AMF

ACCUSCORE PLUS C-90 SERVICE AND TECHNICAL MANUAL

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

PART NUMBER 610-32-0240
Revision: 00
April 1991

misc\stcovers.pm4

Table of Contents

pm4\misc\S&TC90

AccuScore Plus Concept 90
Service and Technical
Manual

1. SYSTEM OVERVIEW

1.1. Introduction

AMF's AccuScore Plus is the worlds most advanced automatic scoring system available to the bowling industry. AccuScore Plus is a fourth generation system that takes advantage of the newest computer technology and has been designed such that it provides a highly reliable and easy to maintain system. The scorer is controlled by a state of the art 16 bit microprocessor housed in a curtain wall mounted chassis containing a single printed circuit board.

1.2 Scorer Characteristics

The AMF AccuScore Plus has the following characteristics:

* Curtain wall mounted electronics containing single system printed circuit board.
* System printed circuit board contains high performance 16 bit 68000 microprocessor with enhanced graphics speed.
* User friendly, simplified keyboard entry and correction.
* Help feature with overhead prompting
* Highly accurate AccuCam optical pinsensing.
* System status LED indicators that show system operation status of each unit.
* Modular cable connector system for easy system maintenance.
* Two high resolution bit mapped color graphic displays.
* Fully compatible with existing AccuTrac II/AccuDesk II

2. SPECIFICATIONS

2.1. Curtain Wall Equipment

Curtain wall chassis dimensions	19" x 18" x 5"
Curtain wall chassis weight	14 lbs.
Operation voltage range	90-135/180-260 VAC
Power line frequency	50/60 Hz
Power consumption	87 watts
Maximum operating temperature	0-50 C
Video	Dual RGB, 512 pixels x 240 lines

2.2. Bowler Terminal Equipment

Bowler terminal dimensions	21" x 27" x 40"
Bowler terminal weight	78 lbs.
Input power requirements	8-15 VAC
Maximum operating temperature	0-50 C
Language Options	English, French, Spanish, German, Japanese

2.3. Color Monitor Equipment

Monitor housing dimensions	72" x 24" x 26"
Monitor housing weight	300 lbs.
Operating voltage	120/240 VAC
Power line frequency	50/60 Hz
Maximum operating temperature	0-50 C
Picture dimensions	27" diagonal
Type of video drive	RGB/NTSC composite

2.4. Pinsense Equipment

Optical pinsense dimensions	12 1/2" x 5 1/2" x 9"
Optical pinsense weight	5 lbs.
Input power requirements	18 - 27 VAC
Maximum operating temperature	0-50 C

3. COMPATIBILITY

AccuSystem Plus is Compatible with:

* AccuTrac II
* AccuDesk II
* AccuScore II - lane pairs can be mixed together in the same house.
* Advantage

AccuSystem Plus is not compatible with:

* AccuTrac I
* AccuDesk I
* AccuScore I, ColorScore, MagicScore
* APS
* AccuCam is not compatible with scorers other than AccuScore Plus, except with the use of AUI.

ACCUSCORE PLUS C-90
USER'S GUIDE

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

REVISION: 00
APRIL 1991

AccuScore Plus C-90
Table of Contents

pm4\misc\cpusgu

AccuScore Plus C-90
Table of Contents
cont.

Open Bowling

When bowler's are checked on to a lane, the first thing they should do is clear the lane's monitor of all information, scores, names, etc. if it has not been done. They should then type their names into the AccuScore console in the order that they want to bowl and, if desired, their handicaps. Then, before bowling the first frame, they simply press a key to indicate that the first bowler is up. We also recommend that they check to see that their lane is set for open bowling. A red light indicates the current setting.

This section contains simple step by step, "How To" instructions for clearing the scoring monitor, typing in the bowler's names and handicaps, and what to press to begin bowling. As you will see, it is really quite simple.

Refer to the "Help" screen menu as often as needed. You will find it useful as you can get to know the AccuScore System. The "Help" menu is discussed on the following pages.

Open Bowling at the Lane Console

Ready the Scoring Monitor for Play

1. If monitor is black, press "Left Lane" or "Right Lane" and type "On". This will bring up the "AMF AccuScore" Logo.

2. Press "End Bowling". This will bring up the six player scoring grid.

Selecting Open Scoring

Check the AccuScore console to make sure that you are in correcting scoring mode. Either the "Open" or "League" keys will show a red light. If you are in league mode and want to change to open scoring press "Open".

Help Screen Menu

You will find using the "Help" Menu to be easy and convenient.

You can press the "Help" key at any time (once the scoring grid is present) to receive on-screen guidance through various functions available to you at the AccuScore bowler console. "Help" is not available to you while bowling in "ABC" format. That is league play with video (TV) on one screen and both teams' scores displayed on the other.

If you make a mistake typing in information (such as bowler's name) you can use the "Erase" key to back up and retype.

Anytime you want to skip a question the system is prompting you for, simply press "Enter" to skip over (leaving any current information unchanged) and continue on.

The "Help" screen menu is described below:

Help Menu

1. **Sign In**
   Enter Team Name (press "Enter" if there is no team name)
   Enter Team Handicap (press "Enter" is there is no team handicap)
   Enter Bowler Name
   Enter Bowler Handicap

2. **Change Team Information**
   Old Team Name (displays current team name)
   New Team Name (enter desired team name)
   Old Team Handicap (displays current team handicap)
   New Team Handicap (enter desired team handicap)

3 **Change Bowler information**
   Bowler List (list bowler's on that lanes by number)
   You are prompted to type in the bowler number you wish to make changes to.

   You are then given the opportunity to:

   Change Bowler Name (press "Enter" if there is no change to be made)
   Change Bowler Handicap (press "Enter" if there is no change to be made)
   Change Bowler to Normal, Blind, or Pacer (press "Enter" if no change is to be made)

4. **Game Control**
    1. Clear Display (removes names/handicaps and scores) (This command does not respond when interfaced as it is handled by the Control Desk.)
    2. End Bowling (This command does not respond when interfaced as it is handled by the Control Desk)
    3. Start New Game (removes scores only)
    4. Restore Game (restores last game removed from Scorers) (This command does not respond when interfaced as it is handled by the Control Desk)
    5. Exit (returns you to bowler grid).

    Enter Number

5. **Adjust Play**
    1. Change Score (allows you to change score of 1 ball in any frame)
    2. Erase Frame (erases last frame bowled, both balls)
    3. Out of Sequence Bowler (allows you to skip bowler's)
    4. Pinspotter Reset
    5. Exit (returns you to bowler grid)

    Enter Number

6. **Exit**
    Returns you to bowler grid

    Entering Bowler Names/Handicaps

Entering Bowler Names/Handicaps

Using the "Help" Menu"

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type in "1" (Sign-in). Type in information as prompted and press "Enter". Press "Enter" to skip over unrequired information requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane" to select lane, and press "Bowler Name". The colored box or "Cursor" will appear in the first bowlers box on your screen.
2. Type in bowlers name. Press "Space" between words. If you wish to enter a handicap for this bowler, press "Enter".
3. If individual handicaps are desired, press "Bowler HDCP".
4. Enter handicap value and "Enter"
5. Repeat steps 2 through 4 for each bowler.
6. When all bowler names/handicaps are entered, press "Bowler Name".

To Begin Bowling

1. Press "Left Lane" or "Right Lane".
2. Press "Start Bowling".

The first bowler's full name will appear at the bottom of the screen on the lane they are to bowl on, their game row will be highlighted with a bower band color, and an arrow will be to the left of his/her initials, pointed to the lane they are to bowl on. Pinfall will be scored and displayed and the next bowler's name and arrow will appear automatically.

Making Corrections and Changes

Correcting a Name

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type in "3" (change bowler information) Press "Enter". Type in changes as prompted and press "Enter" or press "Enter" to skip over any unused or unchanged requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane" to select lane, then "Bowler Name".
2. Use down or up arrow to move cursor (colored box) to the name needing corrections.
3. Press "Erase Name"
4. Type in corrected name.
5. Press "Bowler Name"

Correcting the Bowler Handicap

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type in "3" (change bowler information), press "Enter"
   Type in changes as prompted and press "Enter" or press "Enter" to skip over any unused or unchanged requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane" then "Bowler Name"
2. Use down arrow or up arrow to move cursor (colored box) to the bowler needing handicap correction.
3. Press "Bowler HDCP"
4. Press "Erase" until handicap reads 0 (zero)
5. Type in corrected handicap value and press "Enter"
6. Press "Bowler Name"

Correcting a Score

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type in "5" (adjust play), press "Enter"
3. Type "1" (change score). Type in changes as prompted. This will allow you to change score of 1 ball in any frame.

OR

1. Press "Left Lane" or "Right Lane", then "Change Score". Cursor (colored box) will appear on screen.
2. Use arrows to move the cursor to the exact location of the error.
3. Type in correct number or symbol (miss, foul, strike, spare, etc.)
4. If a split, press "Split" then correct the number. The line score and total will correct automatically.

Making a 10th Frame Score Correction

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "5" (adjust play), press "Enter"
3. Type "1" (change score), Follow system prompts.

Bowling Out of Turn

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "5" (adjust play), press "Enter"
3. Type "3" (out of sequence) and follow prompts.

OR

1. Press "Left Lane" or "Right Lane", then "Select Bowler"
2. Type in the number of the bowler wishing to bowl out of turn. The color band will move to the bowler you have selected.
3. Bowl out of order. Color band will automatically return to the original bower and play will resume normally.

Re-bowling a Frame

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "5" (adjust play), press "Enter"
3. Type "2" (erase frame) and press "Enter" and follow prompts. This erases the last frame bowled (both balls) and positions bowler band for rebowling that frame.

OR

1. Press "Left Lane" or "Right Lane" and "Erase Frame"
2. Use arrows to move cursor (colored box) to frame to be re-bowled.
3. Press "Enter" to erase.
4. Re-bowl frame.

Resetting a Full Rack of Pins Without Scoring

1. Press "Re-Rack" then "Left Lane" or "Right Lane".

Removing Scores to Start Next Game

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "4" (game control), press "Enter"
3. Type "3" (start new game). This removes the scores only, leaving names, handicaps, and positions arrow/color bar to begin next game.

OR

1. Press "Left Lane" or "Right Lane" then "Next Game".

   Names and handicaps are retained and scores are removed. Arrow/color bar will come up.

Restoring Previous Game Scores

(Only for Non Interfaced Systems)

Note: Restoring to the previous game will remove the game in progress from memory. You will not be able to retrieve the current game.

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "4" (game control), press "Enter"
3. Type "4" (restore game). This removes last game removed from scorers.

OR

1. Press "Left Lane" or "Right Lane" to select lane.
2. Type "RG"

Previous game, roster, handicap, and team name will be displayed.

Open Bowling for Interfaced Systems

All features discussed in the open bowling section for non-interfaced systems are available to the bowler on an Interfaced Bowler Console. You will find a few commands have been removed from the bowler's control and put in the hands of the control desk operator. The "End Bowling" key is not active in an interfaced system. This function is reserved for the control desk operator. Also you will find that the "Restore Game" function will not operate from the Bowler Console. Again, this feature is controlled by the desk operator. In addition to the functions discussed previously, with an interfaced system you can download open bowler names/handicaps directly to the lane monitor. (See next page).

Downloading Open Bowler Names

1. Press "Left Lane' or "Right Lane" and "Bowler Name".
2. Type bowler's Open Bowling ID number (see *), press "Enter".
3. Repeat step 2 for each bowler.
4. Press "Team Name"
5. Type 111x and press "Enter". You will see the "Working" message on the screen and the system will update your lane display.

* Each open bowler that has been entered into the center's open bowling database has been assigned an Open Bowling ID number. This number is used for downloading open bowlers and capturing their scores for recordkeeping purposes. (See the Bowling Programs section of this manual.)

League Bowling

The following instructions describe how to enter bowler's names, team names, scores, handicaps, blind bowlers, pacers, etc. from an AccuScore Lane Console. If you have an AccuTrac office system, league information can be downloaded directly to the AccuScores once it has been defined through your office system. League bowlers should be shown how to enter their team name, player's names, handicaps, etc. and make changes at their consoles.

Remember, the "Help" key can be used at anytime during league play (except when in ABC format) to receive on screen guidance through the various functions available to you at the AccuScore Lane Console. To use the "Help" function, press "Left Lane" or "Right Lane" and then "Help".

League Bowling at the Lane Console

For Non Interfaced Systems

Ready the Score Monitor for Play

1. If the monitor is black, press "Left Lane" or "Right Lane" and type "On". This will bring up the "AMF AccuScore" logo.
2. Press "End Bowling". This will bring up the six person grid.
3. Press "League".

Entering Team Name

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "1" (sign in), press "Enter".
3. Enter Team Name as prompted and press "Enter". Press "Enter" to skip over any unused or unchanged requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane".
2. Press "Team Name".
3. Type in team name, press "Space" between words.
4. Press "Enter".

Entering Team Line-Up (Roster)

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "1" (sign in), press "Enter"
3. Enter bowler's name as prompted. Press "Enter" to skip over unused or unchanged requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane".
2. Press "Bowler Name".
3. Type in bowler name. Press "Space" between words, press "Enter" at this time if handicaps are NOT used.
4. If individual handicaps are desired press "Bowler HDCP".
5. Enter handicap value and "Enter".
6. Repeat steps 3 through 5 for each bowler.
7. When all bowlers are entered, press "Bowler Name".

Entering a Blind

(Bowler Name must already be present in Line-Up)

Using "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "3" (change bowler information), press "Enter".
3. Type in bowler number and press "Enter". Follow information requests as prompted. Press "Enter" to skip over any unused or unchanged requests.

