular sensing mode for applications where objects are large and the environment is relatively clean. The effective range for retro-reflective photocells is approximately 30 feet.

Retro-reflective sensors work with special target materials that reflect the emitted light beam back to the sensor. The efficiency of these targets (and, therefore, the sensing range) depends upon the size and the reflective nature of the target. Size is important because, at ranges beyond a few feet, the retro target may not intercept the complete beam. At an extended range, a 3" diameter target will intercept nine times as much light as a 1" diameter target (the area ratio is the square of the diameter ratio). The 1" target will, therefore, require nine times the excess gain required for the 3" target. Reflectivity is a function of target construction. Most plastic targets are made up of small, highly efficient corner-cube reflectors.

Successful retro-reflective mode sensing depends upon adequate optical contrast between the dark (beam broken) state and the light (beam unbroken) state. Retro-reflective sensing, therefore, works best with objects of low reflectivity. Highly reflective objects such as glass, polished metal, mirrors, etc. may not be sensed because they can reflect as much or nearly as much light back to the sensor as does the retro-reflective target. This effect is known as *proxing*. At the other extreme, transparent objects are difficult to sensor retro-reflectively because they may not sufficiently interrupt the sensor's light beam.

Proper operation of retro-reflective mode sensors requires that they be mounted securely and aligned properly. Excessive movement or vibration can result in intermittent or false operation caused by loss of alignment to the retro-reflective target.

Use the LED on the photocell in the following alignment procedure.

1. Begin with the sensor at the desired distance from the retro-reflective target and at the approximate position where it will be mounted. Retro-reflective targets are rather forgiving to beam angle in that they do not begin to lose effectiveness until they are more than 15 degrees off of perpendicular to the beam axis. An object at the *sensing* position should pass through the *core* of the sensor's light beam.

2. Apply power and perform one of the following steps (see notes below). If in either case the LED appears to be on steadily, it is actually pulsing at a rate too fast to be seen. Slow the pulsing to a countable rate by reducing the sensitivity (counter-clockwise rotation of the adjustment). Being able to detect a change in the pulse rate when the position of the sensor or reflector is changed will allow accurate alignment.

    a. If the target position is fixed, tilt the sensor up/down and rotate right/left to obtain the fastest indicator LED pulse rate (no object at the sensing position). Secure the sensor in position.
    b. If the sensor position is fixed, move the target up/down and right/left to obtain the fastest indicator LED pulse rate (no object at the sensing position). Secure the target in position.

At sensing distances up to three feet finding the target with the sensor beam may be difficult. Take a second target and walk backwards away from the sensor, always keeping the target aligned to the beam (up/down/right/left target movement; observe LED indicator). After the target's mounting surface has been reached, the correct target position or necessary sensor orientation changes will be obvious.

3. Turn the sensor's sensitivity control to the fully clockwise position. (This is a 15-turn control, clutched at both ends of travel).

4. Place the object to be detected at the sensing position. If the alignment indicator LED goes off, check operation by alternately removing and replacing the object. The LED should follow the action by coming on when the object is not present and going off when the object is present. If this occurs, alignment is complete. **Note:** A steady on condition of the LED with the object absent is the best situation, but this may not always be possible to achieve.

5. If the alignment indicator stays on when the object is present at the sensing position, the photocell is reacting to light reflected directly from the object (*proxing* is taking place). Reduce the sensitivity (counterclockwise rotation of the adjustment) until the alignment indicator LED goes off, plus two more full turns. Remove the object from the sensing position and check that the alignment indicator LED goes on steadily or is pulsing at more than two beats per second, then repeat step #4 (above).

A.4 Installation and Alignment: SM30 Series Barrel Sensors

The SM30 Barrel Sensors are used at the start line because they eliminate cross talk by using different modulation frequencies for each pair. We use an “A” frequency pair for the stage line, and a “C” frequency pair for the pre-stage and guard beam. The photocells are very durable and have an effective range of up to 700 feet. When setting up photocells, make sure to follow IHRA and NHRA rules for distances and heights.

For alignment:

1. Use the SM30 mounting brackets and secure them to the track. Mount the emitters to the outside brackets and loosely tighten them down. Mount the receivers on the inside of the track and loosely tighten them down.
2. If you know the exact location where the emitters are to be, securely tighten them to the mounting brackets. Apply power to the emitters and make sure the red indicator LED is on to show it is sending a beam and is powered up.
3. After you have powered up every emitter, apply power and signal to each receiver, then line up each corresponding receiver by using the indicator LED on top of each receiver. If the LED is on, the photocell pair is lined up and all it needs is some fine-tuning to set your rollout distance.
4. Test each photocell pair after they’ve been lined up by putting your hand in front of the receiver. The LED indicator should go out when it is blocked. Remove your hand and the LED will come back on. Have somebody take a voltmeter and measure the voltage on the isolation interface where the respective photocell input is. It should measure less than 1 VDC when the beam is not broken. When the beam is broken, the voltage should read around +12 VDC ("2 VDC). If it does, these test okay, make sure everything is tightened and the alignment is complete.

Appendix B: Glossary of Drag Racing Terms

Amber Countdown Lights- The three amber lights on the "Christmas" tree that drivers attempt to time, in order to start at the exact time the green light comes on. These lights can be set for intervals of .3, .4, or .5 seconds.

Breakout- In handicap racing, "breakout" means the contestant has run faster than his dial in.

Burn Out- A "burn out" is the spinning of rear wheels at high RPM, in water, to heat rubber, which results in improved traction.

"Christmas" Tree- this is an electronic starting device incorporating calibrated lights displaying a visual countdown for each driver, activated by a designated official.

Deep Staging- This is the practice of moving the car as far forward at the starting line as possible in an effort to gain a few inches advantage over the other car. When this system is activated, a blue lamp is lit on the "Christmas" tree.

Dial-in- A "dial-in" is a selection of elapsed time that the driver believes he will run.

E.T.- The "elapsed time" is the total time it takes to go from the start line to the finish line.

Foul Start- When a car leaves the starting line before the green starting light is activated, it is called a "foul start".

Guard Beam- This is a third photocell at the start line to prevent deep staging.

Heads Up Racing- This is another way of stating that there is no handicap.

I.H.R.A.- International Hot Rod Association

N.H.R.A.- National Hot Rod Association

Pre-stage- A "pre-stage" is the lighting of lamps to warn drivers that their vehicle is almost at the point of the starting line.

Pro Start- In a "pro start", there is no handicap and all three amber lamps light at the same time.

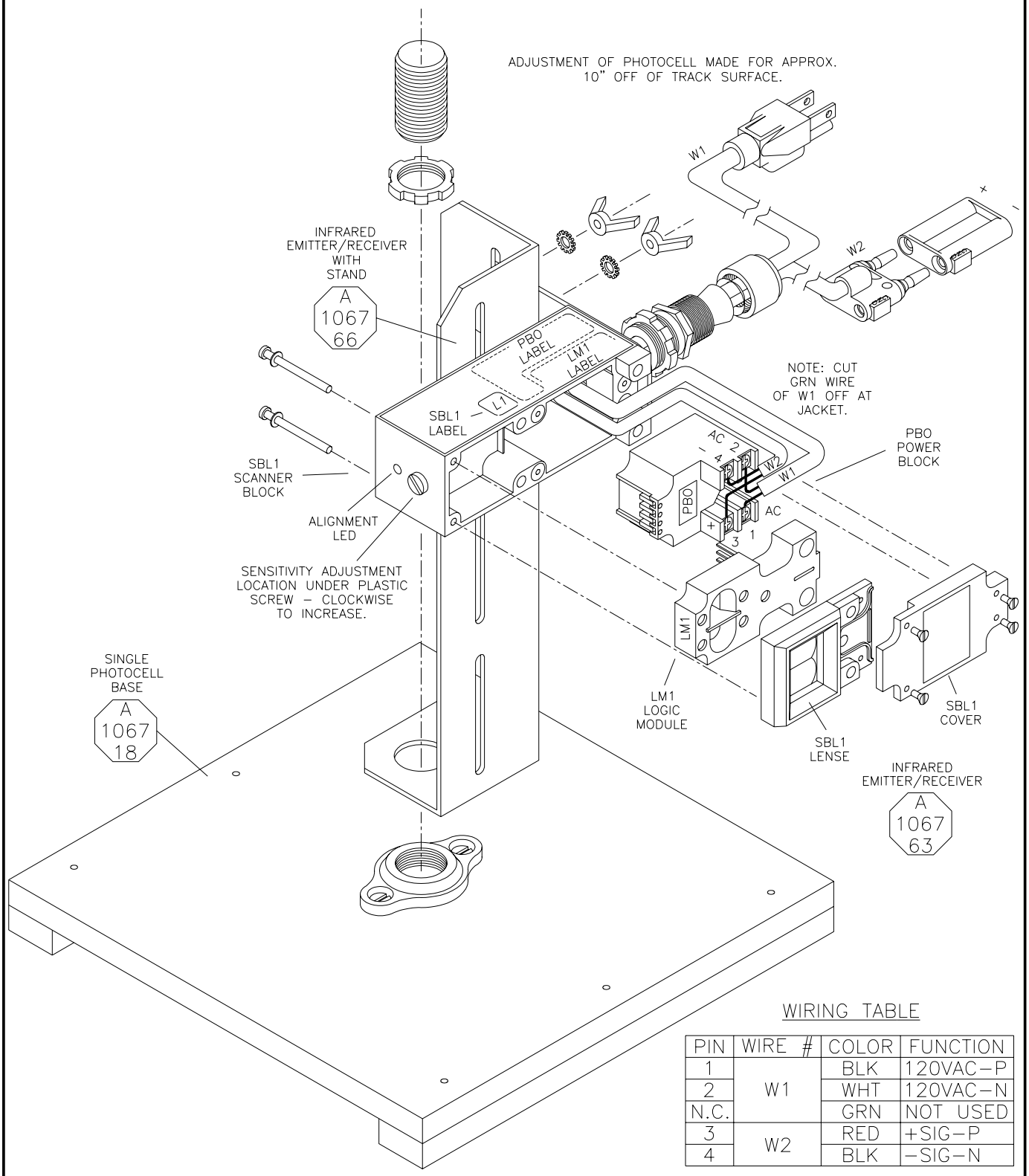
Reaction Time- This is the difference in time between when the green light comes on and the vehicle leaves the starting line, activating the E.T. clocks.

Speed Trap- This is a 66' space at the finish line area where breaking the first photocell beam starts the MPH calculation and the second photocell ends the MPH calculation as well as the E.T.

Stage- This lamp lighting advises driver and officials that the vehicle is ready and positioned for the start of the race.

True Win- Where provided, this light will identify the true winner, taking into account various occurrences that carry different penalty weights.

Appendix C: Miscellaneous Drawings



WIRING TABLE

PIN	WIRE #	COLOR	FUNCTION
1	W1	BLK	120VAC–P
2		WHT	120VAC–N
N.C.		GRN	NOT USED
3	W2	RED	+SIG–P
4		BLK	–SIG–N

FIGURE A3.4

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

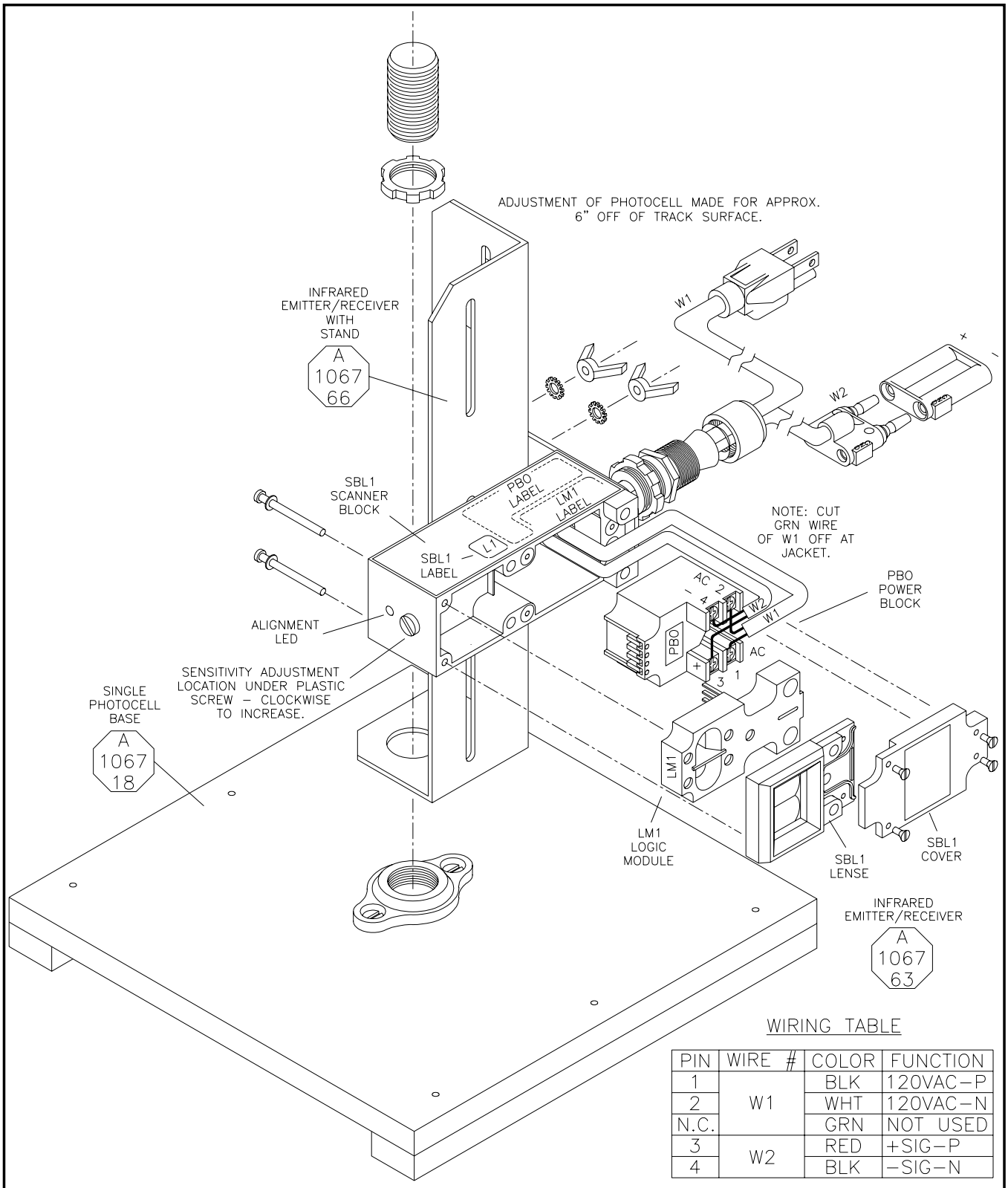
TITLE: INFRARED PHOTOCELL; EMITTER/RECEIVER W/ STAND 10"