OR

1. Press "Left Lane" or "Right Lane" and "Bowler Name"
2. Use down arrow or up arrow to move the cursor (colored box) to the bowler to be make a blind.
3. Press "Blind".
4. Cursor will appear in the HDCP column. Use "Erase" key to erase existing handicap if present. Type in blind AVERAGE and press "Enter"
5. "B" will appear above bowler name to show blind status. Frame count based on the blind average will be calculated automatically as bowling progresses.

To Remove a Blind

Using the "Help" Menu

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "3" (change bowler information), press "Enter".
3. Type in bowler number and press "Enter" to skip over any unused or unchanged requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane" and "Bowler Name".
2. Use down arrow or up arrow to move cursor (colored box) to the bowler whose blind status is to be removed.
3. Press "Blind".

Entering a Team Handicap

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "1" (sign in), press "Enter".
3. Type in team handicap value as prompted. Press "Enter" to skip over any unused or unchanged requests and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane".
2. Press "Team HDCP".
3. Use "Erase" key to erase existing team handicap if present.
4. Type in team handicap value and press "Enter".

To Begin Bowling

1. Press "Left Lane" or "Right Lane" and "Start Bowling".

Removing Scores to Start Next Game

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "4" (game control), press "Enter".
3. Type "3" (start new game) and press "Enter". This will remove scores of current game, leaving names and handicaps (if used).

OR

1. Press "Left Lane" or "Right Lane".
2. Press "Next Game".

To End Bowling

Using "Help" Menu"

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "4" (game control), press "Enter".
3. Type "2" (end bowling) and press "Enter". This clears all names, scores, and handicaps from bowler grid.

OR

1. Press "Left Lane" or "Right Lane".
2. Press "End Bowling".

League Bowling at the Lane Console

For Interfaced Systems

Downloading Leagues

There are two methods you can use to download your leagues to the AccuScores. The method you use should be selected on the basis of whether a league changes its team line-up (rosters) frequently or not. You can select either method and change from one to the other if the nature of a league changes.

1. FOR LEAGUE THAT DO NOT CHANGE LINE-UP (ROSTER) FREQUENTLY we recommend downloading the team names and line-up (rosters). This is accomplished by specifying this when you are defining the league. When you select this method of downloading the league, the team names and line-up will appear automatically on the lane monitors when you turn the lanes on for the league.

2. FOR LEAGUES THAT CHANGE LINE-UP (ROSTER) FREQUENTLY we recommend that you elect to download only the team names when you are defining the league. When you select this method of downloading the league, only the TEAM NAME will appear on the lane monitors when you turn on the lanes for the league. The bowlers will then be entered from the bowler console.

Entering Non-Standard Team Line-Up (By Bowler ID#) From the Bowler Console

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Bowler Name". Cursor will appear at Bowler number 1.
3. Enter bowler ID# and press "Enter".
4. Repeat step 3 for all bowers.
5. Press "Team Name".
6. Type 111x and "Enter".

You will see the "Working" message on the screen. Display will update.

Entering Standard Line-Up (Roster) From the Bowler Console

1. Press "Left Lane' or "Right Lane" to select lane.
2. Press "Team Name".
3. Type 888x and "Enter"

   You will see the "Working" message on the screen. Display will update.

Changing a Downloaded Team Line-Up (Roster)

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Bowler Name". Cursor will appear at bowler number 1.
3. Use up arrow or down arrow to move the cursor to the bowler being changed.
4. Press "Erase Name" to erase current bowler.
5. Enter the new bowler's ID number. Press "Enter"
6. Repeat steps 3 through 5 for all bowlers being changed.
7. Press "Team Name".
8. Press "Erase Name" to erase team name.
9. Type 111x and "Enter".

You will see "Working" message on the Scorer screen. The display will update the changes entered.

To Return to the Standard Line-Up (roster)

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Team Name".
3. Press "Erase Name".
4. Type 888x and "Enter".

   You will see "Working" message appear on the overhead screen. The display will update and return to the standard roster.

Blinds, Pacers and Vacancies

Instructions for Interfaced Systems

Changing a Bowler to a Blind

(Bowler name must already be present in line-up)

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "3" (change bowler information). Press "Enter".
3. Type in bowler number you wish to change to a "Blind". System will prompt you to "Change Bowler Name", press "Enter" to skip over this prompt you to "Change Bowler to Normal, Blind or Pacer".
4. Type in "B" and "Enter" to change bowler status and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane' to select lane.
2. Press 'Bowler Name".
3. Use down arrow or up arrow to move the cursor to the bowler to be entered as a blind.
4. Press "Blind".
5. Cursor will appear in the HDCP column. Use "Erase" key to erase existing handicap if present. Type in blind AVERAGE and press "Enter".
6. "B" will appear above bowler's name to show blind status. Frame count based on the blind average will be calculated automatically as bowling progresses.

To Remove a Blind

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "3" (change bowler information), press "Enter".
3. Type in bowler number you wish to remove from "Blind" status and press "Enter".
4. Press "Enter" to skip over any unused or unchanged requests. System will prompt you to "Change Bowler to Normal, Blind. or Pacer".
5. Type in "N" and "Enter" to change bowler status and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Bowler Name".
3. Use down arrow or up arrow to move cursor to the bowler you wish to remove form "Blind" status.
4. Press "Blind".

Entering a Pacer

(Bowler name must already be present in line-up. Use "Help" number "1", sign-in)

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "3" (change bowler information), press "Enter".
3. Type in bowler number you wish to enter as a "Pacer". Press "Enter" to skip over any unused or unchanged requests. System will prompt you to "Change Bowler to Normal, Blind, or Pacer".
4. Type in "P" and "Enter" to change bowler status and return to bowler grid.

OR

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Bowler Name".
3. Use down arrow or up arrow to move cursor to the bowler to be entered as a pacer.
4. Press "Pacer".

To Remove a Pacer

Using "Help" Menu:

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Help" and type "3" (change bowler information), press "Enter".
3. Type in bowler number you wish to remove from "Pacer" status. Press "Enter" to skip over unused or unchanged requests. System will prompt you "Change Bowler to Normal, Blind, or Pacer".

OR

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Bowler Name".
3. Use down arrow or up arrow to move cursor to the bowler you wish to remover from "Pacer" status.
4. Press "Pacer".

Adding a Vacancy

1. Press "Left Lane" or "Right Lane" to select lane.
2. Press "Bowler Name". Cursor will appear at bowler number 1.
3. Use down arrow or up arrow to move the cursor to the vacancy position.
4. Press "Erase Name" to erase bowler's name.
5. Type "V" for league with only one type of bowler.
   Type "M" for male vacancy in mixed league.
   Type "F" for female vacancy in mixed league.
   Type "B" for boy vacancy in junior league.
   Type "G" for girl vacancy in junior league.
6. Press "Blind".
7. Press "Team Name".
8. Press "Erase Name" to erase team name.
9. Type 111x and "Enter".

   You will see the "Working" message on the screen. Display will update.

Tournament Bowling at the Lane Console

(For Interfaced Systems)

Downloading Tournaments

There are two ways you can download your tournament to the AccuScore monitors. The first step on both is to define your tournament and enter the participants through the Office System using the Tournament Program.

Then you can choose to download the terms (or singles) from the AccuTrac Desk Console (See Control Desk) or from each individual AccuScore Bowler Console (described on the next page).

Scoring Displays

The AccuScore display automatically adjusts itself according to the number of players entered into the lane console. You will notice that one, two, or three bowlers will have a larger format display than lanes with four or more bowlers.

The display is also capable of a variety of different colors and a five frame and tournament format which can be selected from the Console.

Scorers in Stand Alone Mode

(For Non-Interfaced Systems)

The AccuScore lane console can be used to control the following "Scorer" functions if you do not have an interfaced control desk.

To Turn On Monitors

1. Press "Left Lane" or "Right Lane" and type "On".
2. Press "End Bowling" to bring up scoring grid.

To Turn Off Monitors

1. Press "Left Lane" or "Right Lane" and type "Off".

To Change Colors

1. Press "Left Lane" or "Right Lane" to select lane and type "CC".
2. Select the color by typing a number "00" to "12".

To Change Formats

1. Press "Left Lane" or "Right Lane" to select lane and type "F". This will revert back and forth 10 frame format and 5 frame format.

To Enable/Disable Action Graphics

1. Press "Left Lane" or "Right Lane" to select lanes and type "G".

To Set No-Tap Bowling

1. Press "Left Lane" or "Right Lane" to select lane and type "SSM8" for 8 pin no-tap or "SSM9" for 9 pin no-tap.
2. Press "Left Lane" or "Right Lane" to select lane and type "SSMR" to revert back to regular 10 pin strikes.

Note: No-tap strikes will appear in the same color as the pinfall box numbers, regular strikes will appear as before.

To Reverse "Arrows in League Mode

1. Press "Left Lane" or "Right Lane" to select lane and type "RA".

To Enable/Disable TV

1. Press "Left Lane" or "Right Lane" to select lane and type "V".

To View Scores of Another Lane

1. Press "Left Lane" or "Right Lane" to select lane and type "LV".
2. Type the lane number you wish to view. (**Note:** single, digit lane numbers should be preceded by a zero, e.g.. lane 3 entered as 03.)
3. Press "Left Lane" or "Right Lane" and type "LV" to revert back to your scores.

AccuScore Software Version Command

1. Press "Left Lane" or "Right Lane" to select lane and type "SV". The version number of the software being used in that curtain wall chassis appears where the team name would normally appear for about 10 seconds.

AccuScore Quick Command Guide

Note that all commands except those marked ** work only in Stand Alone mode.

	L Lane or **R** Lane	ON	Turns on monitor to AMF logo
	L Lane or **R** Lane	OFF	Turns off monitor
	L Lane or **R** Lane	F	Toggles 10/5 frame format
	L Lane or **R** Lane	G	Toggles On/Off Action Graphics
	L Lane or **R** Lane	V	Toggles between Scorer and TV mode
	L Lane or **R** Lane	P	Prints score ticket
**	L Lane or **R** Lane	CC#	Sets color to one of eight colors
*	L Lane or **R** Lane	RG	Restores last game from RAM to display
	L Lane or **R** Lane	LV#	Turns on lane view (#is number 1-99)
	L Lane or **R** Lane	LV	Turns off lane view
		R or **L** LANE	
	L Lane or **R** Lane	SSMR	Sets lane pair to regular scoring
	L Lane or **R** Lane	SSM9	Sets lane pair to 9 pin no-tap
	L Lane or **R** Lane	SSM8	Sets lane pair to 8 pin no-tap
	L Lane or **R** Lane	SV	Software version (Vnn-nn, team name)
	L Lane or **R** Lane	AST	Enables/Disables pindication display on monitor
	L Lane or **R** Lane	SPD	When pindication is enabled, scans the pin deck

****	Operation of this feature enabled/disabled by front desk**
***	This command will destroy current scores if used during mid-game!!!**

ACCUSCORE PLUS C-90
GENERAL

AMF Bowling, Inc
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

REVISION:00
APRIL 1991

TABLE OF CONTENTS

ACCUSCORE PLUS

GENERAL

AccuScore Plus forms a complex electronic computer system. This system consists of several independent subsystems that perform various tasks at each lane pair. As with any complex system, it is helpful to have an understanding of how the various subsystems interact before attempting to isolate problems or to make repairs within the system. In the fóllowing sections we will discuss system operation by examining each of the subsystems and how each communicates and interacts with other subsystems.

1. SYSTEM OVERVIEW

Figure 1. shows a top level view of the complete AccuSystem with all its subsystems and the routes that information flow within the system. The front desk computer system communicates with each of the AccuScore Curtain Wall Chassis units to obtain information about the lane status or to issue a command to the AccuScore unit. The AccuScore Curtain Wall unit collects information from and sends information to each of the subsystems attached to it. These subsystems consist of the pinsense unit, odd and even machines, bowler terminal and monitor subsystem. In most cases each of these subsystems has its own microprocessor controlling its operation. So when you sit back and look at the big picture, you see a network of many microprocessors communicating with each other. The proper flow of information over this network is essential for proper system operation.

2. FRONT DESK TO SCORER COMMUNICATION

Information and commands from the front desk computer flow to each of the AccuScore Curtain Wall Chassis units. (See Fig. 2) A modular communication cable interconnects the front desk computer to each of the scorer curtain wall chassis. This communication cable is routed much like a daisy chain, the cable from the front desk computer plugs into the first AccuScore Systems unit and then a cable connects that AccuScore Systems Unit Chassis to the next AccuScore Systems Unit Curtain Wall Chassis. This continues until all units are connected together. This interconnection of the front desk computer and scorers forms a Local Area Network or LAN.

The front desk computer and scorers communicate over this LAN much like a party line phone system. All scorers are connected to and share the same physical pair of wires to receive information from the front desk computer. A separate pair of wires that interconnect all scorers together are used to allow the scorers to transmit data back to the front desk computer. Because of this interconnection technique, only one scorer can communicate to the front desk at a time.

The front desk computer directs information to a particular scorer unit by encoding an address in each information transmission. Each scorer has an address much like your home address. Any message from the front desk computer with an encoded address that matches the address of the scorer is acted on by that scorer. Messages from the scorer to the front desk computer are addressed much the same way. Any scorer sending information back to the front desk computer, encodes its address into the message so that the front desk knows which scorer sent the message. The address of each scorer units is determined by the lane number set into each scorers lane number switches.