DES. BY: DRAWN BY: M. RICHARDSON DATE: 14 MAY 91

REVISION APPR. BY:

SCALE: 3=8

1067-R11A-47264



WIRING TABLE

PIN	WIRE #	COLOR	FUNCTION
1	W1	BLK	120VAC–P
2		WHT	120VAC–N
N.C.		GRN	NOT USED
3	W2	RED	+SIG–P
4		BLK	–SIG–N

FIGURE A3.5

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: INFRARED PHOTOCELL; EMITTER/RECEIVER W/ STAND 6"

DES. BY: DRAWN BY: M. RICHARDSON DATE: 14 MAY 91

REVISION APPR. BY:

SCALE: 3=8

1067-R11A-47265

DISPLAY TRANSMITTER CARD

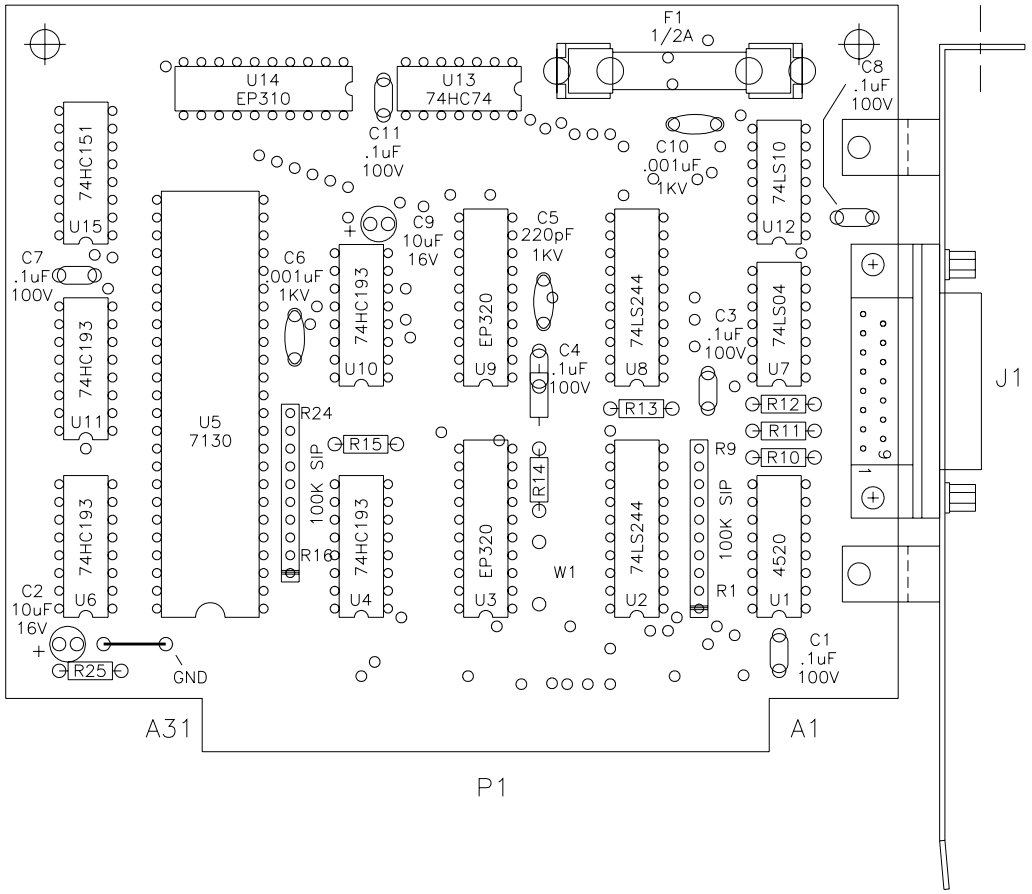


FIGURE 4–7

REV.	DATE	DESCRIPTION	BY	APPR.
2	19 APR 94	CHANGED TO V2000 DISPLAY TRANSMITTER CARD.	MER	
1	15 MAR 94	ADD TITLE, EJECTOR LATCHES AND SIZE TEXT.	CSS	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ:

TITLE: DISPLAY TRANSMITTER CARD

DES. BY: DRAWN BY: C.S.SPERLICH DATE: 7 APR 93

REVISION 4–13

APPR. BY:

SCALE: 1=1

1067-R11A-55998

ITEM	DESCRIPTION
4	TIME SLIP PRINTER
5	CABLE; TIME SLIP PRINTER INTERFACE TO TIME SLIP PRINTER TERMINAL BLOCK, 6 FT.
6	ISOLATOR INTERFACE
7	CABLE; LEFT PHOTOCELL – C44 TO ISOLATOR INTERFACE
8	CABLE; RIGHT PHOTOCELL – C44 TO ISOLATOR INTERFACE
9	CABLE; DISPLAY – C44 TO ISOLATOR INTERFACE
10	CABLE; TIME SLIP PRINTER – C44 TO ISOLATOR INTERFACE
11	CABLE; SLEB – C44 TO ISOLATOR INTERFACE
12	CABLE; ISOLATOR INTERFACE TO TIME SLIP PRINTER TERMINAL BLOCK, 1500 FT.
13	STARTERS BOX INTERFACE.
14	START LINE JUNCTION BOX
15	CABLE; START LINE ELECTRONICS BOX TO ISOLATOR INTERFACE, 200 FT.

ITEM	DESCRIPTION
16	STARTER'S CONSOLE BOX, W/ 20 FT. CABLE
17	3 AMBER STARTING TREE
18	CABLE; TREE TO START LINE ELECTRONICS BOX, 50 FT.
19	BASE; START LINE PHOTOCELLS
20	CABLE; START PHOTOCELLS TO START LINE ELECTRONICS BOX, 20 FT.
21	BASE; INFRARED
22	PHOTOCELL; INFRARED REFLECTOR BLOCK
23	PHOTOCELL; DC LASER EMITTER
24	PHOTOCELL; INFRARED RECEIVER
25	PHOTOCELL; INFRARED EMITTER/RECEIVER
26	CABLE; PHOTOCELL TO FIELD CABLE 18GA.
27	PRINTER INTERFACE
35	ET/MPH DISPLAY
36	CABLE; DISPLAY TO ISOLATOR INTERFACE, 2000 FT.
37	CABLE; DISPLAY TO DISPLAY, 200 FT.
38	10–30VDC POWER SUPPLY, BY OTHER.

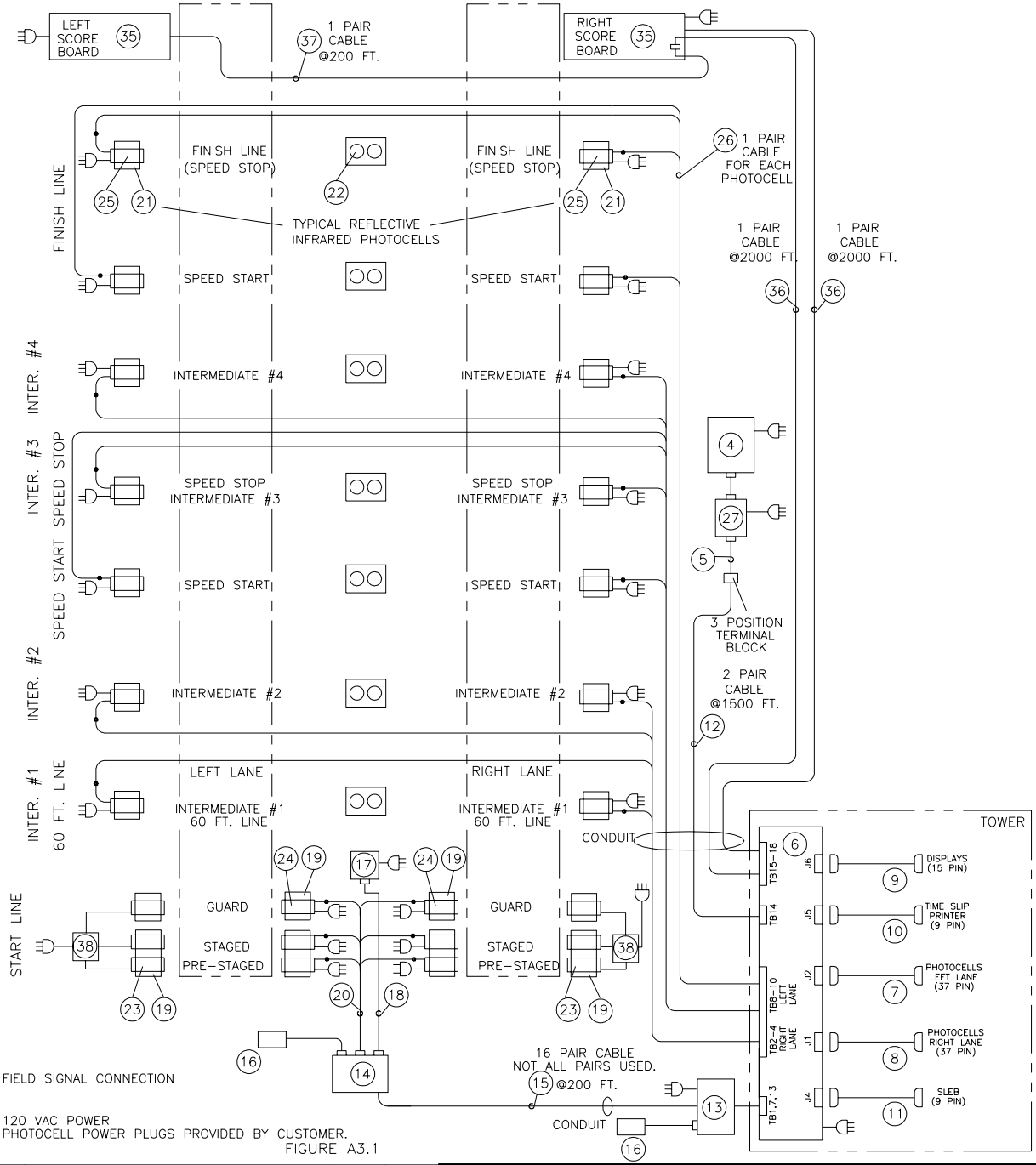


FIGURE A3.1

REV.	DATE	DESCRIPTION	BY	APPR.
3	19 NOV 98	ADDED DC POWER SUPPLY AND REVISED NOTES FOR LASER EMMITERS.	HBB	
2	7 MAR 97	CHANGED SLEB TO STARTERS BOX INTERFACE.	HBB	
1	3 OCT 95	CHANGED 1500 FT CABLE FROM 1 PAIR TO 2 PAIR.	NJA	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: DRAGSTRIP – C44 INFRARED CABLING