3. ACCUSCORE SYSTEM UNIT

An AccuScore Systems Unit is installed on the curtain wall for each pair of lanes. (See Fig. 3) The AccuScore System unit receives signals from the even and odd machines, bowler terminal subsystem, pinsense subsystem and monitor subsystem. The AccuScore System unit contains a powerful 16 bit microprocessor which controls and monitors all functions that take place on a pair of bowling lanes. The microprocessor is controlled by a computer program that is contained in the Electrically Programmable Read Only Memory (EPROM) chips that are installed on the EPROM card. The EPROM card plugs into the front of the AccuScore Systems unit. The EPROM card contains three Light Emitting Diodes (LED), that are used to display status information about the systems unit, and switches to program the lane identification address.

The AccuScore Systems unit normally receives commands and information from the front desk computer system. The AccuScore Systems unit can operate in a stand-alone mode if there is a failure of the front desk computer. When in stand-alone mode, it is possible to use the Bowler Terminal keyboard to issue commands to the AccuScore Systems unit. The list of stand-alone commands can be found in the operators section of this manual.

4. BOWLER TERMINAL SUBSYSTEM

The Bowler Terminal Subsystem consists of a console housing, bowler terminal keyboard and bowler terminal printed circuit board. The complete bowler terminal subsystem is installed at the front of the approach area for each lane pair.

The bowler terminal subsystem operates from low voltage A.C. power that is supplied from the AccuScore Systems unit. (See Fig. 4) This low voltage A.C. power is converted to regulated D.C. power on the bowler terminal printed circuit board and is used to power the microprocessor chip that controls all functions in the bowler terminal.

The functions that the bowler terminal printed circuit board performs are as follows:

* Operates the four LED's mounted on the bowler terminal keyboard.

* Generates audio tones that indicate that a key on the keyboard was pressed.

* Transfers data entered through the bowler terminal keyboard to the AccuScore System unit.

The bowler terminal is connected to the AccuScore Systems unit by two cables. One cable supplies low voltage A.C. power from the AccuScore System unit to the bowler terminal printed circuit board. The other cable provides communication from the AccuScore Systems unit and from the bowler terminal printed circuit board to the AccuScore Systems unit.

When a key is pressed on the keyboard, the microprocessor detects this and transmits a coded message to the AccuScore System units through the communications cable. There is a unique code transmitted for each of the different keys pressed. Each time the AccuScore System unit receives a coded message from the bowler terminal and verifies that the code received is a valid code, it then transmits a coded message back to the bowler terminal that causes a beep to be sounded from the bowler terminal speaker. If the AccuScore Systems unit receives a code that it will not accept, three beeps will be sounded at the bowler terminal.

The four LED's on the keyboard are controlled by a coded message transmitted from the AccuScore Systems unit. The microprocessor on the bowler terminal printed circuit board recognizes a certain code received as a command to either turn ON or OFF one of the four LED's.

5. COLOR MONITOR DISPLAY SUBSYSTEM

The Color Monitor Display Subsystem consists of monitor housing, two 27 inch color monitors and monitor control printed circuit board. This complete subsystem is normally installed above the approach area just forward of the ball return housing. (See Fig. 5).

The functions that this subsystem performs are as follows:

* Provide two high resolution color displays for scoring information.

* Provide display capability for remote video programs from video tape units.

* Provide two audio channels from a remote audio amplifier.

Each of the two 27 inch monitors can display video from one of two video sources. The two sources are the normal scoring display and the remote video source (i.e. a VCR or other device, normally is located at the control counter.) The scoring display video is supplied from the AccuScore Systems unit. The video signals from the AccuScore Systems unit are transmitted to the monitors over a multiconductor coax ribbon cable in a RGB format. The video signals for the remote video source are supplied from a video distribution amplifier located at the control counter and transmitted to the monitor over a single coax cable. The remote video signal is composite video as per the EIA RS-170 specifications.

6. ACCUCAM PINSENSE SYSTEM

The AccuCam Pinsense Subsystem (See Fig. 6) consists of a CCD Camera and electronics. This system is mounted on lane capping in such a way that the camera can see all pins of a pair of lanes.

The low voltage A.C. to operate the electronics inside this system is sent to it by the Curtain Wall Chassis.

The AccuCam Pinsense Subsystem communicates to the Curtain Wall Chassis over two pairs of wires (one pair for Receive; one pair for Transmit).

After each ball is thrown, the Curtain Wall Chassis commands AccuCam to scan the pindeck, i.e. identify which pins are still standing, if any. This information is transmitted back to the Curtain Wall Chassis and is used to compute the scores.

7. MACHINE SIGNALS (See Fig. 7)

Four signals are sent from each pinspotting machine to AccuScore. These are:

* START — AccuScore needs to know when a ball has hit the cushion so that

it can command AccuCam to scan the pindeck.

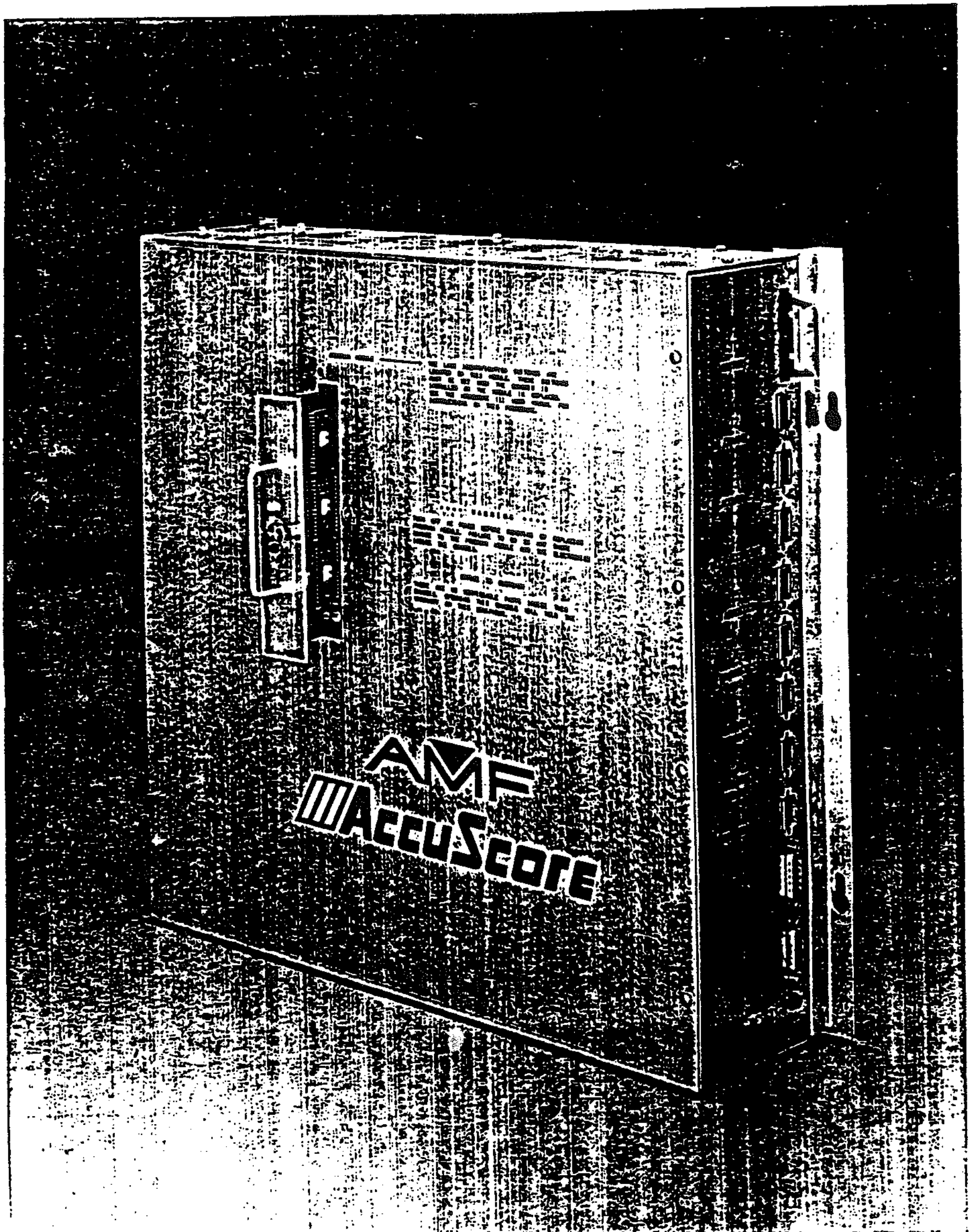
* BALL 2 — Tells AccuScore that the ball thrown was second ball.

* RPO REQUEST — This requests from AccuScore a machine cycle for the sole purpose of spotting a new rack of pins. When a START pulse is generated, it is ignored by AccuScore and not used as a basis for scanning the pindeck.

* FOUL — Indicates that the bowler has fouled and his/her score should not be taken into account. Although in Fig. 4, the foul signal is shown to come from the machine for simplicity, it typically comes from a Foul Detector Unit.

The only signal which is sent _from_ AccuScore _to_ machines is the RPO (Respot Pins Only), which is a request by AccuScore for the machine to spot a new rack of pins.

Where the signals are picked up for AccuScore depends on the type of pinspotting machine used. The magnitude and polarity (A.C. or D. C.) of these signals also vary with machine type.