DES. BY: DRAWN BY: C.S.SPERLICH DATE: 22 APR 93

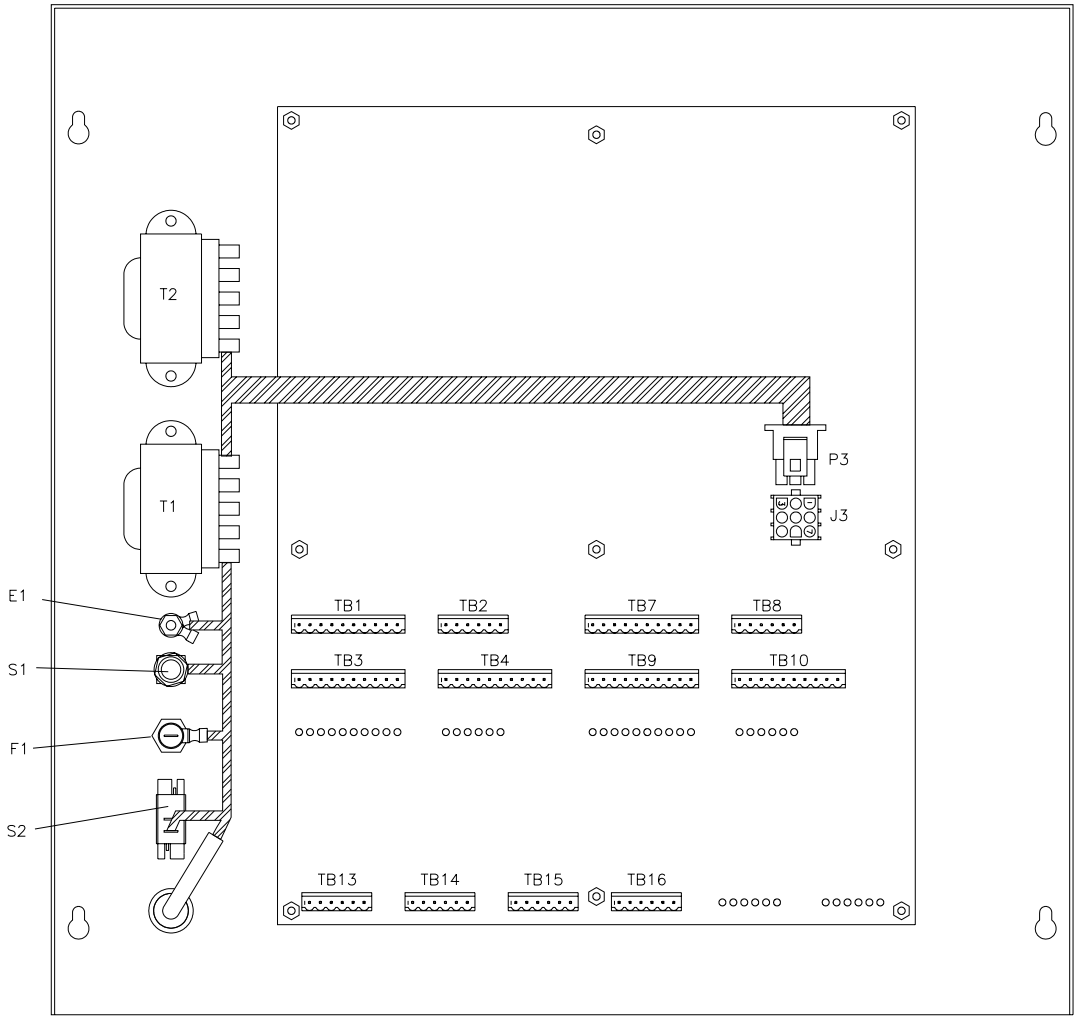
REVISION APPR. BY:

SCALE: NONE

1067-R11A-56251

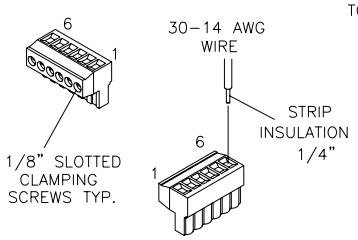
ISOLATION INTERFACE LID

(REAR VIEW, REMOVED FROM ENCLOSURE)



FIELD WIRING CONNECTORS

(NUMBERING TYP. FOR 6 AND 10 POSITION PLUGS)



SCHEMATIC

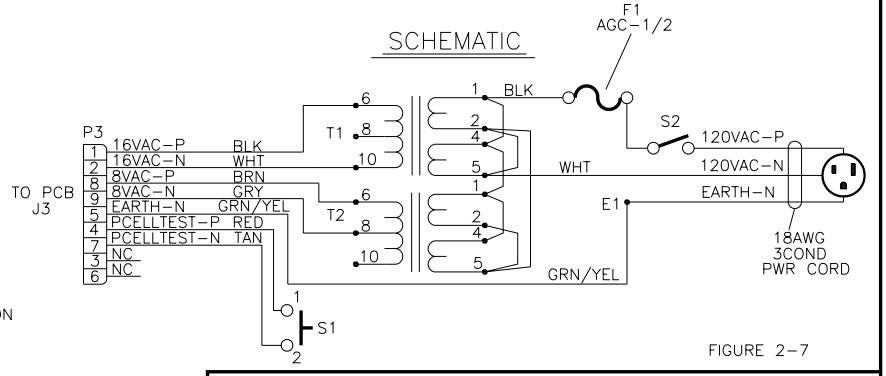


FIGURE 2-7

REV.	DATE	DESCRIPTION	BY	APPR.
1	10 OCT 94	ADD POWER SWITCH (S2).	CSS	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: ISOLATION INTERFACE TERMINAL BLOCK DETAIL

DES. BY: DRAWN BY: C.S.SPERLICH DATE: 22 APR 93

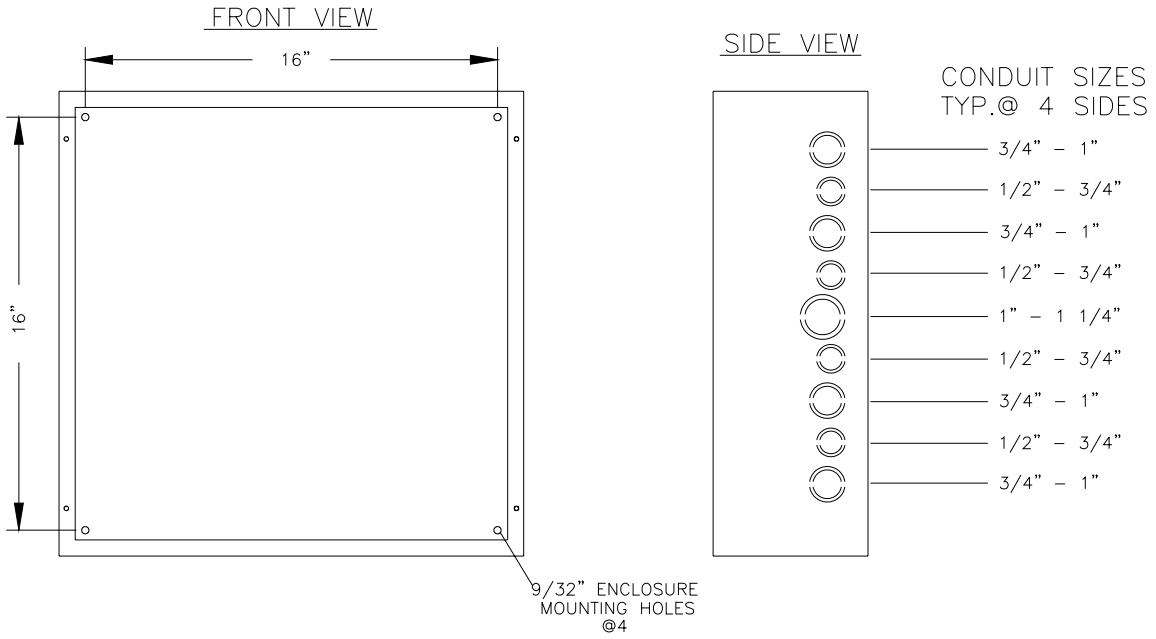
REVISION 2-15

APPR. BY:

SCALE: 1=3

1067-R11A-56252

ENCLOSURE MOUNTING HOLE AND KNOCKOUT DETAIL



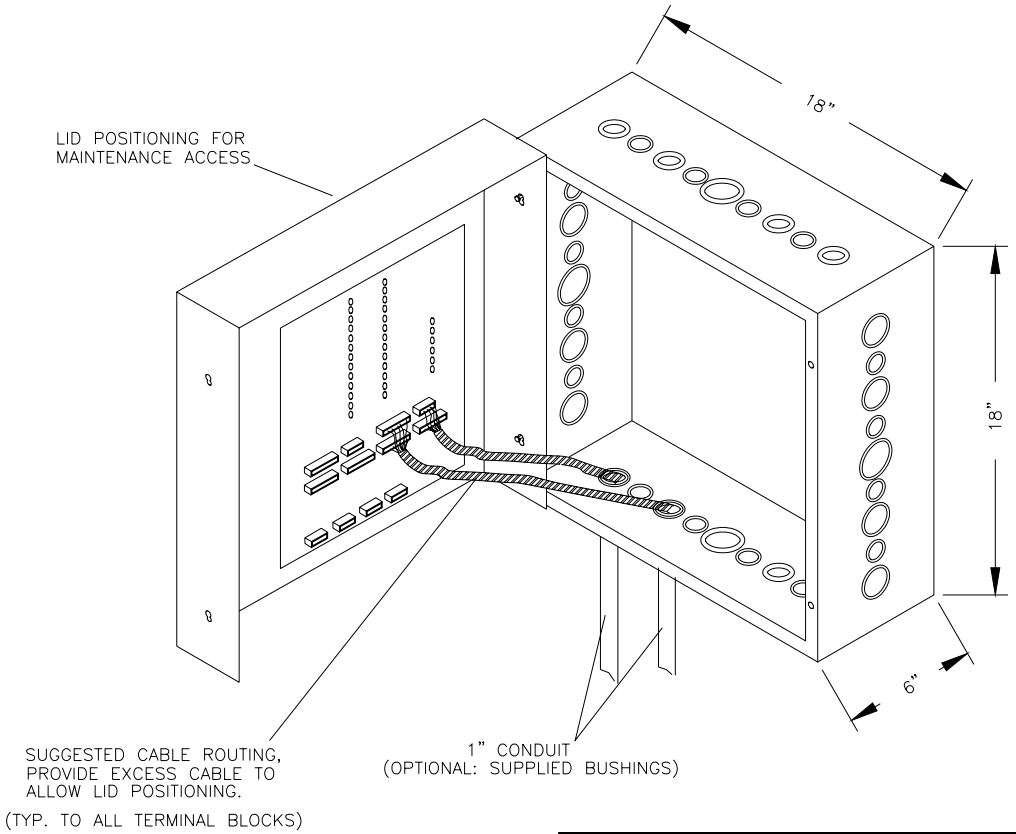


FIGURE 2-8

REV.	DATE	DESCRIPTION	BY	APPR.
REVISION 2-16				

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

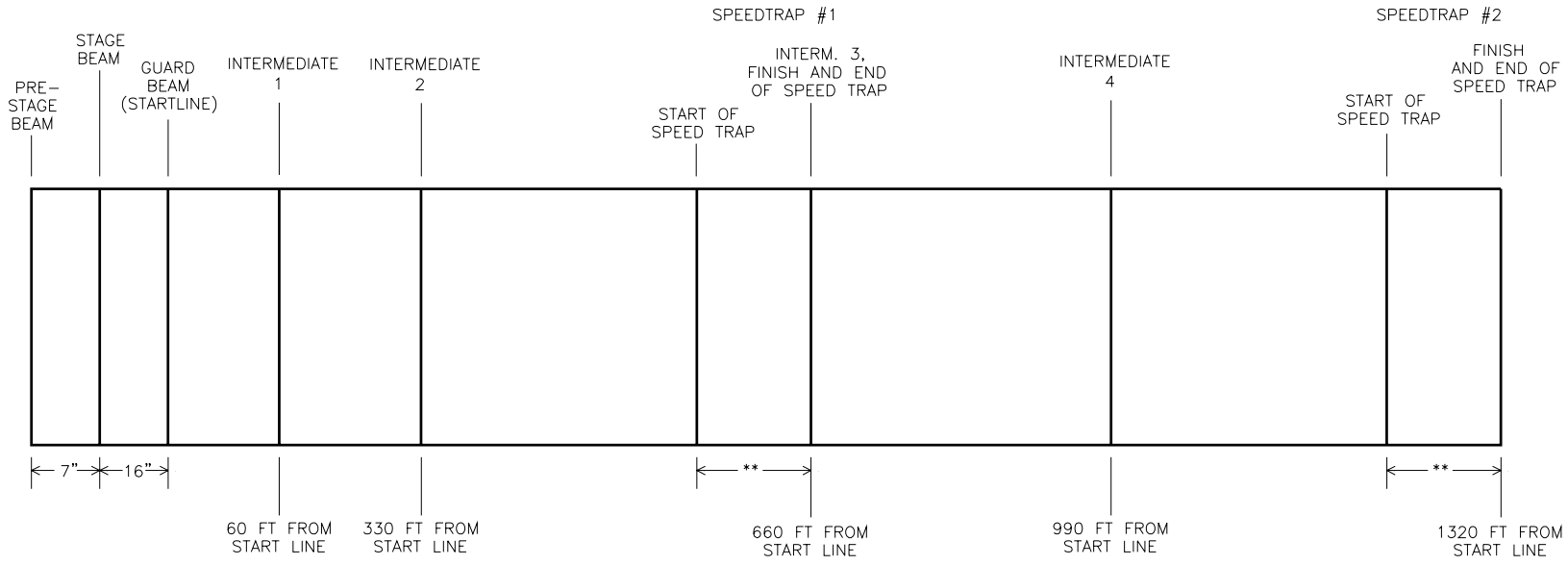
TITLE: ISOLATION INTERFACE ENCLOSURE DETAIL

DES. BY: DRAWN BY: C.S.SPERLICH DATE: 22 APR 93

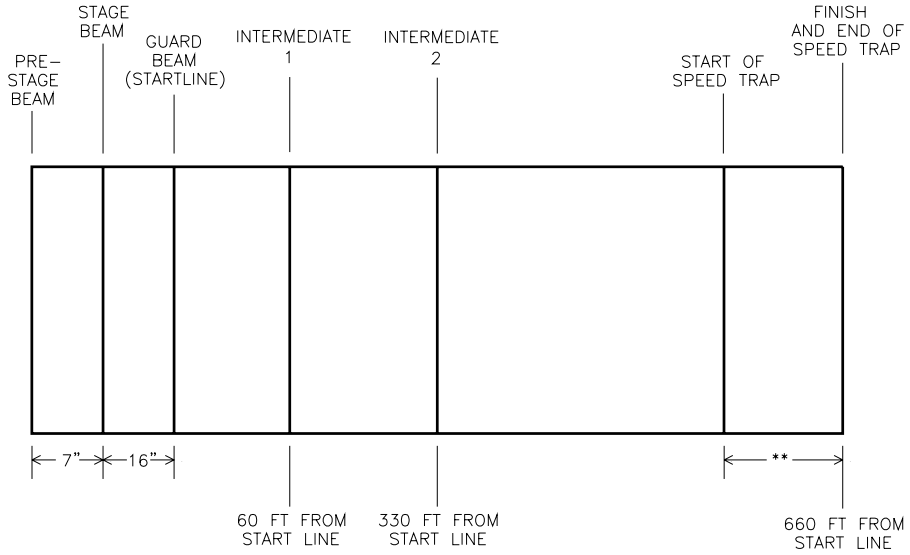
APPR. BY:

SCALE: 1=7

1067-R11A-56253



1/4TH MILE TRACK = 1320 FT. *



1/8TH MILE TRACK = 660 FT. *

* THE STARTLINE IS 16" IN FRONT OF THE STAGE BEAM. ALL POINTS SHOULD BE MEASURED FROM THE STARTLINE.