AMF
AccuScore

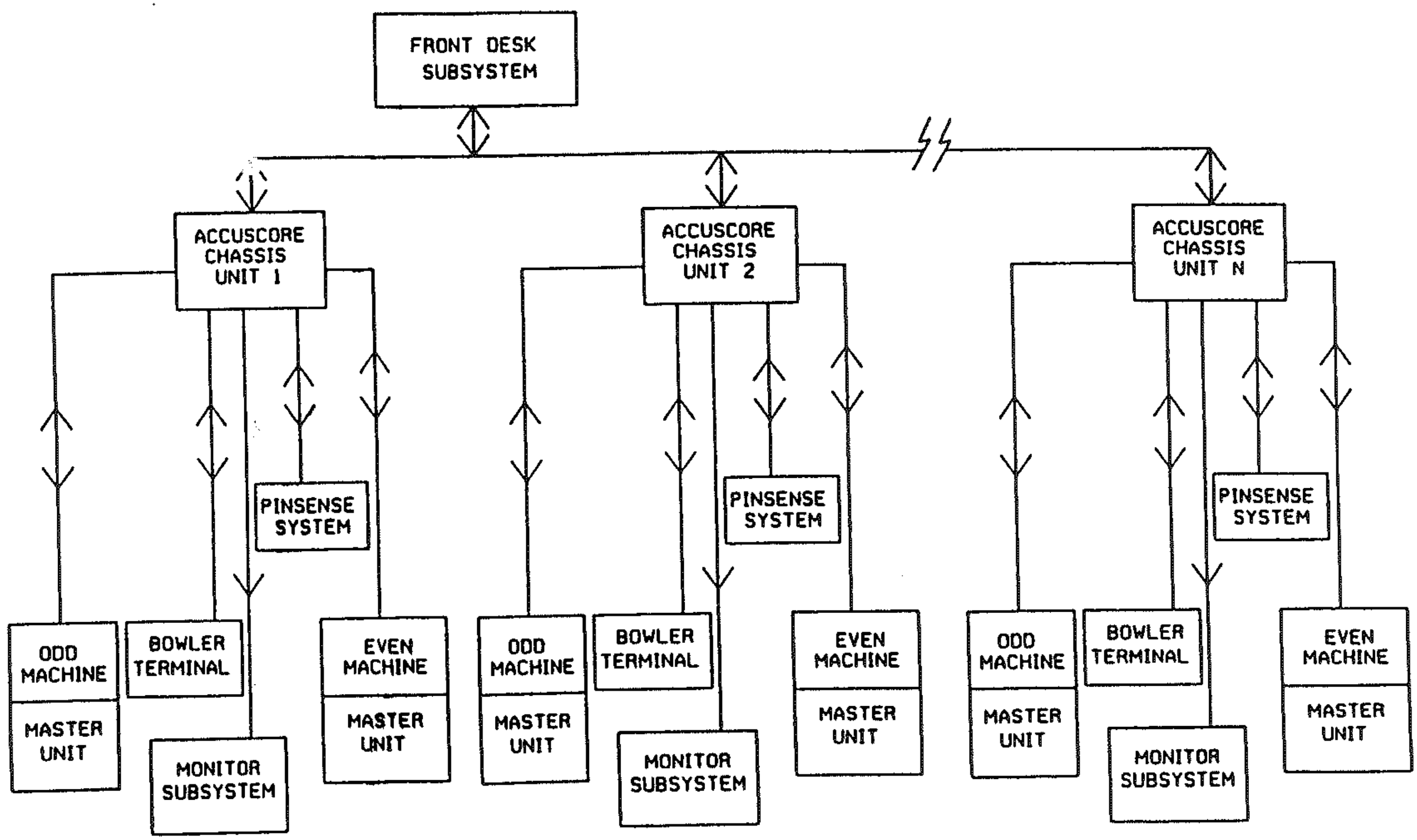


FIGURE 1
ACCUSCORE PLUS
SYSTEM DIAGRAM

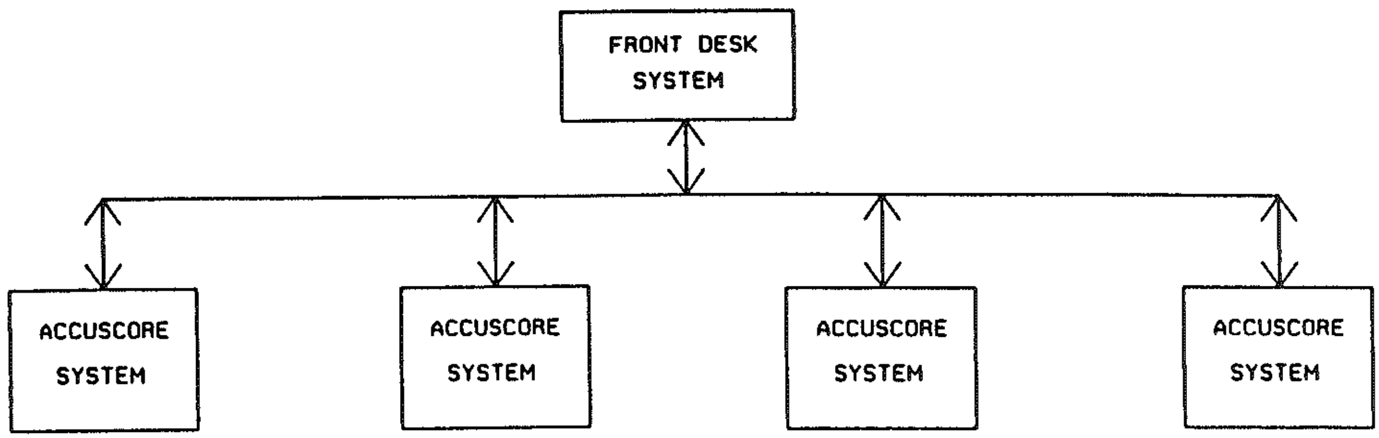


FIGURE 2
ACCUSCORE PLUS
FRONT DESK TO ACCUSCORE INTERFACE

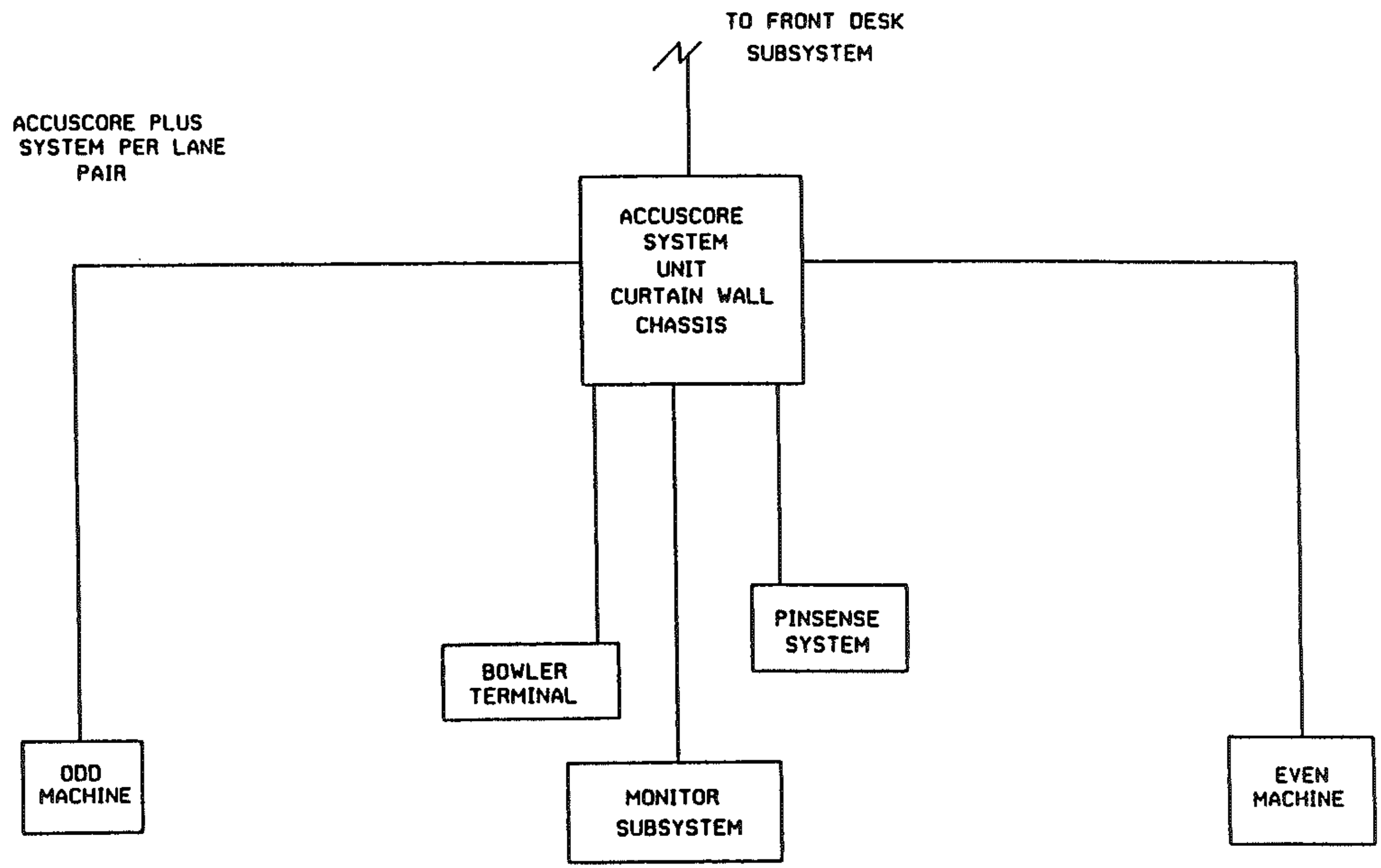


FIGURE 3
ACCUSCORE PLUS
SUBSYSTEM DIAGRAM

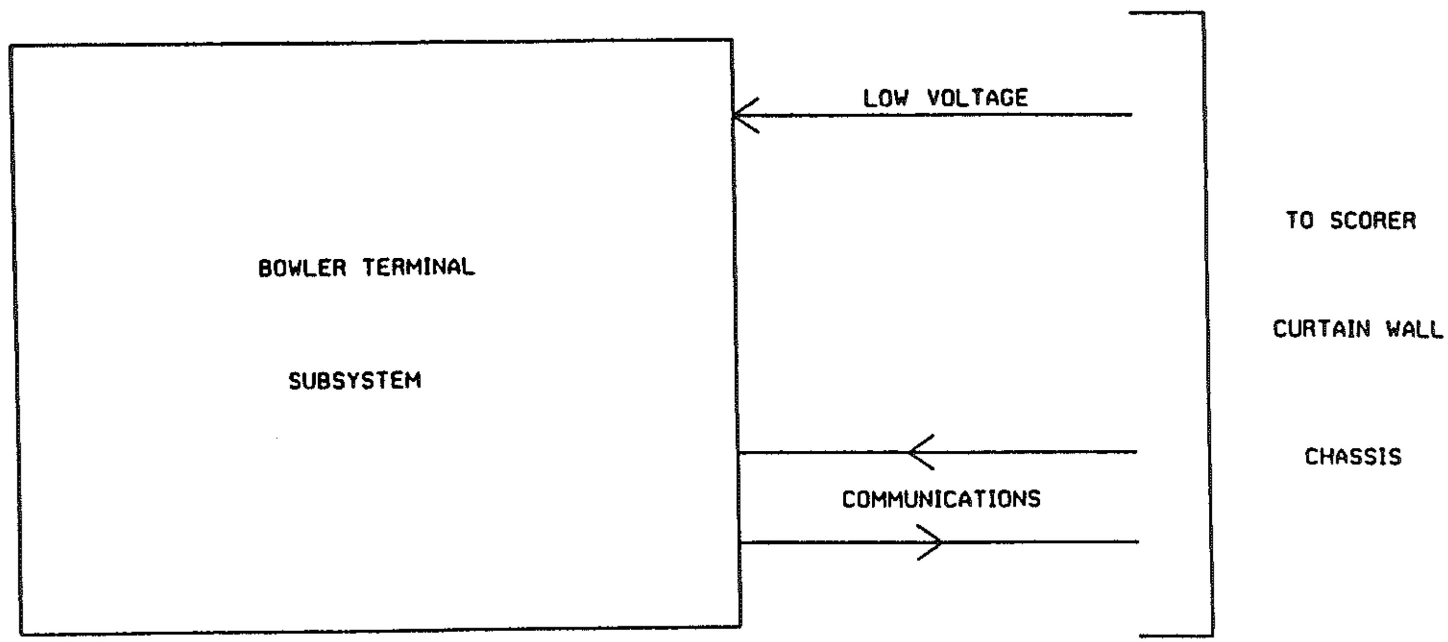


FIGURE 4

ACCUSCORE PLUS

BOWLER TERMINAL TO SCORER INTERFACE SIGNALS

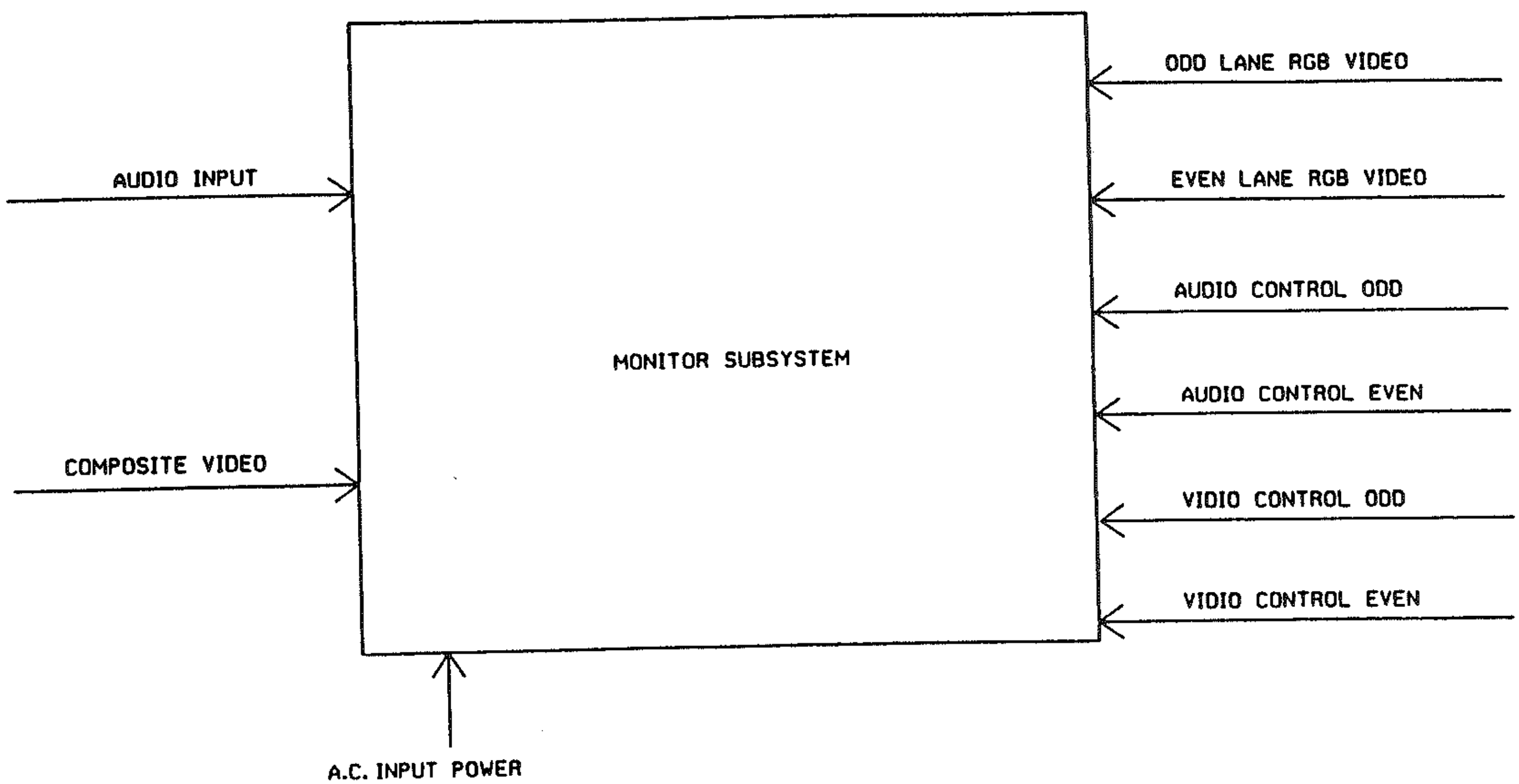


FIGURE 5
ACCUSCORE PLUS
MONITOR SUBSYSTEM TO SCORER INTERFACE SIGNALS

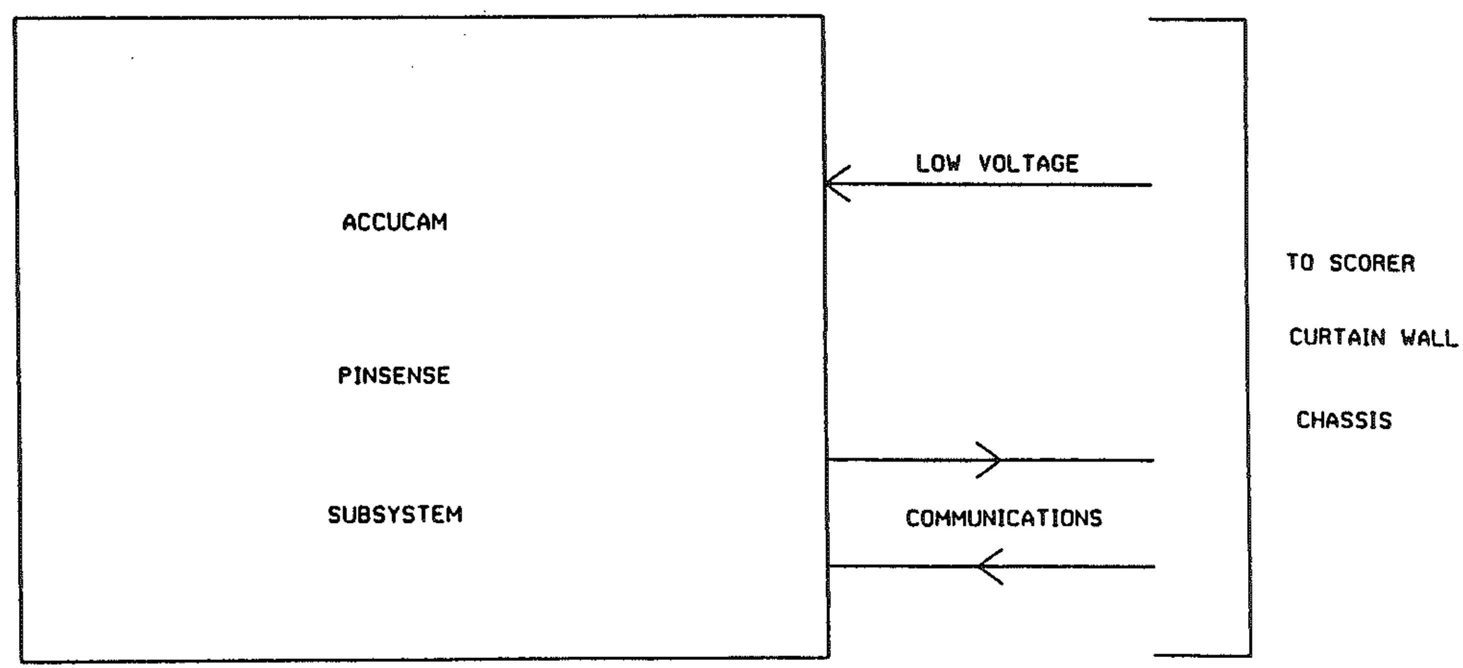
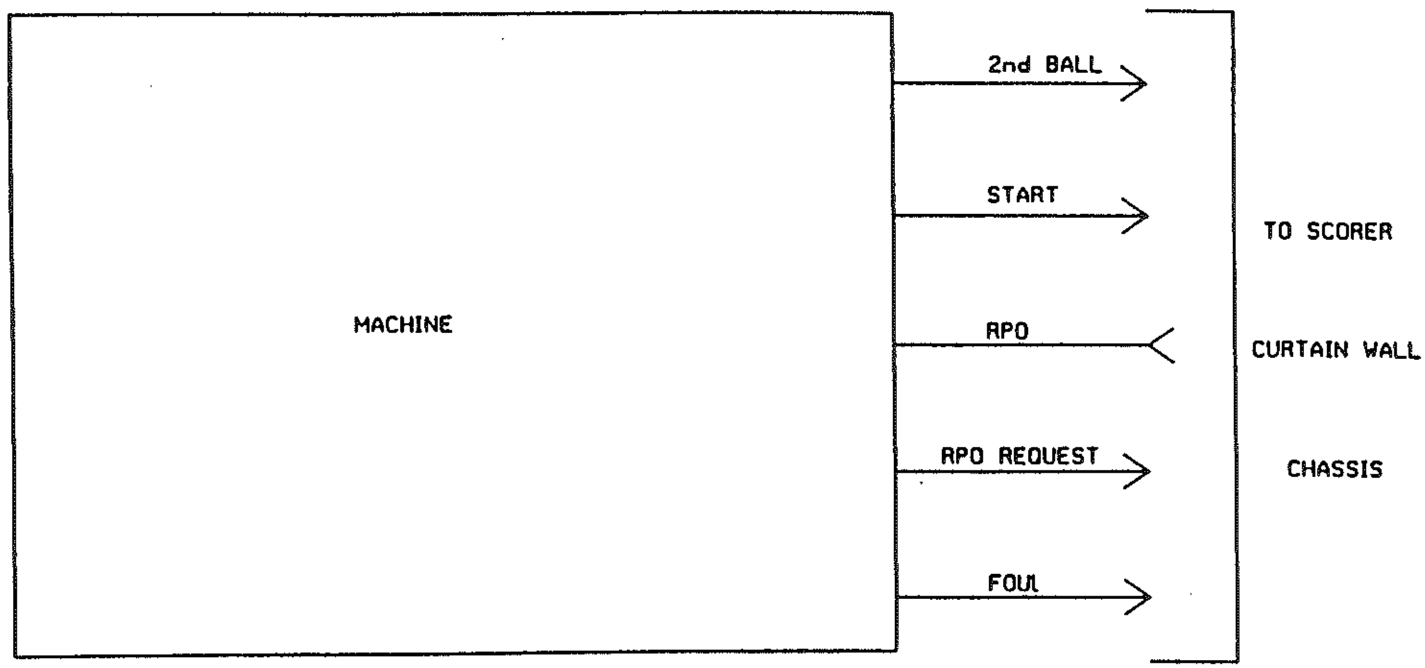


FIGURE 6

ACCUSCORE PLUS
ACCUCAM TO SCORER INTERFACE SIGNAL



* MAY VARY WITH MACHINE TYPE

FIGURE 7

ACCUSCORE PLUS

MACHINE TO SCORER INTERFACE SIGNALS

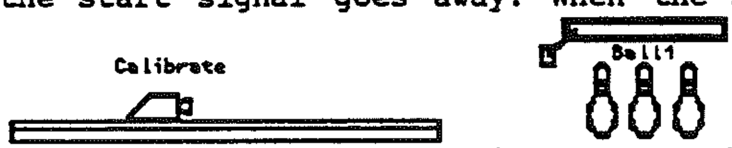
Machine Interaction

The following is a step by step discussion of how the AccuScore Plus system interacts with the machines to which it is connected.

When the AccuScore Plus system is first put in play (bowler bands up) a calibration signal is sent to the AccuCam. At this time, the machine is assumed to have a full deck of pins and the sweep is at home position. This provides AccuCam with an initial reference for pin positions and light levels. If the machine is not ready, a default set of values is used by the AccuCam.

A ball is thrown, which causes a start signal to the AccuScore Plus. The actual mechanism of generating the start signal varies depending upon the machine type, as does the action of the sweep/rake. For the purpose of this discussion we will assume a AMF 82-70 MP machine is used. On the 82-70, the sweep drops to guard position and at the same time a number of actions take place in the AccuScore Plus system. A command to scan the pin deck is communicated to AccuCam, and the state of the Ball 2 and Foul signals is stored. The AccuCam waits 1.2 seconds, for late falling pins, and then scans the pindeck. AccuCam communicates the pinfall back to the AccuScore Plus which in turn communicates mask information to the 82-70 MP chassis.

The machine cycles and as the sweep returns to home position, the start signal goes away. When the start signal goes away after a second ball (ie first ball full deck of pins and sweep up) a calibrate command is sent to AccuCam. This means that AccuCam recalibrates every frame. If the machine drops pins as it is setting a full deck, the AccuCam will be unable to calibrate. If a calibrate is unsuccessful, the values from the previous frame will be used. The only other machine interaction signal which has not been discussed is the RPO request switch. This switch, at the back of the machine, is used to request a Respot Pins Only cycle. Even though AccuCam will scan and calibrate as usual, the AccuScore Plus will not score.



The standard AST & SPD tests can be used with AccuCam for debugging not only pinsensing, but also for testing the machine signals. The pindication display of AST test will show if the AccuScore Plus chassis is receiving a start and a proper ball2 signal. The thing which is different about pinsensing on the AccuScore Plus is that all machine inputs are sampled by the AccuScore Plus chassis, not the pinsense units. This means that noscores and scoring at the wrong time are probably due to the machine signals and/or the AccuScore Plus chassis, not the pinsense unit. The use of the AST test ,and manually entering SPD, will verify that a pinsense unit is operating properly.

ACCUSCORE PLUS C-90
MAINTENANCE

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

REVISION: 00
APRIL 1991

misc\stcovers.pm4

TABLE OF CONTENTS

ACCUSCORE PLUS
MAINTENANCE

1. TOOLS REQUIRED

Degaussing coil	Part #xxx-xxx-xxx
Camera Lens Brush	Part #xxx-xxx-xxx
Lens Cleaning Solution	Part #xxx-xxx-xxx
Pinsense Alignment Tool Kit	Part #xxx-xxx-xxx
MultiMeter (Fluke 77)	Part #xxx-xxx-xxx

2. MAINTENANCE REQUIRED

Curtain Wall Chassis & EPROM Module : None
Bowler Terminal : None
Overhead Monitors :
Degauss overhead monitors once every month by using degaussing coil part # xxx-xxx-xxx and using a circular motion over the monitors. Use "Windex" and a dry cloth to wipe the surface of the monitors as required.
Optical Pinsense Unit :
Align the Optical Pinsense Unit using the procedure described in Section xxx of this manual, on a monthly basis.
Using the camera lens brush, part #xxx-xxx-xxx, wipe the surface of the lens free of any dust or other foreign particles on a monthly basis. If the lens has lane oil or other stubborn contaminate on it, use the lens cleaning solution and a lint-free cloth to remove it.

3. TROUBLESHOOTING

3.1. INTRODUCTION

Troubleshooting the AccuScore Plus system is simplified by classifying the major malfunctions into 10 types:

These 10 types are:

(1) System dead

(2) No scores on both lanes

(3) No scores on one lane

(4) Miss scores on both lanes

(5) Miss scores on one lane

(6) One scorer not communicating

(7) All scorers not communicating

(8) One display black, the other normal

(9) One display either a color or a graphics problem, the other normal.

(10) Both displays are black

(11) Both displays have graphic problems

(12) Bowler terminal problems

Troubleshooting each malfunction is treated on a separate flow chart which is numbered according to the above list. Each flow chart is organized so that the most likely cause of the malfunction is described first. An objective of the flow chart organization is also to minimize trips from the front to the back of the bowling lanes.

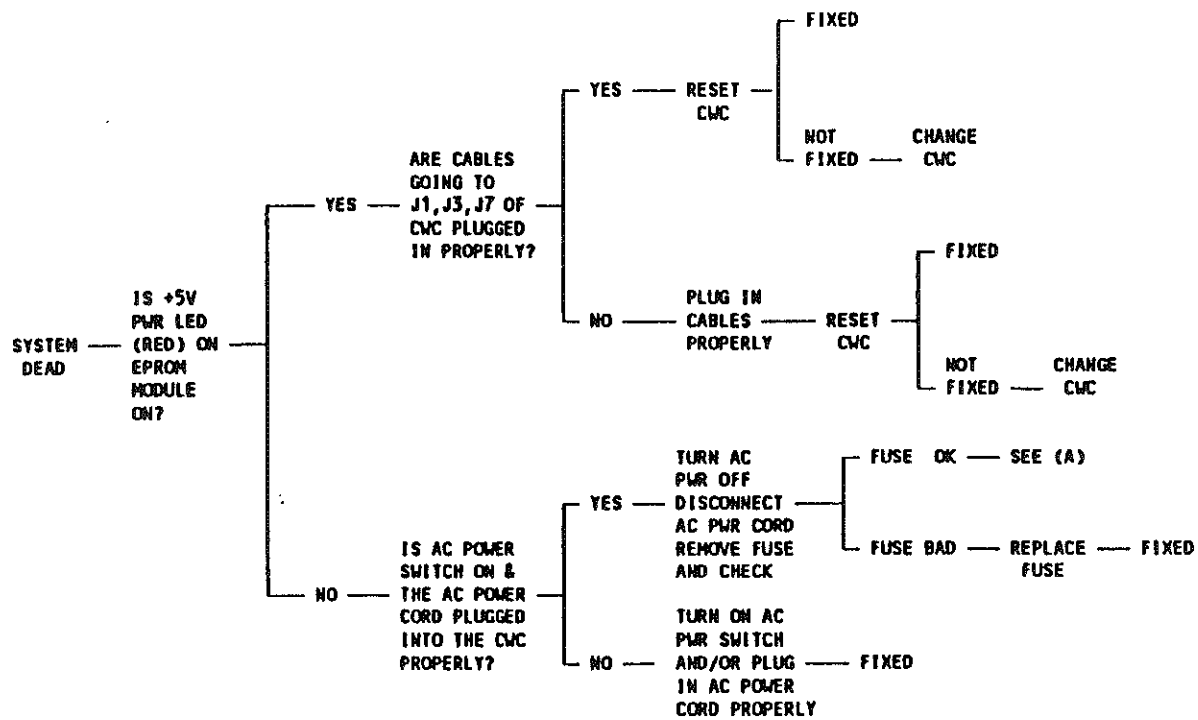
3.2. SUMMARY OF MALFUNCTIONS AND POSSIBLE CAUSES

The following is a list of the major malfunctions and possible causes for these malfunctions.