** POSSIBLE SPEED TRAP LENGTHS

2', 7-11/16"
13' 2-3/8"
66' 0"
132' 0"

FIGURE 2-4

REV.	DATE	DESCRIPTION	BY	APPR.
2	3 OCT 95	ADDED NOTE THAT STARTLINE IS 16" FROM STAGE BEAM.	NJA	
1	16 AUG 93	**ADD SPEEDTRAP #1 AND SPEEDTRAP #2 TO LABELING**	**CSS**	

REVISION

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: PHOTOCELL MOUNTING DISTANCE DIAGRAM

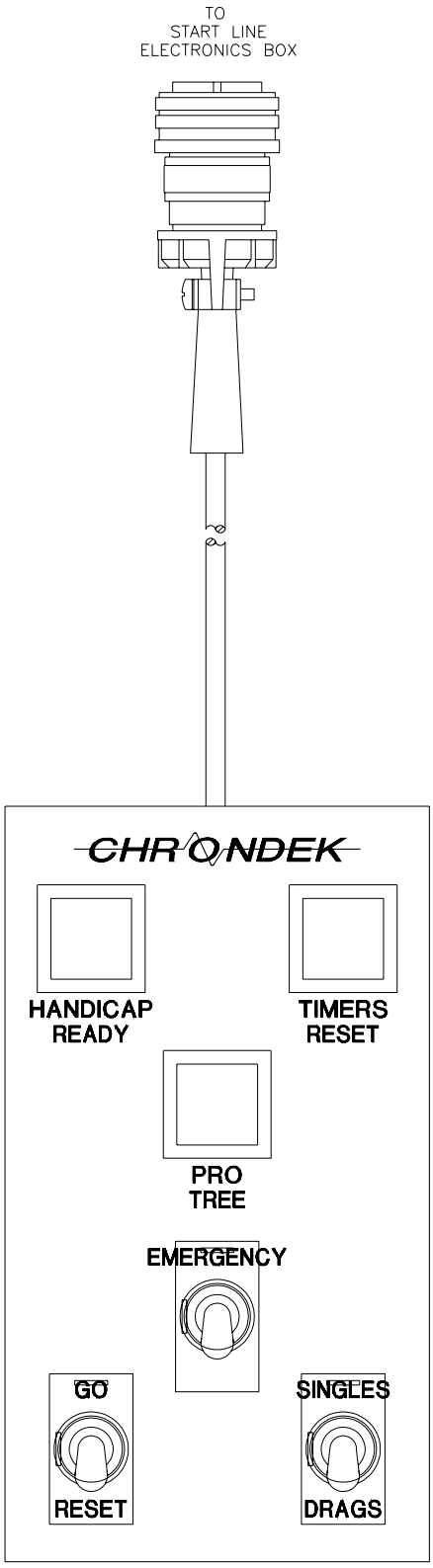
DES. BY:

DRAWN BY: C.S.SPERLICH DATE: 30 APR 93

APPR. BY:

SCALE: NONE

1067-R11A-56354



STARTER'S CONSOLE

BOX SIZE
3-1/4" X 5-3/4" X 2"
(L X W X H)

FIGURE 3-2

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK

TITLE: STARTERS CONSOLE

DES. BY: DRAWN BY: C.S.SPERLICH DATE: 25 JUN 93

REVISION 3-5

APPR. BY:

SCALE: NONE

1067-R11A-57318

VIDEO CARD

(BOCA BASIC VGA)

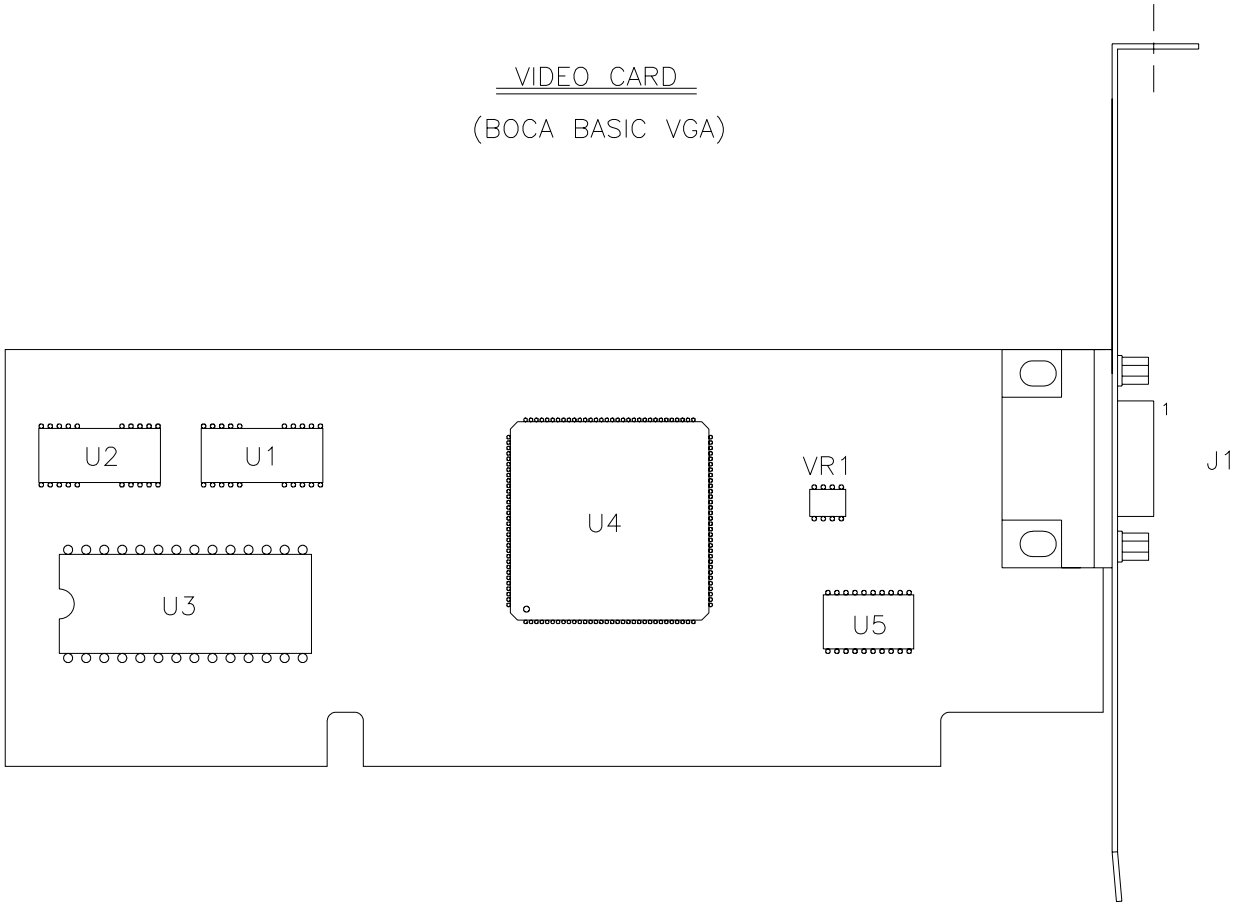


FIGURE 4-6

REV.	DATE	DESCRIPTION	BY	APPR.
0	10 NOV 94	CHANGE PAGE #	CSS	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ:

TITLE: VIDEO CARD; VGA

DES. BY: DRAWN BY: C.S.SPERLICH DATE: 25 FEB 94

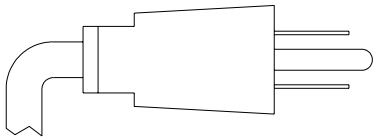
REVISION 4-12

APPR. BY:

SCALE: 1=1

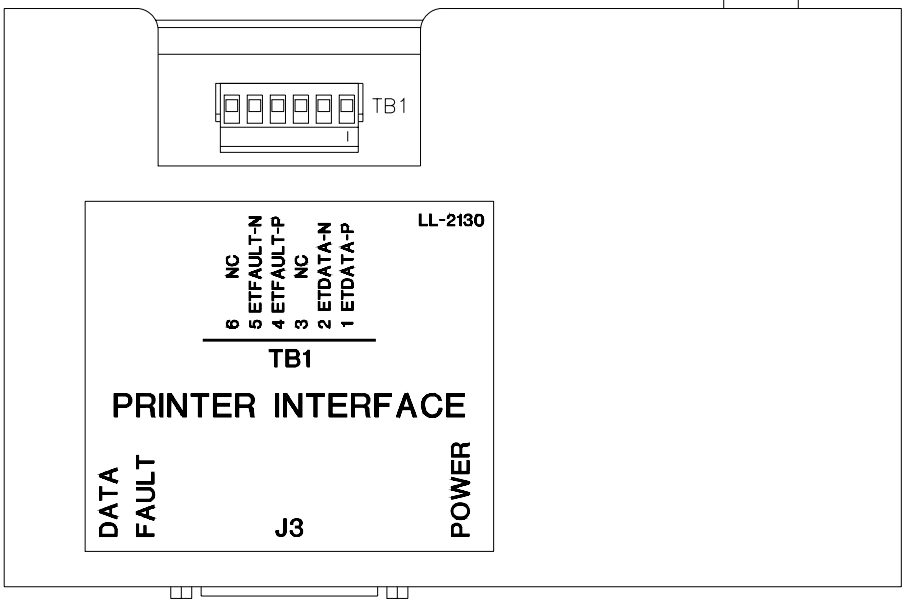
1067-R11A-61305

TIME SLIP
PRINTER INTERFACE
(TOP VIEW)



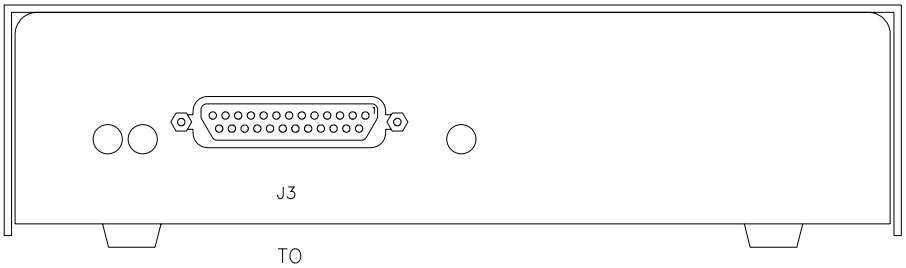
POWER
120 VAC 50/60 Hz

TO
TOWER
(ISOLATION
INTERFACE)



BOX SIZE
5" X 7 3/4" X 2"
(L X W X H)

TIME SLIP
PRINTER INTERFACE
(FRONT VIEW)



TO
TIME SLIP PRINTER
(VIA STANDARD PARALLEL PRINTER CABLE)

FIGURE 2-15

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ:

TITLE: PRINTER INTERFACE ASSY.

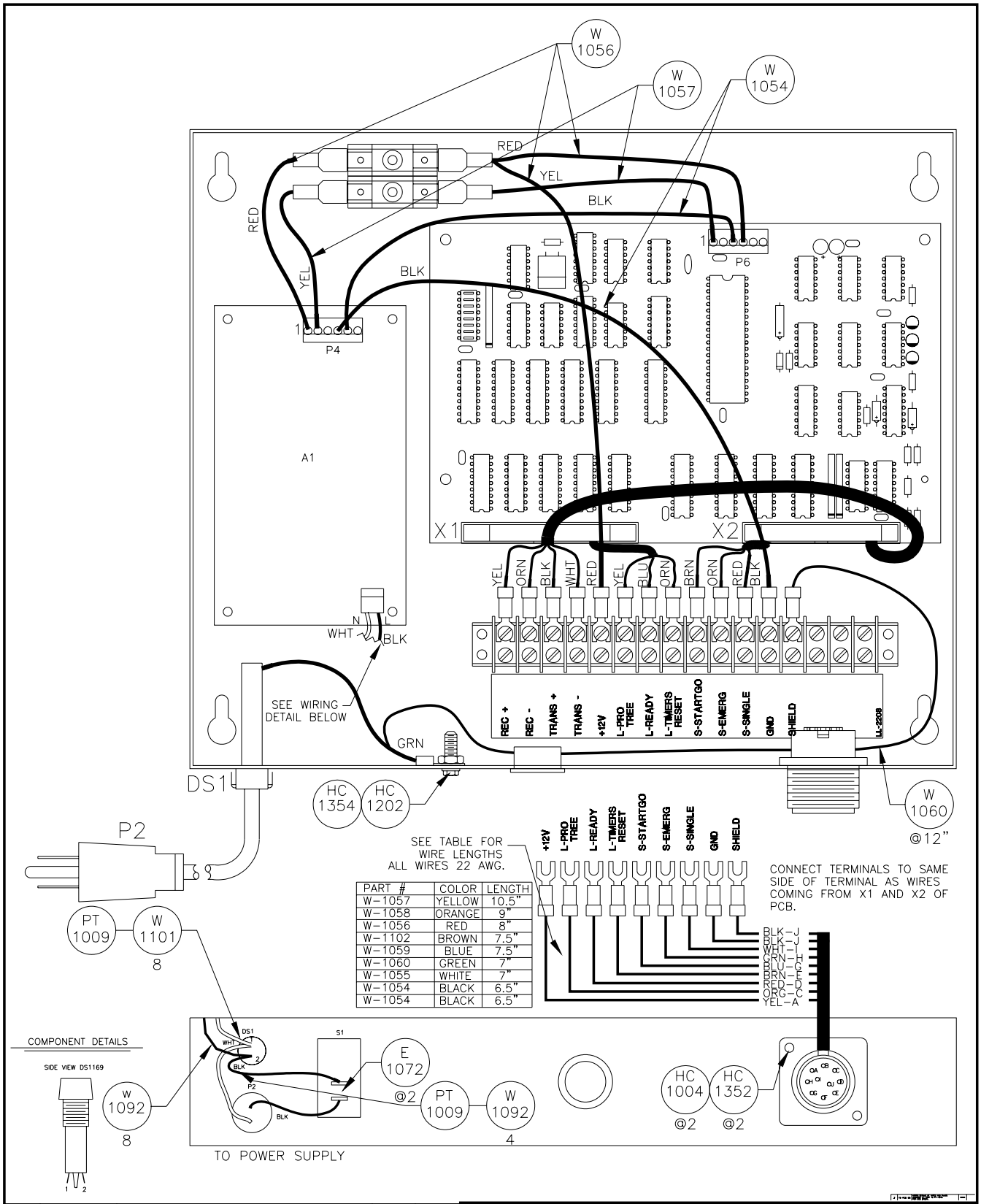
DES. BY: DRAWN BY: C.S.SPERLICH DATE: 6 OCT 94

REVISION 2-29

APPR. BY:

SCALE: 2=3

1067-R11A-65810



PART #	COLOR	LENGTH
W-1057	YELLOW	10.5"
W-1058	ORANGE	9"
W-1056	RED	8"
W-1102	BROWN	7.5"
W-1059	BLUE	7.5"
W-1060	GREEN	7"
W-1055	WHITE	7"
W-1054	BLACK	6.5"
W-1054	BLACK	6.5"

REV.	DATE	DESCRIPTION	BY	APPR.
5	23 APR 98	ADDED PART NUMBER TO COLORED WIRES	HBB	
4	13 JAN 98	CHANGED HEAT SHRINK FROM PT 1010 TO PT 1009 PER ECO 10663.	HBB	
3	11 JULY 96	CHANGED HC-1080 AND HC-1103 TO HC-1352, ADDED HC-1202 AND HC-1354 PER ECO #7673.	MWM	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK

TITLE: STARTERS BOX INTERFACE, WIRING

DES. BY: DRAWN BY: CIVERSEN DATE: 3 JULY 95

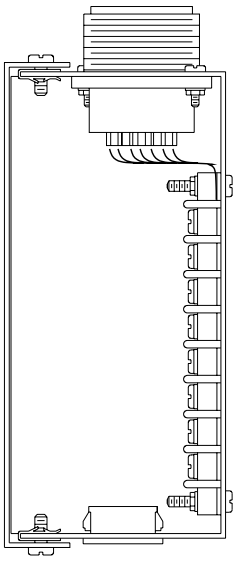
REVISION APPR. BY:

SCALE: 1=2

1067-R10A-72242

NOTE: ALL FIELD CABLING IS 18 AWG.

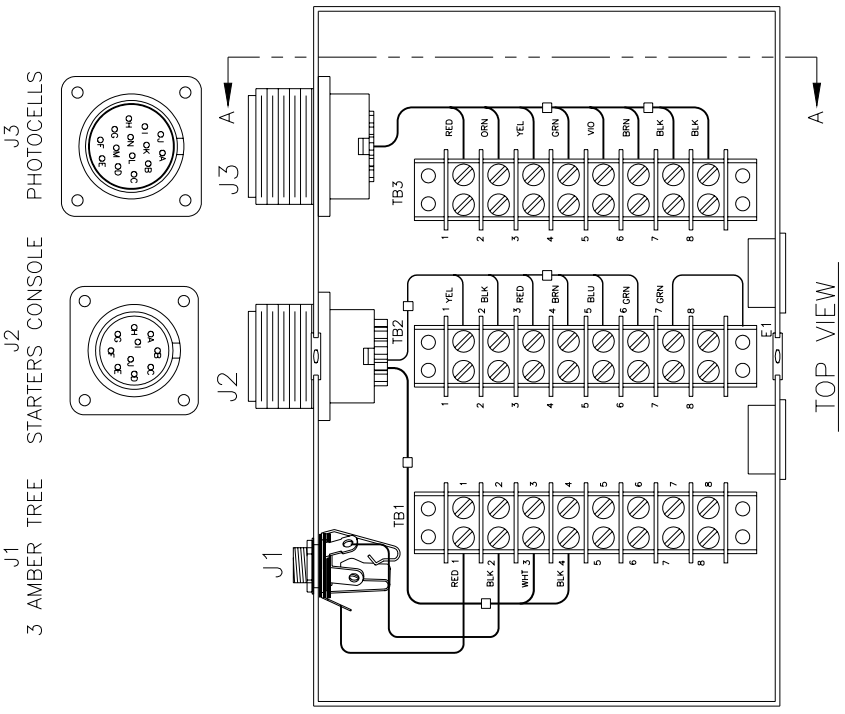
BOX SIZE
7-1/2" X 5-1/4" X 2-3/8"



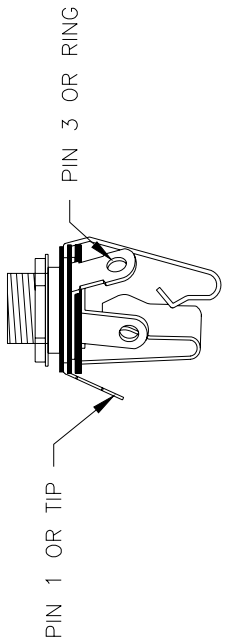
SECTION VIEW A-A

JUNCTION BOX WIRING LIST

FROM	COLOR	FUNCTION	AWG	TO
J1-1	RED	SIG-P	22	TB1-1
J1-3	BLK	SIG-N	22	TB1-2
J2-I	WHT	SINGLE-N	22	TB1-3
J2-J	BLK	GND	22	TB1-4
J2-A	YEL	+12V-P	22	TB2-1
J2-C	BLK	PROTREE-N	22	TB2-2
J2-D	RED	READY-N	22	TB2-3
J2-E	BRN	TIMERSRESET-N	22	TB2-4
J2-G	BLU	STARTGO-N	22	TB2-5
J2-H	GRN	EMERG-N	22	TB2-6
TB2-7	GRN	EARTH-N	22	E1
J3-B	RED	LEFTPRESTAGEP	22	TB3-1
J3-D	ORN	LEFTSTAGEP	22	TB3-2
J3-F	YEL	LEFTGUARDP	22	TB3-3
J3-H	GRN	RIGHTPRESTAGEP	22	TB3-4
J3-J	VIO	RIGHTSTAGEP	22	TB3-5
J3-L	BRN	RIGHTGUARDP	22	TB3-6
J3-A,C,E	BLK	LEFTCOM	22	TB3-7
J3-G,I,K	BLK	RIGHTCOM	22	TB3-8



TOP VIEW



PHONE JACK DETAIL

REV.	DATE	DESCRIPTION	BY	APPR.
1	6APR99	ADDED NOTE ABOUT FIELD CABLING	RASMUS	J.W.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK

TITLE: C44 START LINE JUNCTION BOX

DES. BY: DRAWN BY: NJA DATE: 4 OCT 95

REVISION APPR. BY:

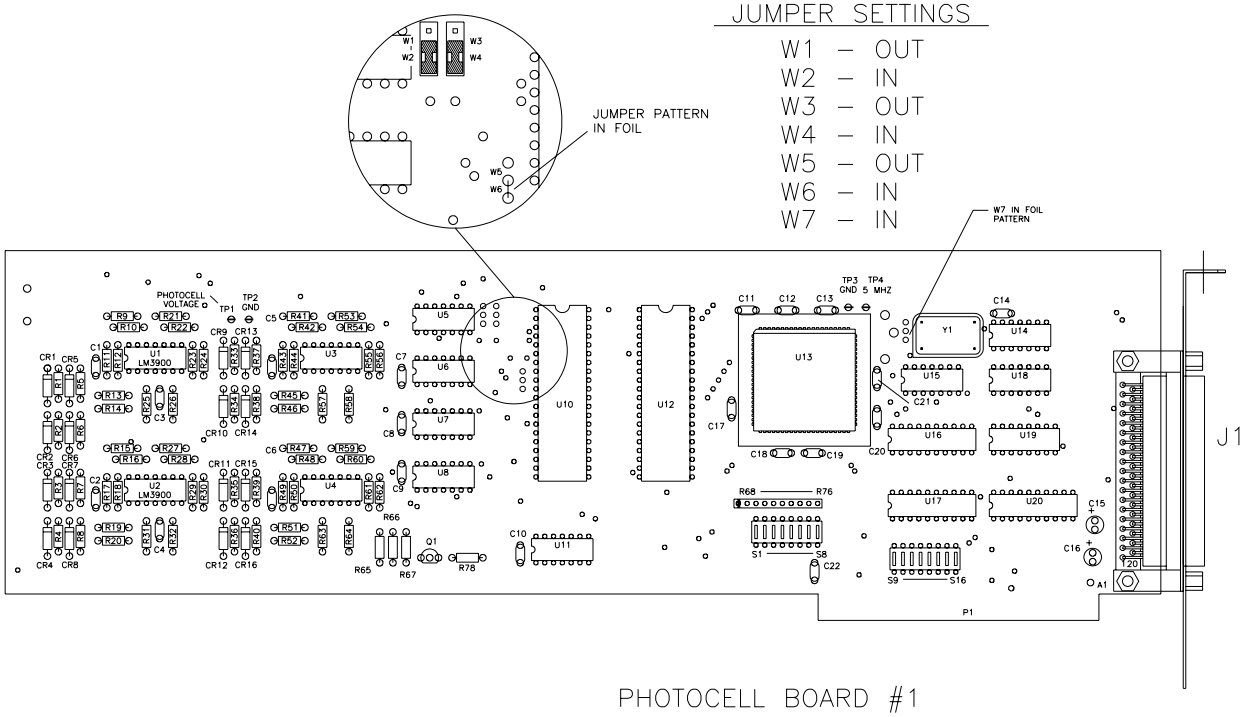
SCALE: 1=2

1067-R11A-75431

PHOTOCELL BOARD III

JUMPER SETTINGS

W1 – OUT
W2 – IN
W3 – OUT
W4 – IN
W5 – OUT
W6 – IN
W7 – IN



PHOTOCELL BOARD #1

DIP SWITCH SETTINGS		DIP SWITCH SETTINGS	
S1	– OPEN	S9	– OPEN
S2	– CLOSED	S10	– OPEN
S3	– OPEN	S11	– OPEN
S4	– CLOSED	S12	– OPEN
S5	– CLOSED	S13	– CLOSED
S6	– CLOSED	S14	– OPEN
S7	– OPEN	S15	– OPEN
S8	– OPEN	S16	– OPEN

(OPEN = OFF)
(CLOSED = ON)

PHOTOCELL BOARD #2

DIP SWITCH SETTINGS		DIP SWITCH SETTINGS	
S1	– OPEN	S9	– OPEN
S2	– CLOSED	S10	– OPEN
S3	– CLOSED	S11	– OPEN
S4	– OPEN	S12	– OPEN
S5	– CLOSED	S13	– OPEN
S6	– CLOSED	S14	– OPEN
S7	– OPEN	S15	– OPEN
S8	– OPEN	S16	– OPEN