MALFUNCTION	POSSIBLE CAUSES
1. System dead (no displays, no bowler terminal, no comm.)	**CWC power switch off CWC fuse blown CWC power cord loose House electrical problem CWC EPROM module**
2. No scores on both lanes	**Pinsense switch in align Pinsense comm cable Pinsense power cable Circuit breaker CB1 on CWC popped CWC Optical Pinsensing Unit**
3. No scores on one lane	**Optical Pinsensing Unit CWC Machine problems**
4. Miss scores on both lanes	**Optical Pinsensing Unit not in alignment Optical Pinsense Unit**
5. Miss scores on one lane	**Optical Pinsensing Unit Shiny objects Dirt particles on lens**
6. One scorer not communicating	**"X'ed out" at front desk Lane number switches on EPROM module set wrong EPROM module CWC**

8. All scorers not communicating	Front desk comm cable One bad CWC on daisy chain AccuTrac (AccuDesk) computer RS485 Board DRV-11 Board
9. One display black, the other normal	Ribbon coax Ribbon cable inside overhead monitor assembly Monitor fuse blown Monitor control panel Monitor
9. One display either a color or graphics problem, the other normal	Ribbon coax cable Ribbon cable inside overhead monitor assembly CWC Monitor
10. Both displays are black	Ribbon coax cable not plugged in Ribbon cables inside overhead monitor assembly CWC Monitor control panel Monitor House electrical problem
11. Both displays have graphic problems	CWC Ribbon coax cable
12. Bowler terminal problems	Bowler terminal comm cable Bowler terminal power cable CWC Bowler terminal board Bowler terminal keyboard

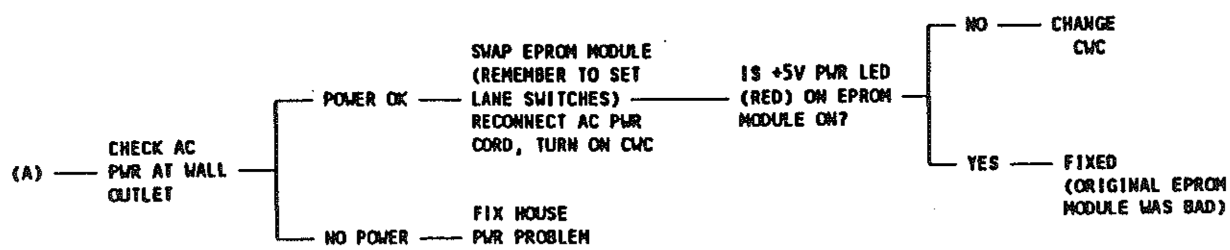
3.3.TROUBLESHOOTING FLOW CHARTS



1. SYSTEM DEAD

(NO DISPLAYS, NO BOWLER TERMINAL, NO COMM.

PAGE 1



1. SYSTEM DEAD (CON'T)

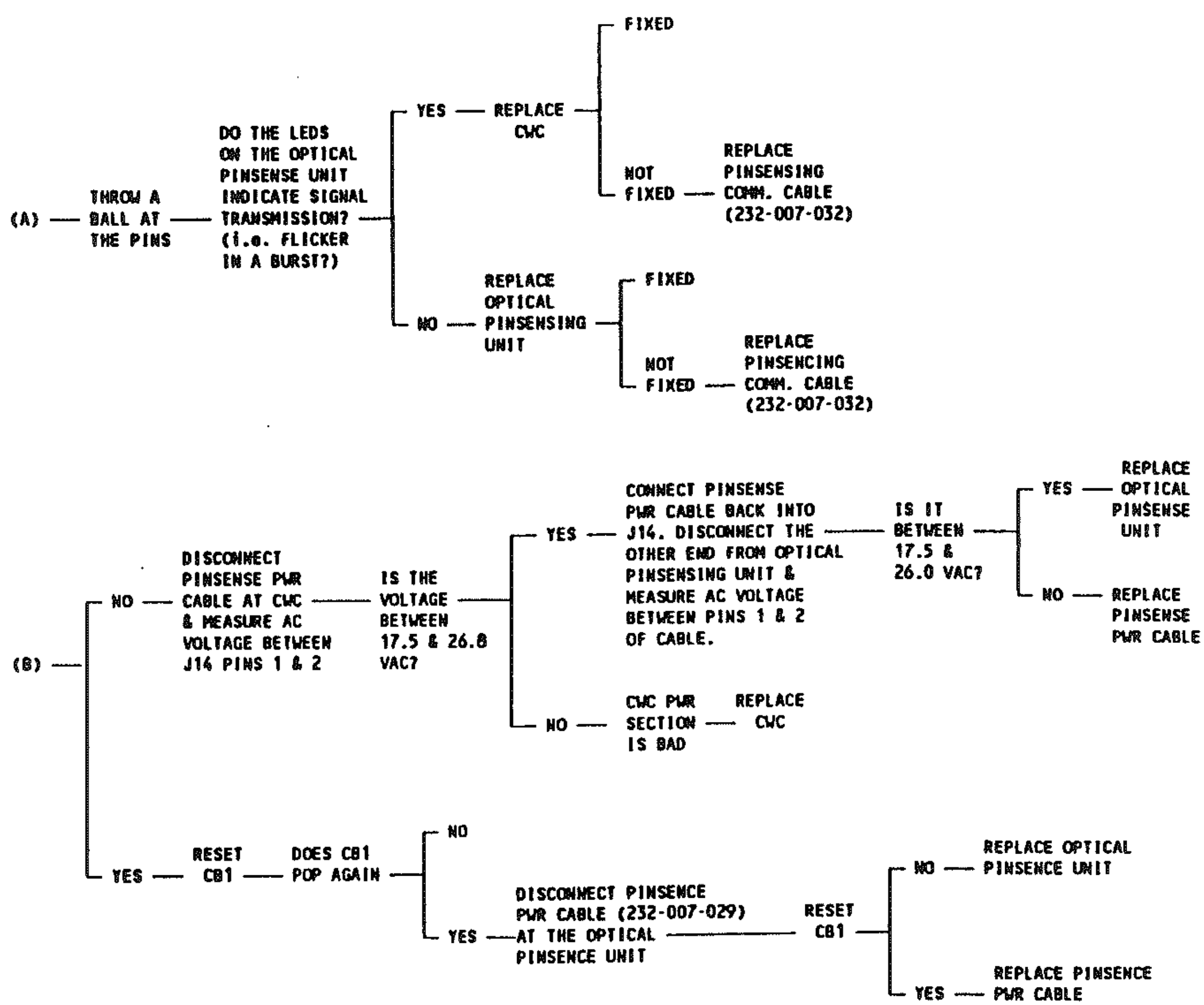
(NO DISPLAYS, NO BOWLER TERMINAL, NO COMM.)

PAGE 2

- NO SCORES ON BOTH LANES
  - DOES OPTICAL PINSENSING UNIT HAVE PWR GOING TO IT (i.e. IS AT LEAST ONE LED ON THE UNIT ON?) NOTE: ON EARLIER UNITS, THE SHROUD MUST BE REMOVED TO SEE THE LEDS.
    - YES — ENSURE THAT:
      (i) PINSENSING COMM CABLE (232-007-032) IS PLUGED IN AT BOTH ENDS, AND
      (ii) THE RUN/ALIGN SWITCH ON THE OPTICAL PINSENSING UNIT IS IN THE RUN POSITION
      - FIXED
      - NOT FIXED — SWITCH CWC OFF & BACK ON
        - FIXED
        - NOT FIXED — SEE (A)
    - NO — IS CWC ON
      - NO — TURN ON CWC
      - YES — IS PINSENSE PWR CABLE (232-007-029) PLUGGED IN AT BOTH ENDS?
        - NO — PLUG IN CABLE
        - YES — IS CIRCUIT BREAKER CB1 ON CWC POPPED? — SEE (B)

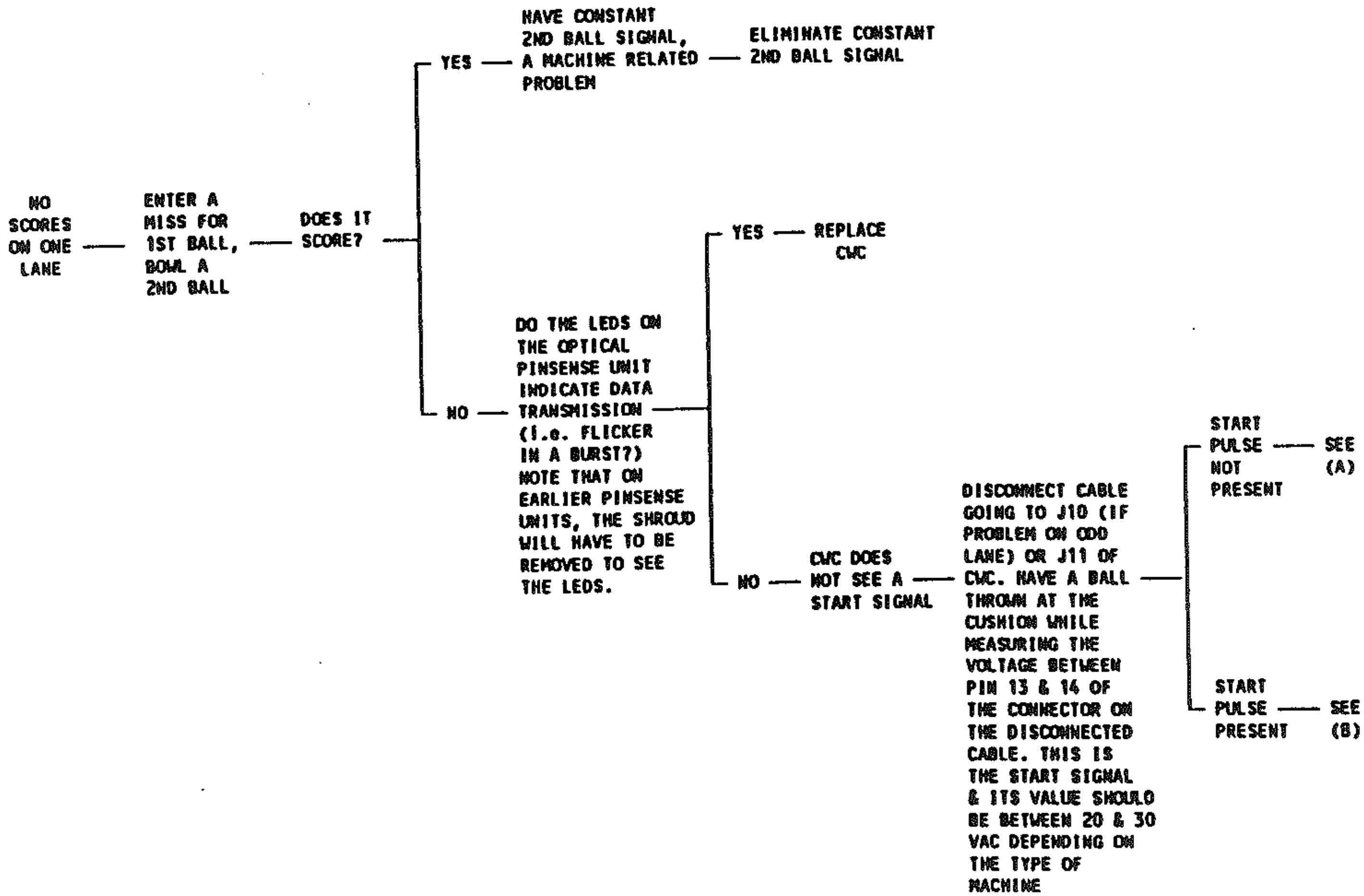
2. NO SCORES ON BOTH LANES

PAGE 1



2. NO SCORES ON BOTH LANES (CON'T)

PAGE 2



3. NO SCORES ON ONE LANE

PAGE 1

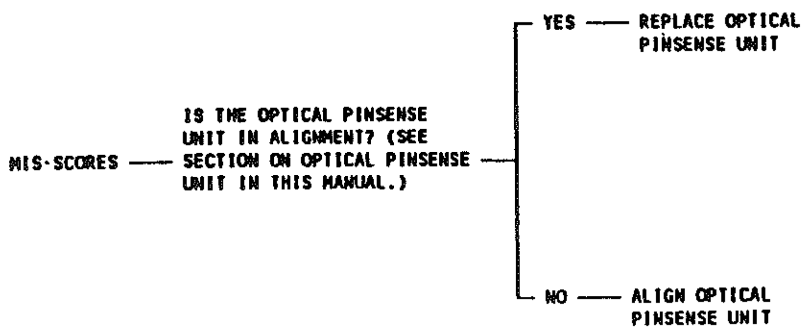
- (A) — CHECK MACHINE CABLES
  - CABLES OK — MACHINES RELATED PROBLEM (NO START SIGNAL) — CORRECT MACHINE PROBLEM
  - CABLES NOT OK — REPLACE BAD CABLE(S)