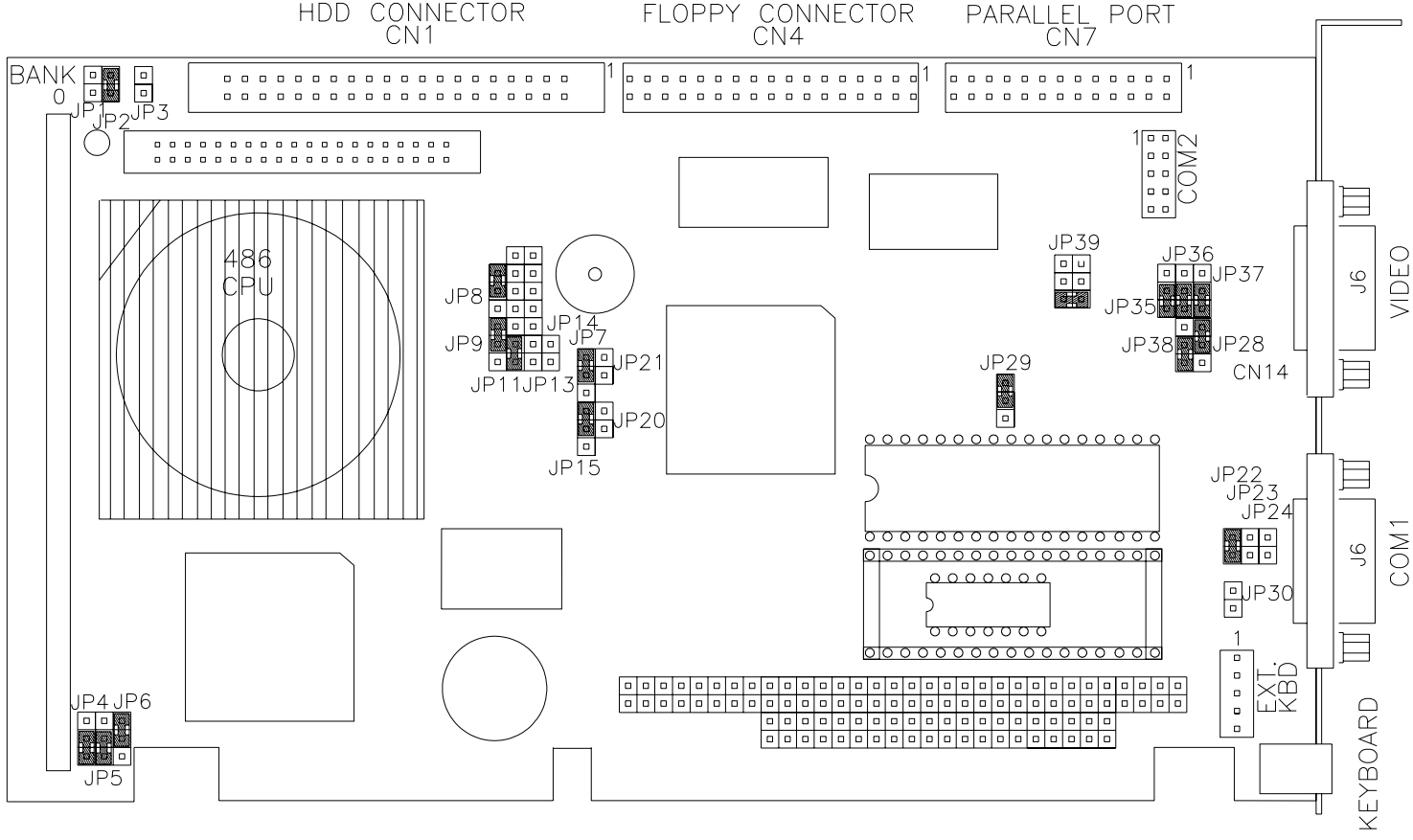
REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK
TITLE: PHOTOCELL BOARD III
DES. BY: DRAWN BY: J.M.LAMBERTZ DATE: 24 JAN 96
REVISION APPR. BY:
SCALE: 1=2

1067-R11A-78599

INDUSTRIAL 486DX MOTHER BOARD
WITH CONNECTOR SETTINGS.



NOTE: COM2 COMES STANDARD DEFAULT SETTING OF 485.
BE SURE TO CHANGE ALL JUMPERS AS SHOWEN. BOTH
COMPORTS MUST BE SET FOR RS232. REFER TO
THE PCA-6145B, MOTHERBOARD MANUAL, FOR FUTHER INSTRUCTION.

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK

TITLE: MOTHERBOARD, 486DX INDUSTRIAL

DES. BY: HBB DRAWN BY: HBONER DATE: 16 JULY 99

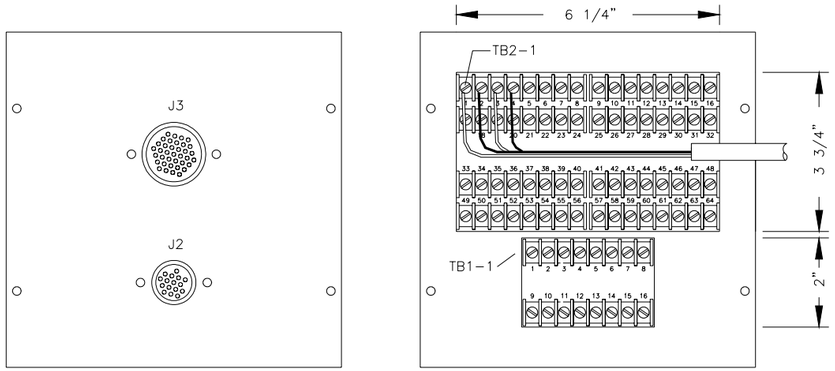
REVISION APPR. BY:

SCALE: 1=1

1067-R11A-118588

TOWER JUNCTION BOX

WIRE PREPARATION DETAIL



FRONT VIEW

BACK VIEW

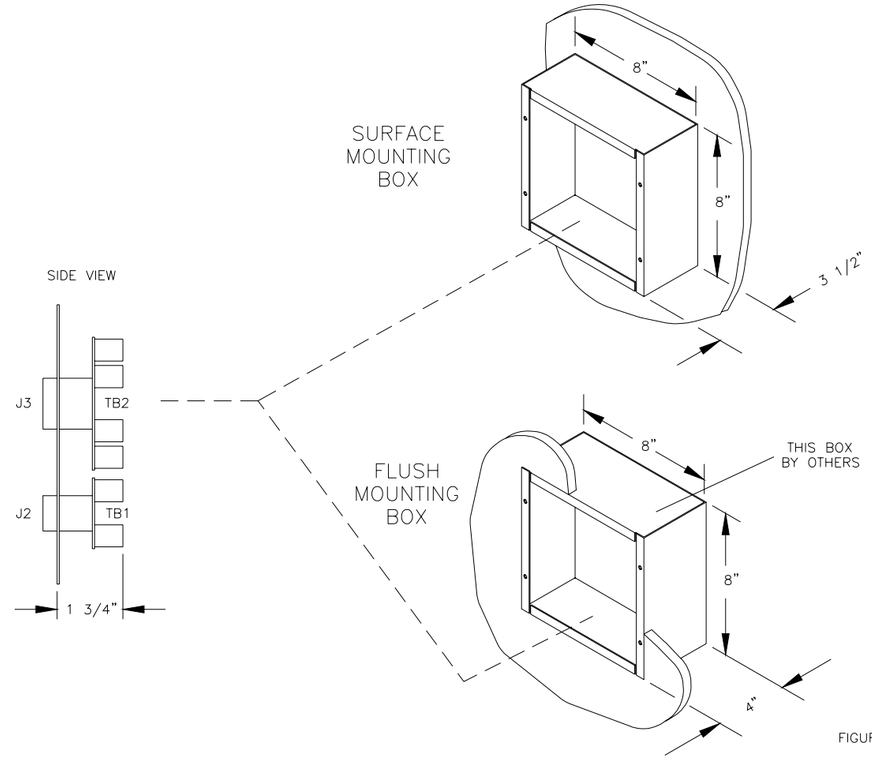


FIGURE 6.0

DRAWING NO. 1067-R11B-38362 REV. 1

TOWER JUNCTION BOX

PLOT THIS DRAWING:

1. WITH PEN PLOTTER AS NORMAL
2. POSTSCRIPT PLOTTER
   - A. PLOT ROTATED, LIMITS 11,17
   - B. PLOT SIZED 11 X 17 (ERROR)
   - C. ADD POSTSCRIPT COMMAND
     "statusdict begin 830 1512 1 setpage end"
     TO FILE BEFORE BEING SENT OUT FOR PLOTTING.
   - D. SET TRANSLATE TO "0" "0" TRANSLATE
   - E. FILE NAME TO *.EPS

REV.	DATE	DESCRIPTION	MADE	APPR.
1	16 JAN 91	ADDED J2 - 16 PIN CIRC. TO C33 INTERMEDIATE LINES.	MER	

DAKTRONICS, INC.
BROOKINGS, SOUTH DAKOTA 57006

CHRONDEK INC.

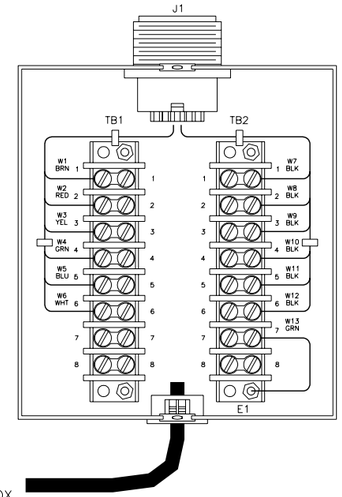
TOWER JUNCTION BOX

DRAWING NUMBER: 1067-R11B-38362	SCALE: NONE
DESIGNED:	DRAWN: S. WHALEN
DATE:	DATE: 26 JUN 89
CHECKED:	APPROVED:
DATE:	DATE:

TO START LINE
ELECTRONICS BOX

START LINE
JUNCTION BOX

(TOP VIEW W/O COVER)



FIELD CABLE TO
TOWER JUNCTION BOX

BOX SIZE
5" X 4-1/2" X 2-1/2"
(L X W X H)

START LINE
JUNCTION BOX
J1

SCHEMATIC

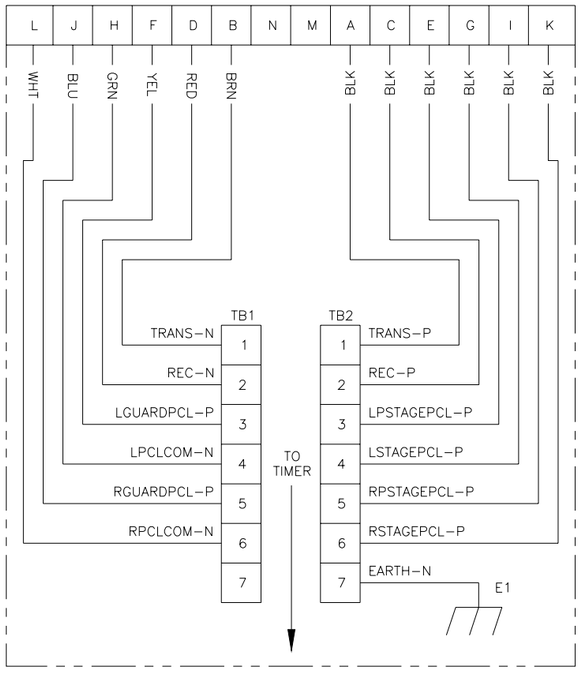


FIGURE 7.0

DRAWING NO. 1067-R11B-38363	REV.	0	START LINE JUNCTION BOX

PLOT THIS DRAWING:
1. WITH PEN PLOTTER AS NORMAL
2. WITH NEC POSTSCRIPT LASER PRINTER:
(LEFT SIDE, PAPER SIZE 8.00 X 10.75
USE PRINT OFFSET -0.17,-0.25, 1=1,
LIMITS, PEN WIDTH = .003.)

REV.	DATE	DESCRIPTION	MADE	APPR.

DAKTRONICS, INC.
BROOKINGS, SOUTH DAKOTA 57006

CHRONDEK INC.

START LINE JUNCTION BOX

DRAWING NUMBER: 1067-R11B-38363	SCALE: NONE
DESIGNED:	DRAWN: S. WHALEN
DATE:	DATE: 26 JUN 89
CHECKED:	APPROVED:
DATE:	DATE:

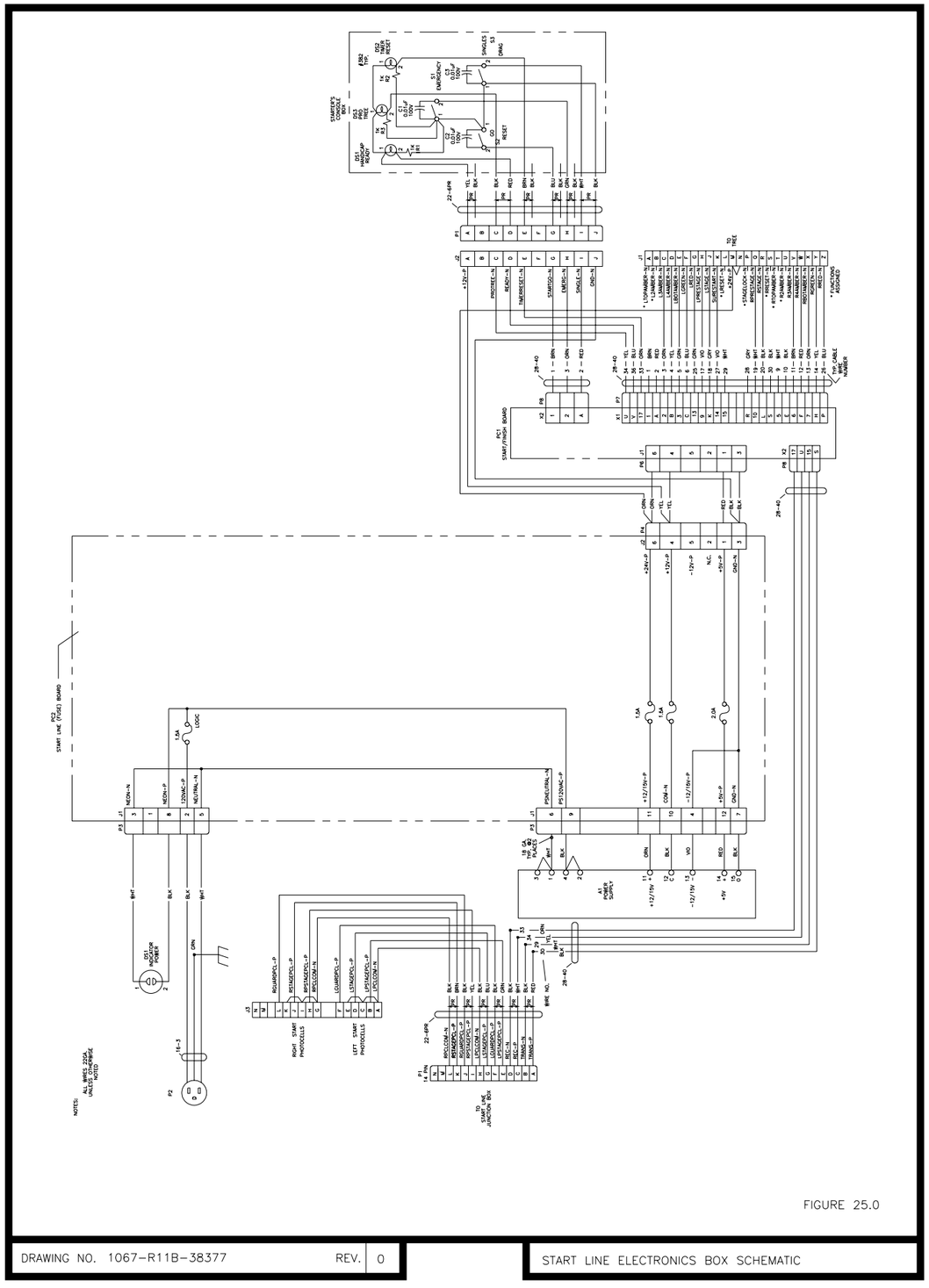


FIGURE 25.0

DRAWING NO. 1067-R11B-38377 REV. 0

START LINE ELECTRONICS BOX SCHEMATIC

PLOT THIS DRAWING:

1. WITH PEN PLOTTER AS NORMAL
2. WITH NEC POSTSCRIPT LASER PRINTER:
   (LEFT SIDE, PAPER SIZE 8.00 X 10.75
   USE PRINT OFFSET -0.17,-0.25, 1=1,
   LIMITS, PEN WIDTH = .003.)

REV.	DATE	DESCRIPTION	MADE	APPR.

AKTRONICS, INC.

BROOKINGS, SOUTH DAKOTA 57006

CHRONDEK INC.

START LINE ELECTRONICS BOX SCHEMATIC

DRAWING NUMBER: 1067-R11B-38377	SCALE: NONE
DESIGNED:	DRAWN: S. WHALEN
DATE:	DATE: 26 JUN 89
CHECKED:	APPROVED:
DATE:	DATE:

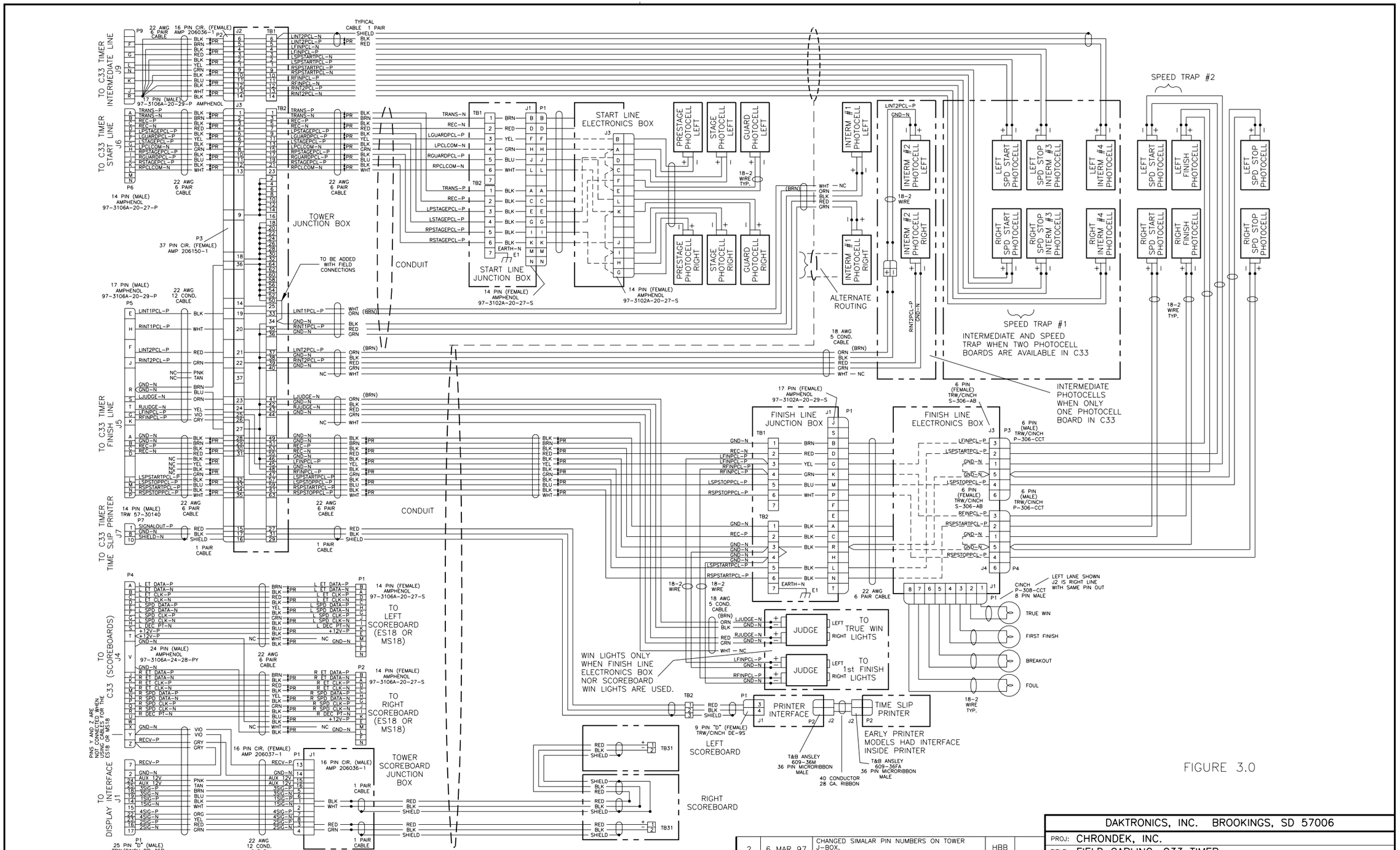


FIGURE 3.0

REV.	DATE	DESCRIPTION	BY	APPR.
2	6 MAR 97	CHANGED SIMALAR PIN NUMBERS ON TOWER J-BOX.	HBB	
1	10 COT 95	CONNECTED PIN 17 OF J3 TO PIN 31 OF TB2 AND PIN 16 OF J3 TO PIN 29 OF TB2 ON TOWER JUNCTION BOX.	NJA	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: FIELD CABLING, C33 TIMER

DES. BY: DRAWN BY: M. RICHARDSON DATE: 16 JAN 91

REVISION APPR. BY:

SCALE: NONE

1067-R11B-45820

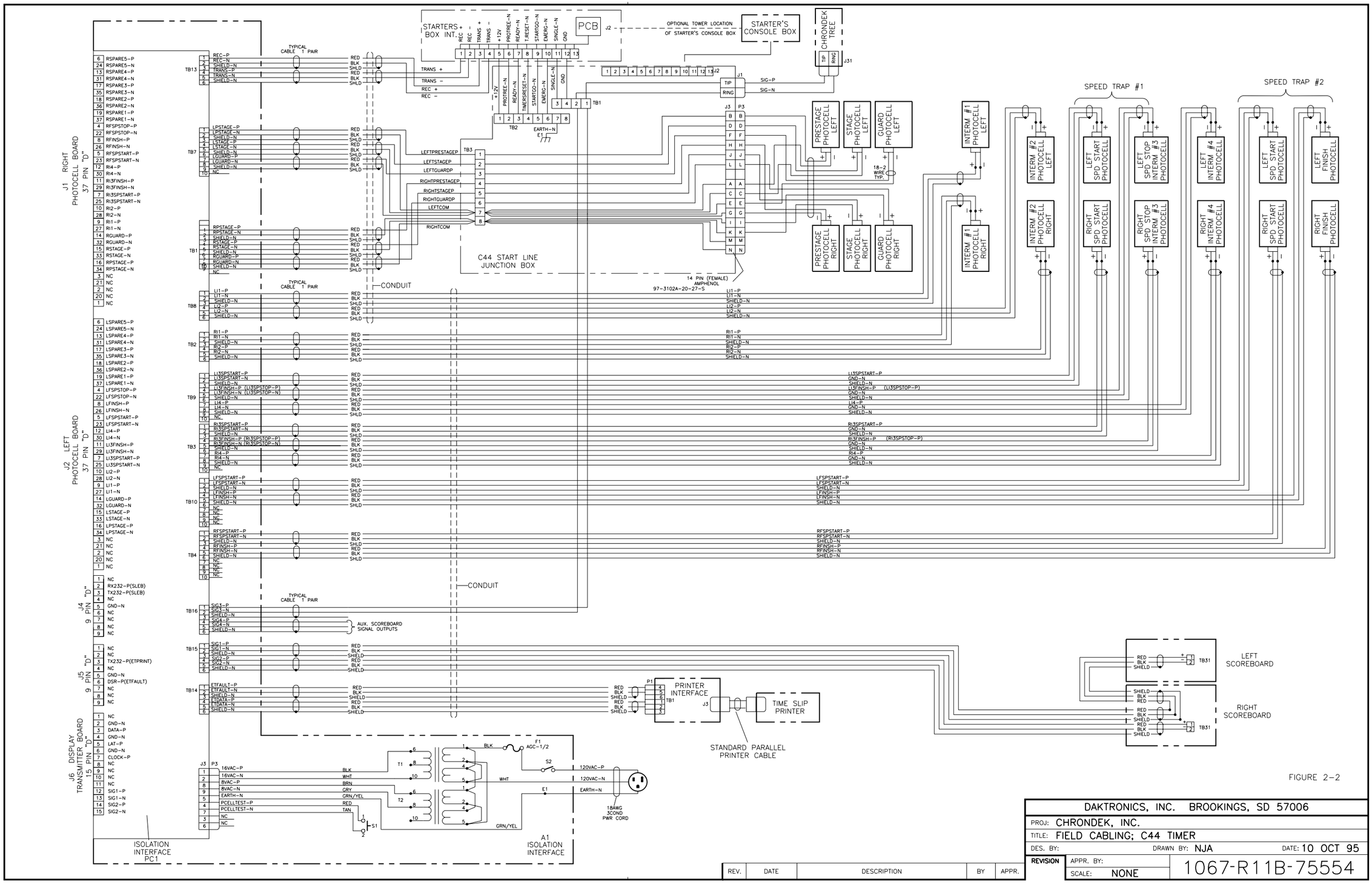


FIGURE 2-2

REV.	DATE	DESCRIPTION	BY	APPR.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: FIELD CABLING; C44 TIMER

DES. BY: DRAWN BY: NJA DATE: 10 OCT 95

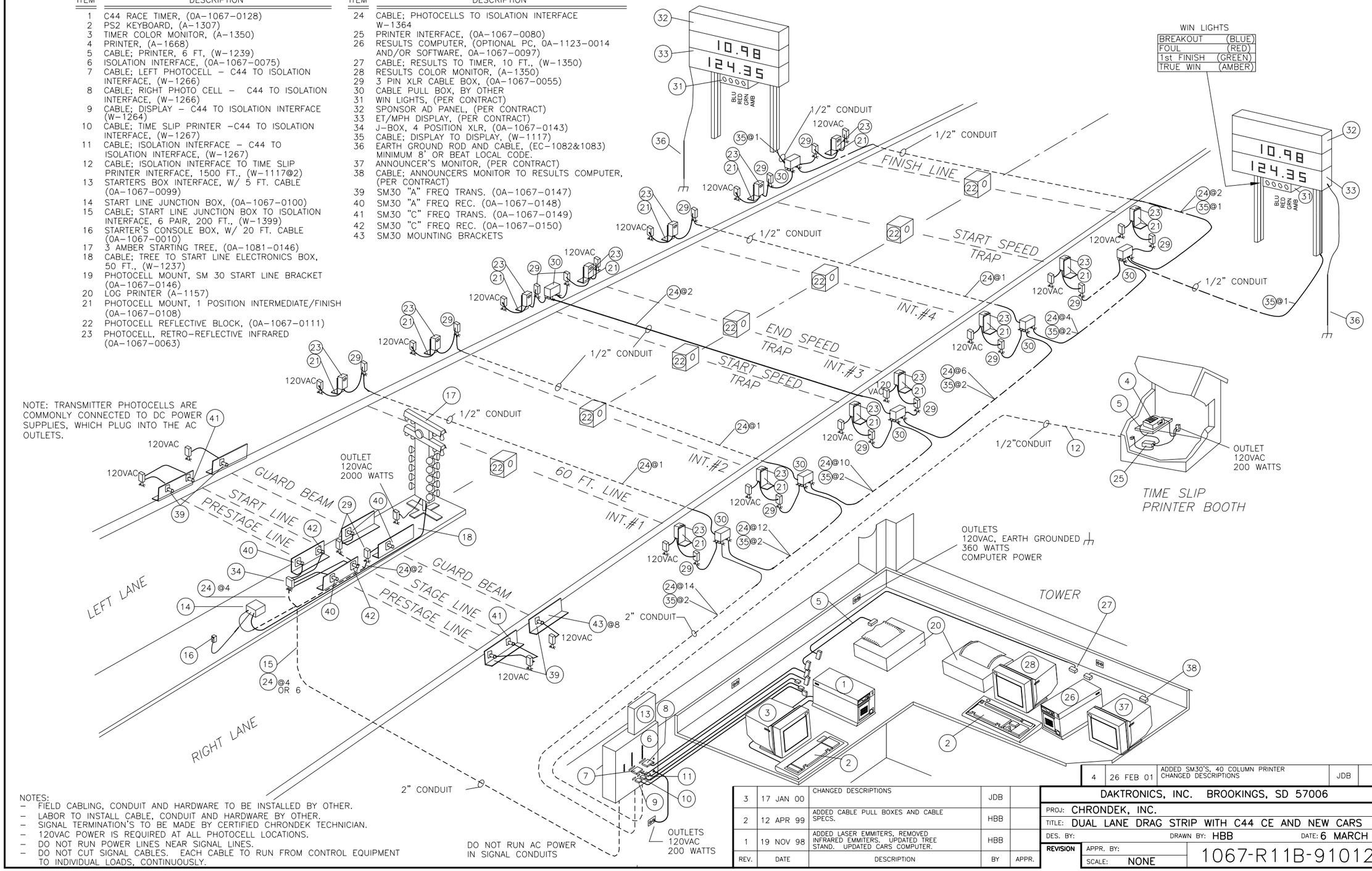
REVISION APPR. BY:

SCALE: NONE

1067-R11B-75554

ITEM	DESCRIPTION
1	C44 RACE TIMER, (0A-1067-0128)
2	PS2 KEYBOARD, (A-1307)
3	TIMER COLOR MONITOR, (A-1350)
4	PRINTER, (A-1668)
5	CABLE; PRINTER, 6 FT, (W-1239)
6	ISOLATION INTERFACE, (0A-1067-0075)
7	CABLE; LEFT PHOTOCELL - C44 TO ISOLATION INTERFACE, (W-1266)
8	CABLE; RIGHT PHOTO CELL - C44 TO ISOLATION INTERFACE, (W-1266)
9	CABLE; DISPLAY - C44 TO ISOLATION INTERFACE (W-1264)
10	CABLE; TIME SLIP PRINTER -C44 TO ISOLATION INTERFACE, (W-1267)
11	CABLE; ISOLATION INTERFACE - C44 TO ISOLATION INTERFACE, (W-1267)
12	CABLE; ISOLATION INTERFACE TO TIME SLIP PRINTER INTERFACE, 1500 FT., (W-1117@2)
13	STARTERS BOX INTERFACE, W/ 5 FT. CABLE (0A-1067-0099)
14	START LINE JUNCTION BOX, (0A-1067-0100)
15	CABLE; START LINE JUNCTION BOX TO ISOLATION INTERFACE, 6 PAIR, 200 FT., (W-1399)
16	STARTER'S CONSOLE BOX, W/ 20 FT. CABLE (0A-1067-0010)
17	3 AMBER STARTING TREE, (0A-1081-0146)
18	CABLE; TREE TO START LINE ELECTRONICS BOX, 50 FT., (W-1237)
19	PHOTOCELL MOUNT, SM 30 START LINE BRACKET (0A-1067-0146)
20	LOG PRINTER (A-1157)
21	PHOTOCELL MOUNT, 1 POSITION INTERMEDIATE/FINISH (0A-1067-0108)
22	PHOTOCELL REFLECTIVE BLOCK, (0A-1067-0111)
23	PHOTOCELL, RETRO-REFLECTIVE INFRARED (0A-1067-0063)

ITEM	DESCRIPTION
24	CABLE; PHOTOCELLS TO ISOLATION INTERFACE W-1364
25	PRINTER INTERFACE, (0A-1067-0080)
26	RESULTS COMPUTER, (OPTIONAL PC, 0A-1123-0014 AND/OR SOFTWARE, 0A-1067-0097)
27	CABLE; RESULTS TO TIMER, 10 FT., (W-1350)
28	RESULTS COLOR MONITOR, (A-1350)
29	3 PIN XLR CABLE BOX, (0A-1067-0055)
30	CABLE PULL BOX, BY OTHER
31	WIN LIGHTS, (PER CONTRACT)
32	SPONSOR AD PANEL, (PER CONTRACT)
33	ET/MPH DISPLAY, (PER CONTRACT)
34	J-BOX, 4 POSITION XLR, (0A-1067-0143)
35	CABLE; DISPLAY TO DISPLAY, (W-1117)
36	EARTH GROUND ROD AND CABLE, (EC-1082&1083) MINIMUM 8' OR BEAT LOCAL CODE.
37	ANNOUNCER'S MONITOR, (PER CONTRACT)
38	CABLE; ANNOUNCERS MONITOR TO RESULTS COMPUTER, (PER CONTRACT)
39	SM30 "A" FREQ TRANS. (0A-1067-0147)
40	SM30 "A" FREQ REC. (0A-1067-0148)
41	SM30 "C" FREQ TRANS. (0A-1067-0149)
42	SM30 "C" FREQ REC. (0A-1067-0150)
43	SM30 MOUNTING BRACKETS



NOTE: TRANSMITTER PHOTOCELLS ARE COMMONLY CONNECTED TO DC POWER SUPPLIES, WHICH PLUG INTO THE AC OUTLETS.

NOTES:
- FIELD CABLING, CONDUIT AND HARDWARE TO BE INSTALLED BY OTHER.
- LABOR TO INSTALL CABLE, CONDUIT AND HARDWARE BY OTHER.
- SIGNAL TERMINATION'S TO BE MADE BY CERTIFIED CHRONDEK TECHNICIAN.
- 120VAC POWER IS REQUIRED AT ALL PHOTOCELL LOCATIONS.
- DO NOT RUN POWER LINES NEAR SIGNAL LINES.
- DO NOT CUT SIGNAL CABLES. EACH CABLE TO RUN FROM CONTROL EQUIPMENT TO INDIVIDUAL LOADS, CONTINUOUSLY.

REV.	DATE	DESCRIPTION	BY	APPR.
4	26 FEB 01	ADDED SM30'S, 40 COLUMN PRINTER CHANGED DESCRIPTIONS	JDB	
3	17 JAN 00	CHANGED DESCRIPTIONS	JDB	
2	12 APR 99	ADDED CABLE PULL BOXES AND CABLE SPECS.	HBB	
1	19 NOV 98	ADDED LASER EMMITERS, REMOVED INFRARED EMMITERS. UPDATED TREE STAND. UPDATED CARS COMPUTER.	HBB	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

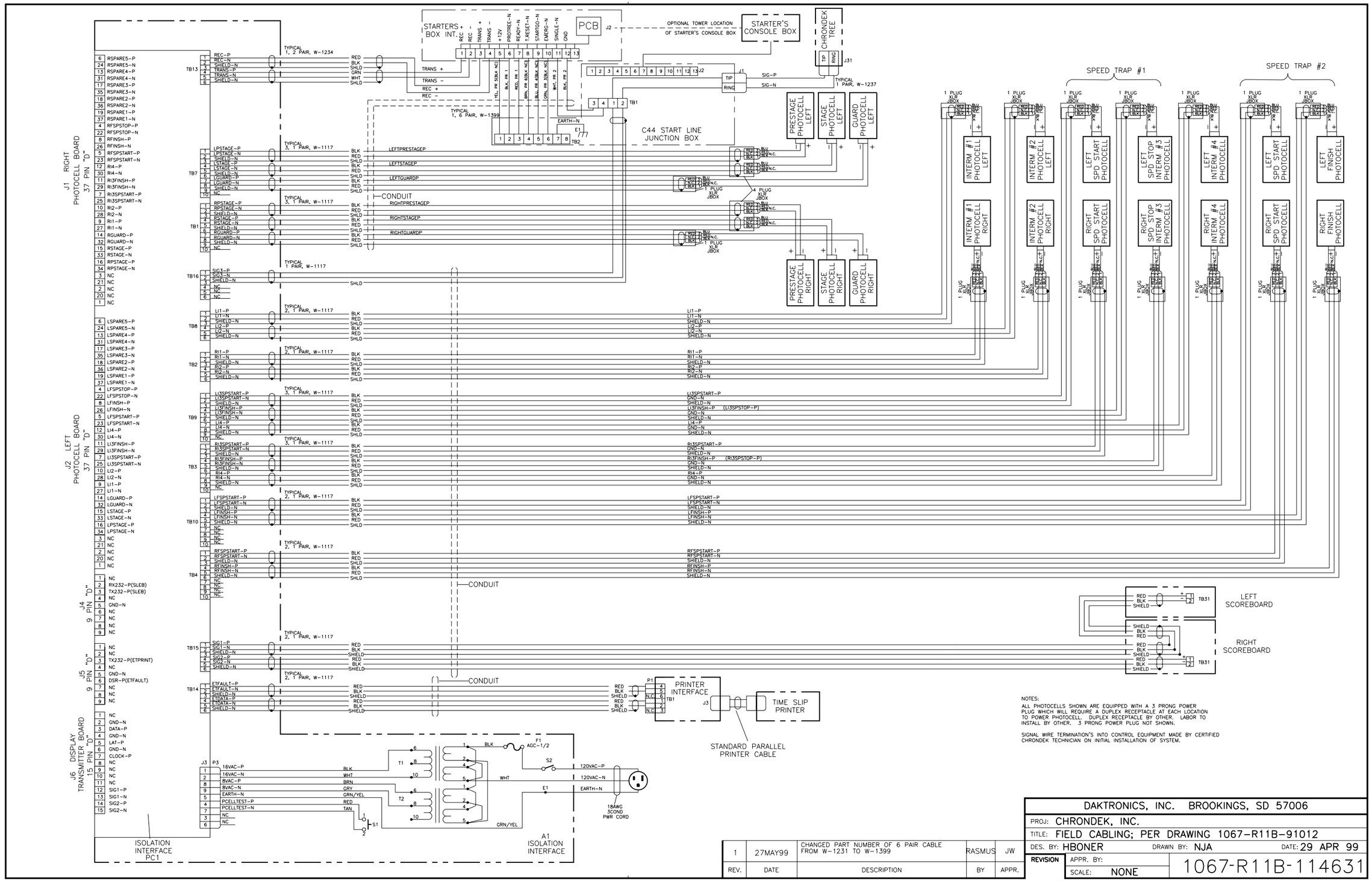
TITLE: DUAL LANE DRAG STRIP WITH C44 CE AND NEW CARS

DES. BY: DRAWN BY: HBB DATE: 6 MARCH 97

REVISION APPR. BY:

SCALE: NONE

1067-R11B-91012



NOTES:
ALL PHOTOCELLS SHOWN ARE EQUIPPED WITH A 3 PRONG POWER PLUG WHICH WILL REQUIRE A DUPLEX RECEPTACLE AT EACH LOCATION TO POWER PHOTOCELL. DUPLEX RECEPTACLE BY OTHER. LABOR TO INSTALL BY OTHER. 3 PRONG POWER PLUG NOT SHOWN.

SIGNAL WIRE TERMINATION'S INTO CONTROL EQUIPMENT MADE BY CERTIFIED CHRONDEK TECHNICIAN ON INITIAL INSTALLATION OF SYSTEM.

REV.	DATE	DESCRIPTION	BY	APPR.
1	27MAY99	CHANGED PART NUMBER OF 6 PAIR CABLE FROM W-1231 TO W-1399	RASMUS	JW

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: CHRONDEK, INC.

TITLE: FIELD CABLING; PER DRAWING 1067-R11B-91012

DES. BY: HBONER DRAWN BY: NJA DATE: 29 APR 99

REVISION APPR. BY:

SCALE: NONE

1067-R11B-114631