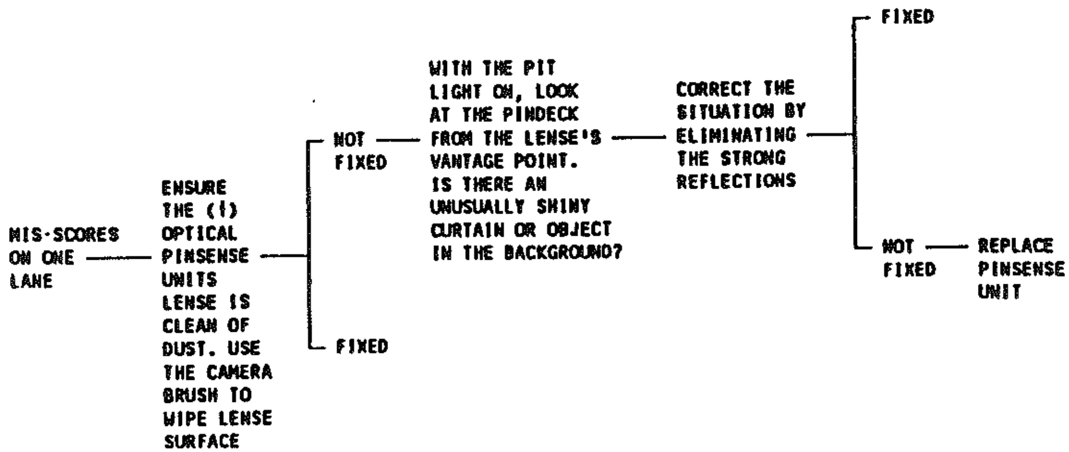
- (B) — REPLACE CWC

3. NO SCORES ON ONE LANE (CON'T)

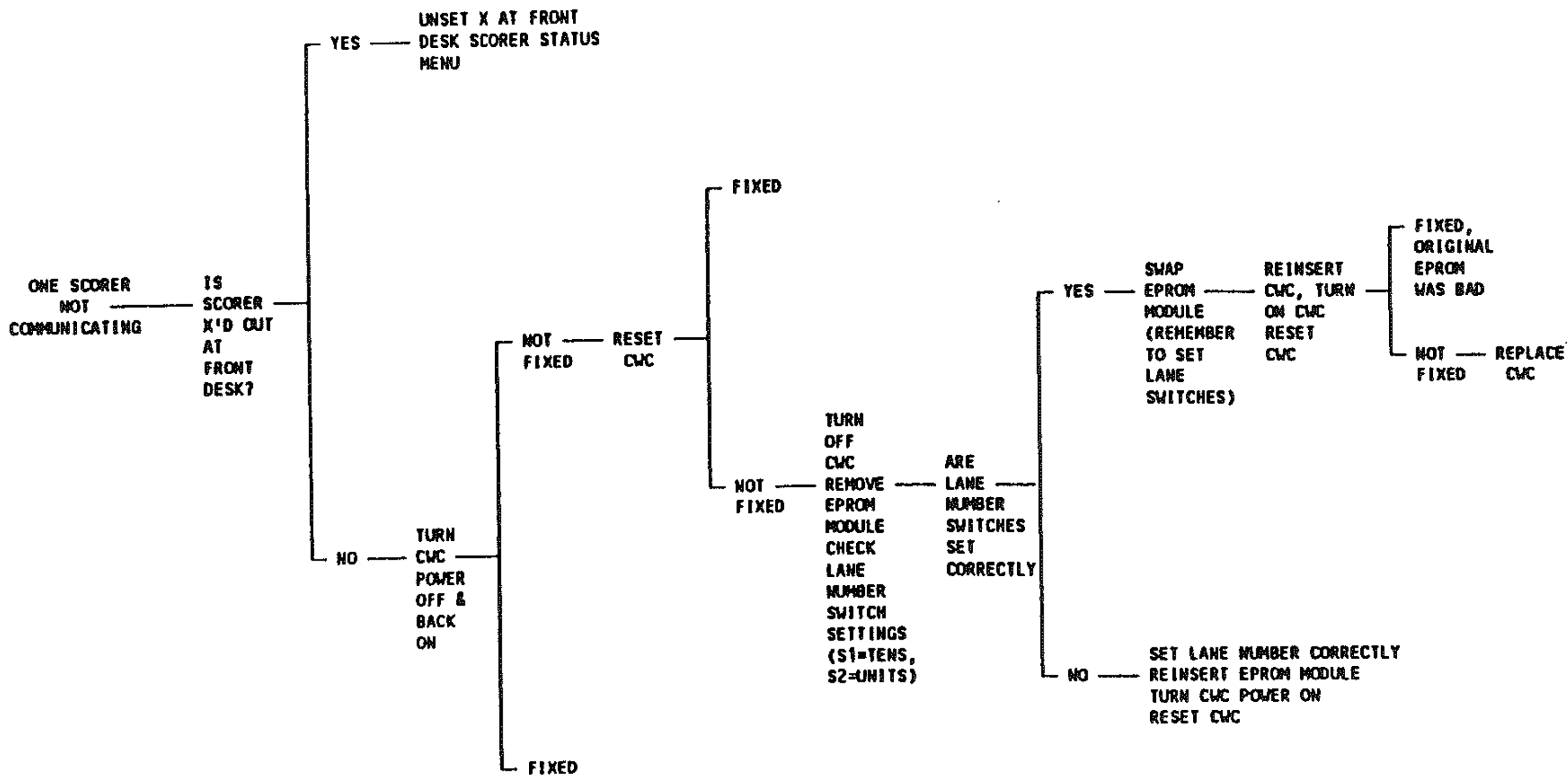
PAGE 2

4. MIS-SCORES ON BOTH LANES

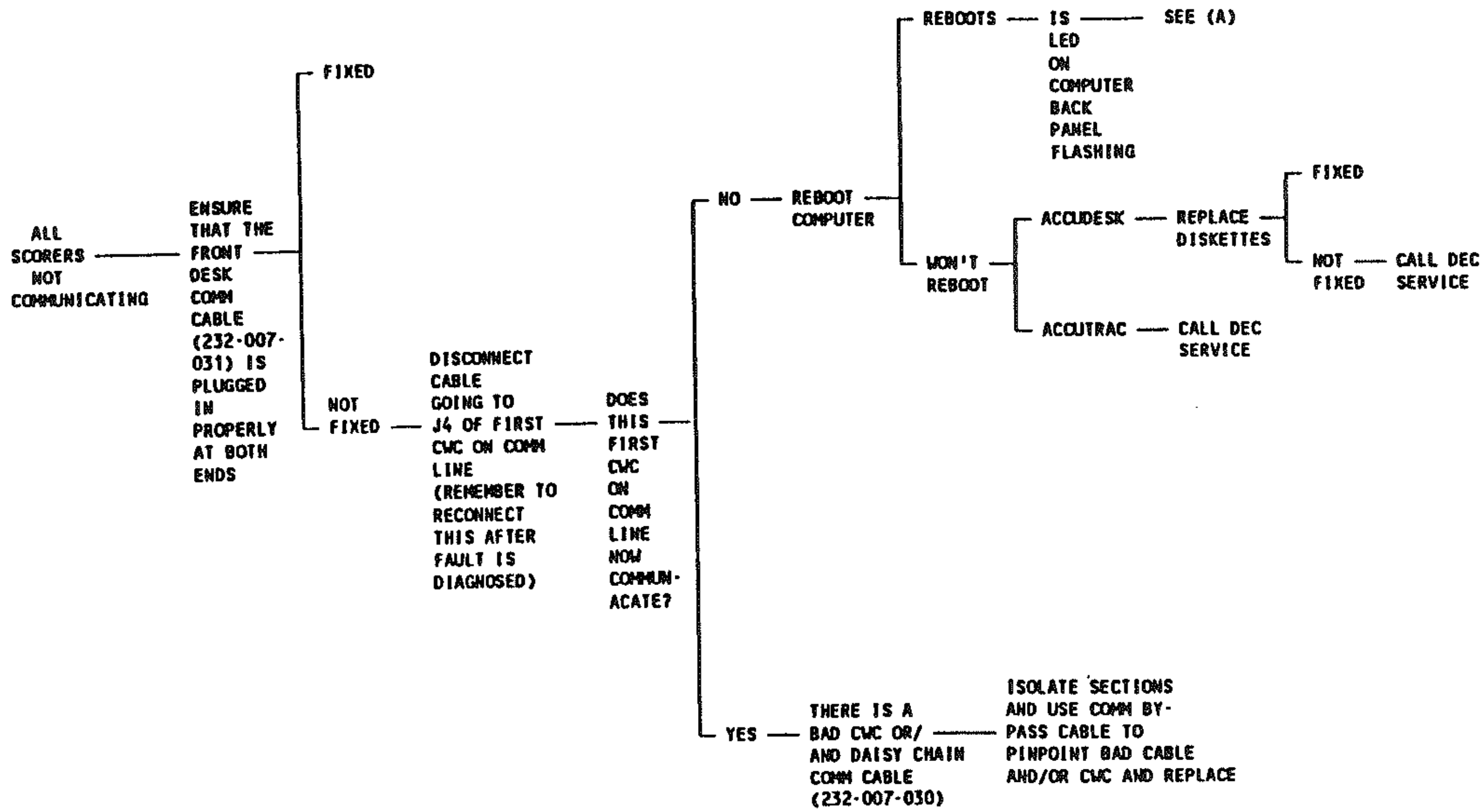




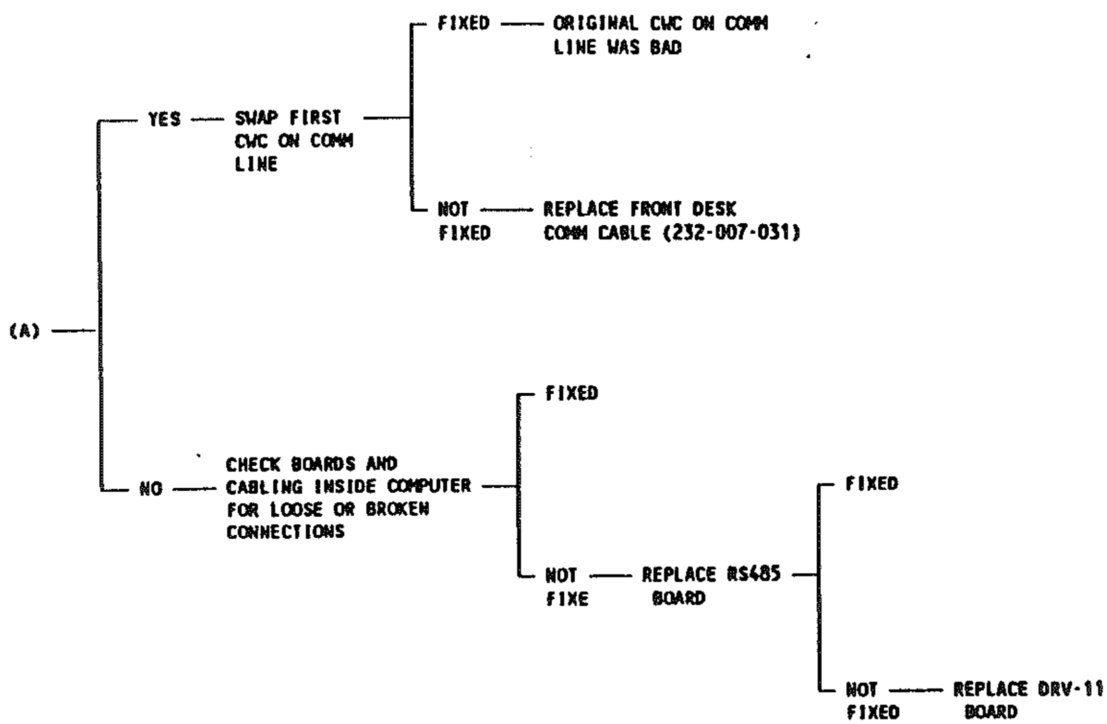
5. MIS·SCORES ON ONE LANE



6. ONE SCORER NOT COMMUNICATING

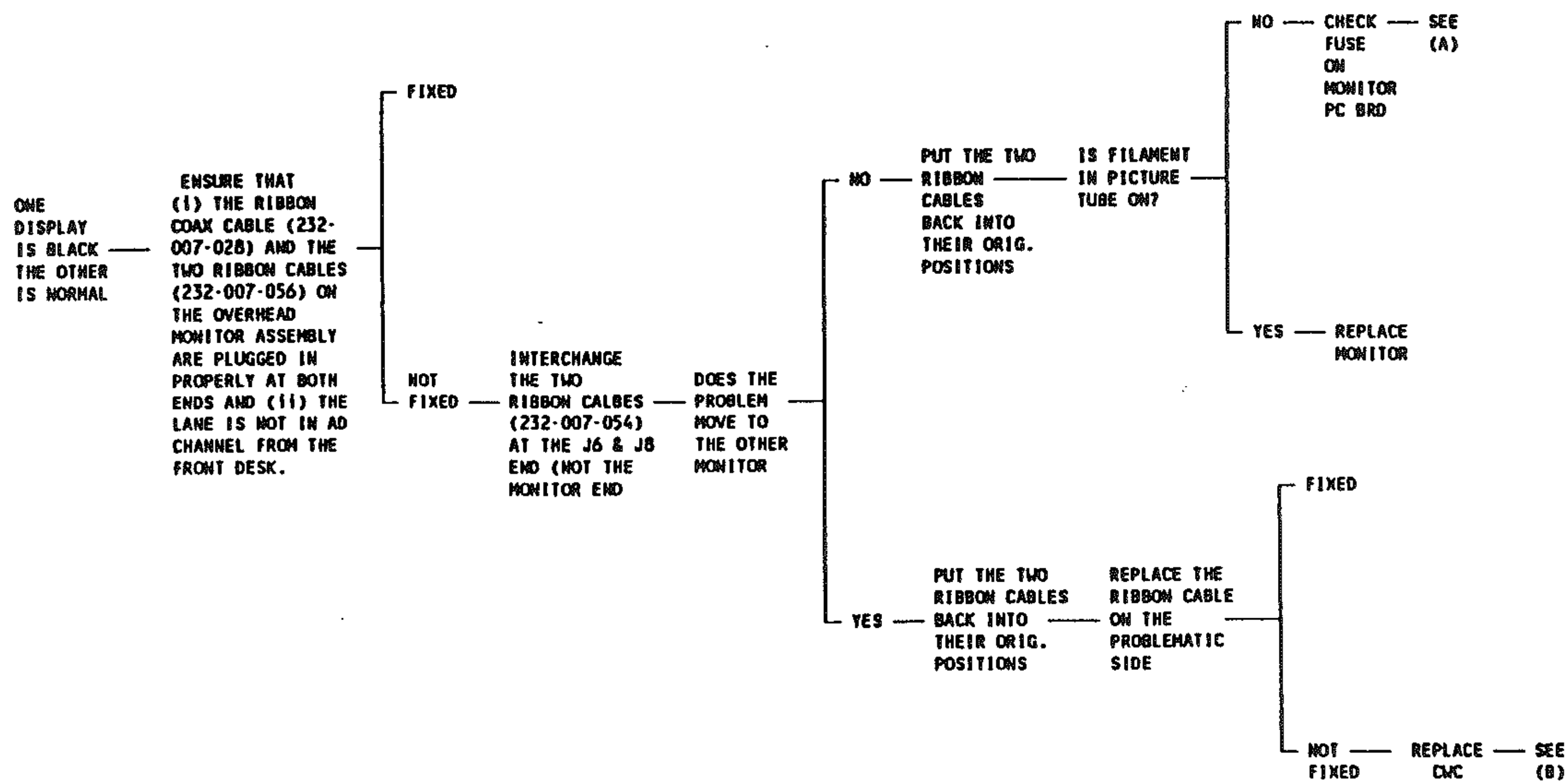


7. ALL SCORERS NOT COMMUNICATING



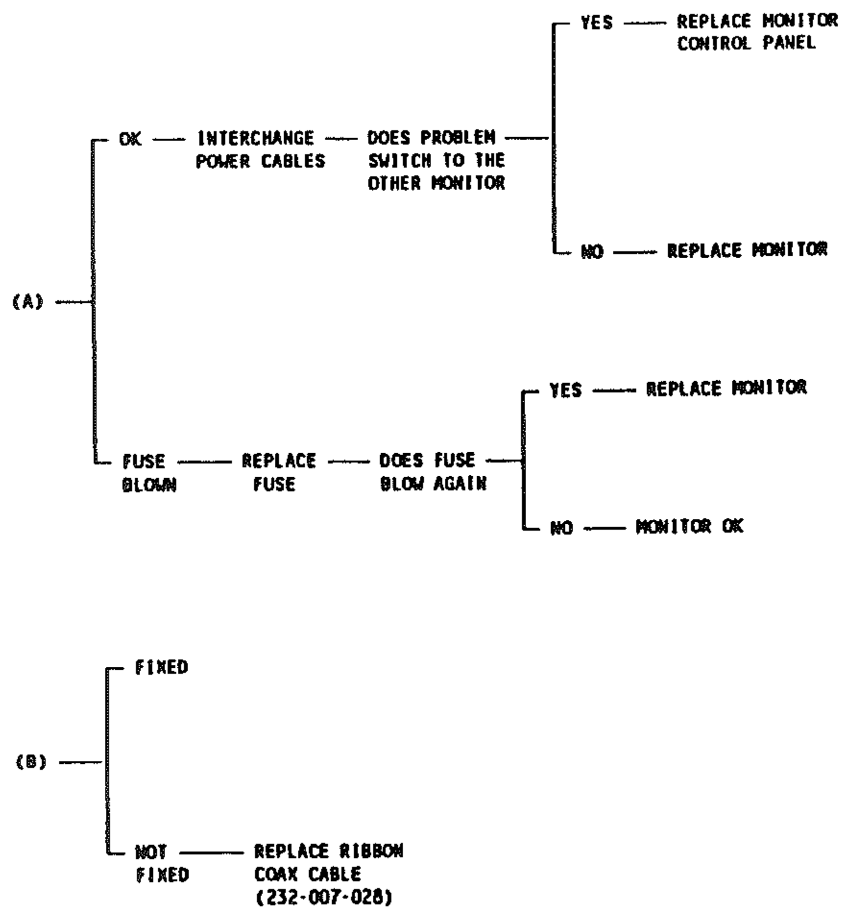
7. ALL SCORERS NOT COMMUNICATING (CON'T)

PAGE 2



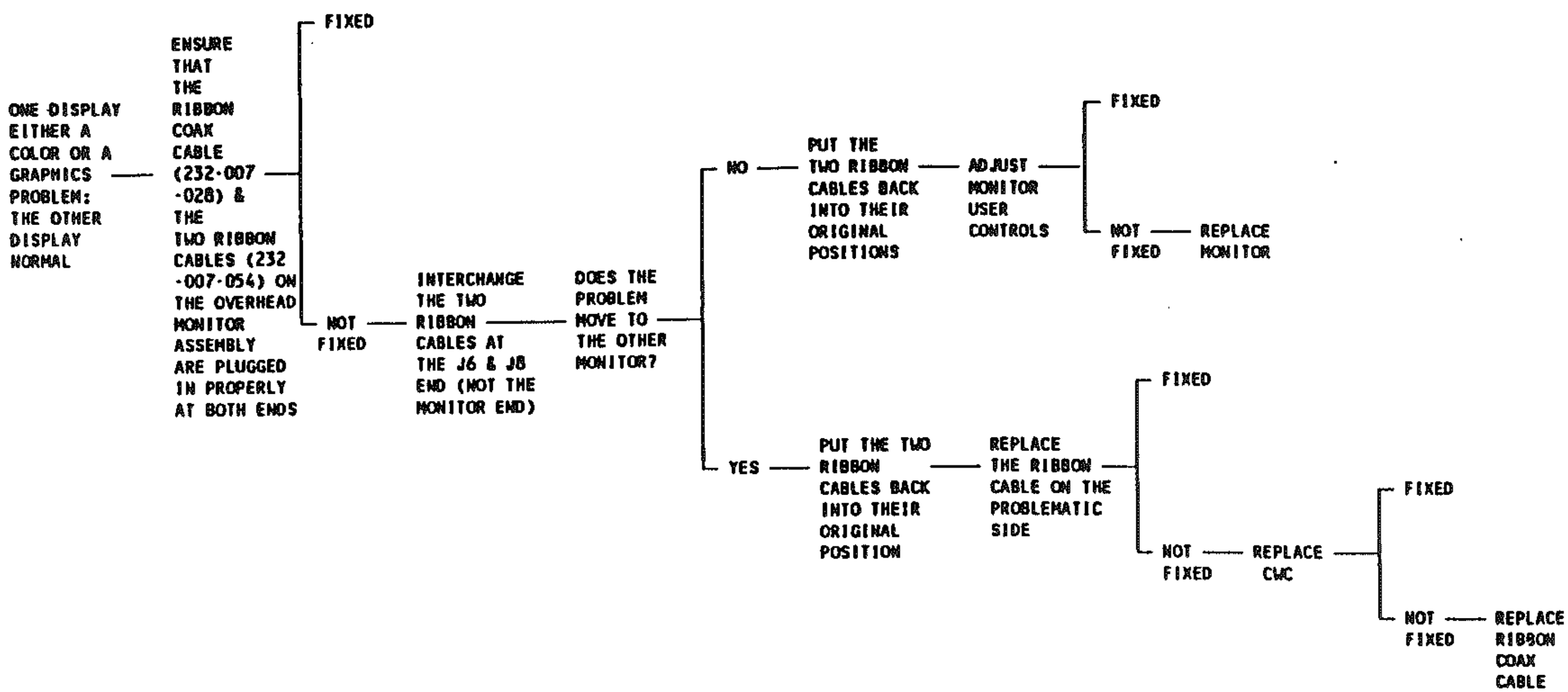
8. ONE DISPLAY BLACK, THE OTHER NORMAL

PAGE 1

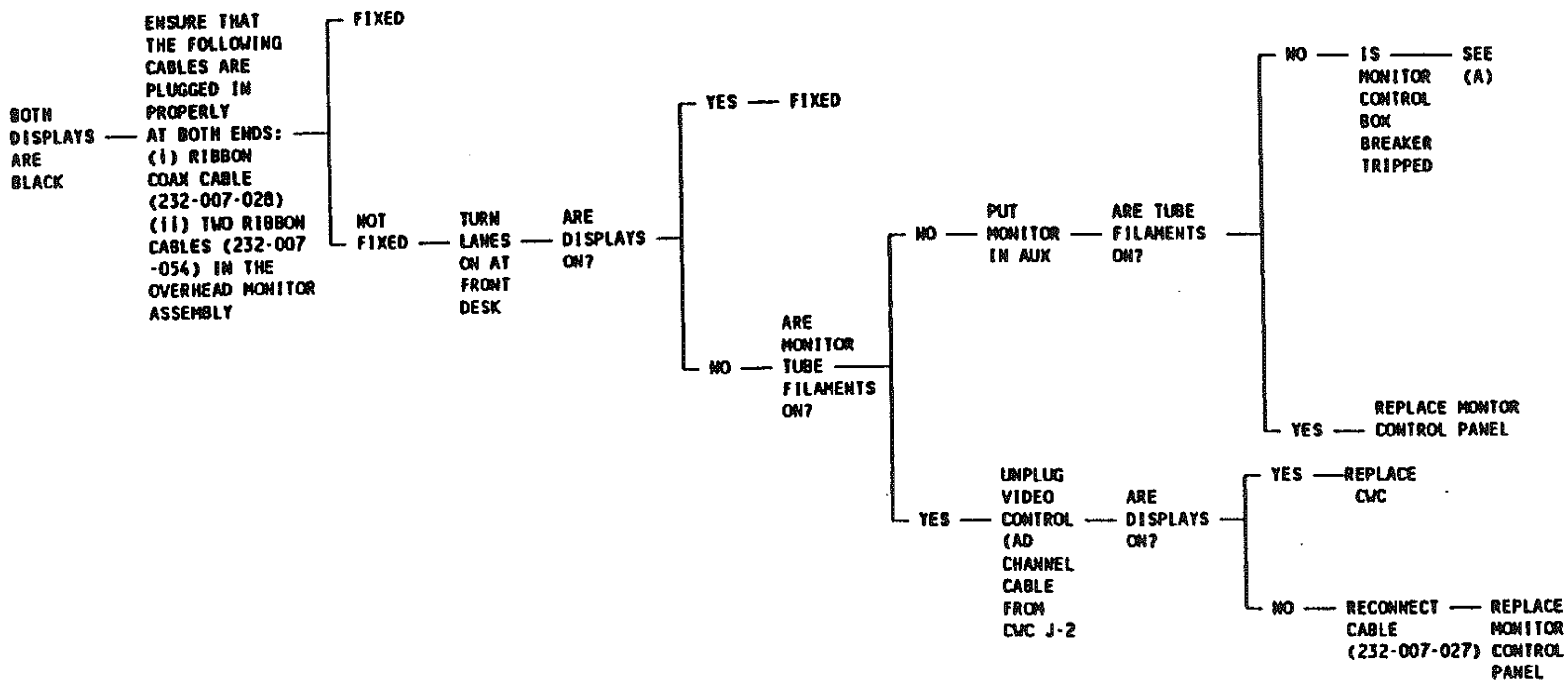


8. ONE DISPLAY BLACK, THE OTHER NORMAL

PAGE 2

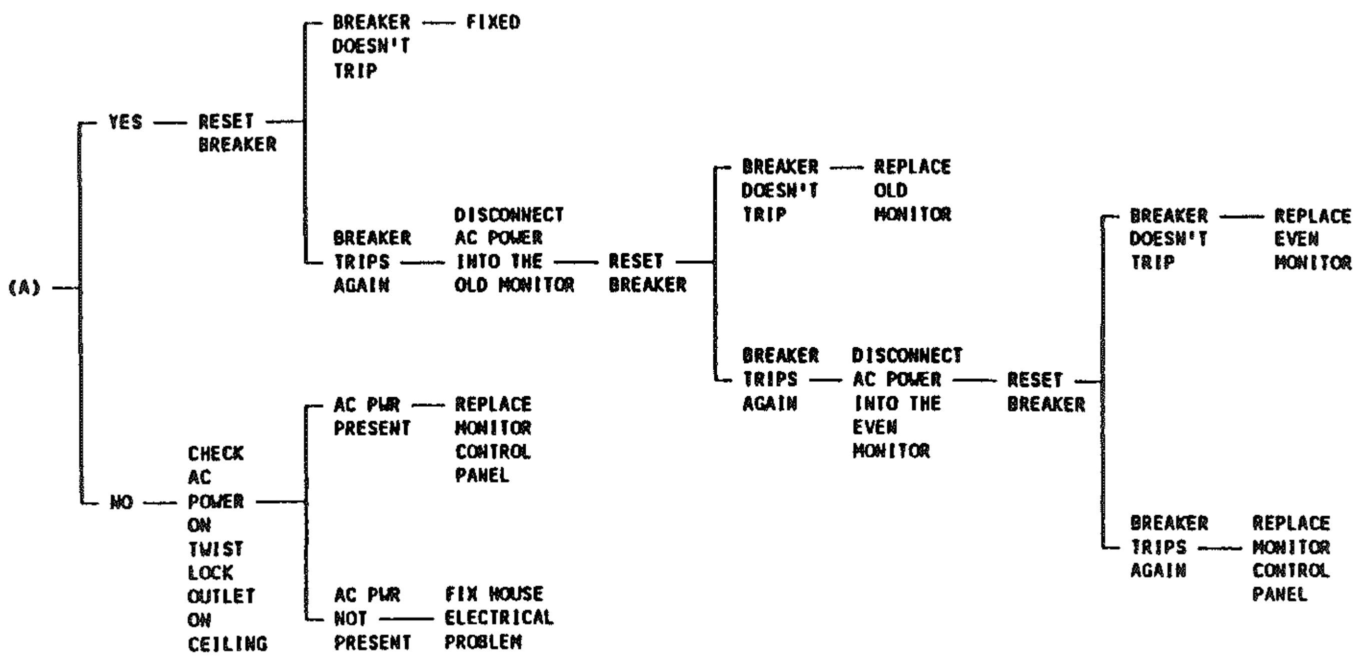


9. ONE DISPLAY EITHER A COLOR OR A GRAPHICS PROBLEM, THE OTHER NORMAL



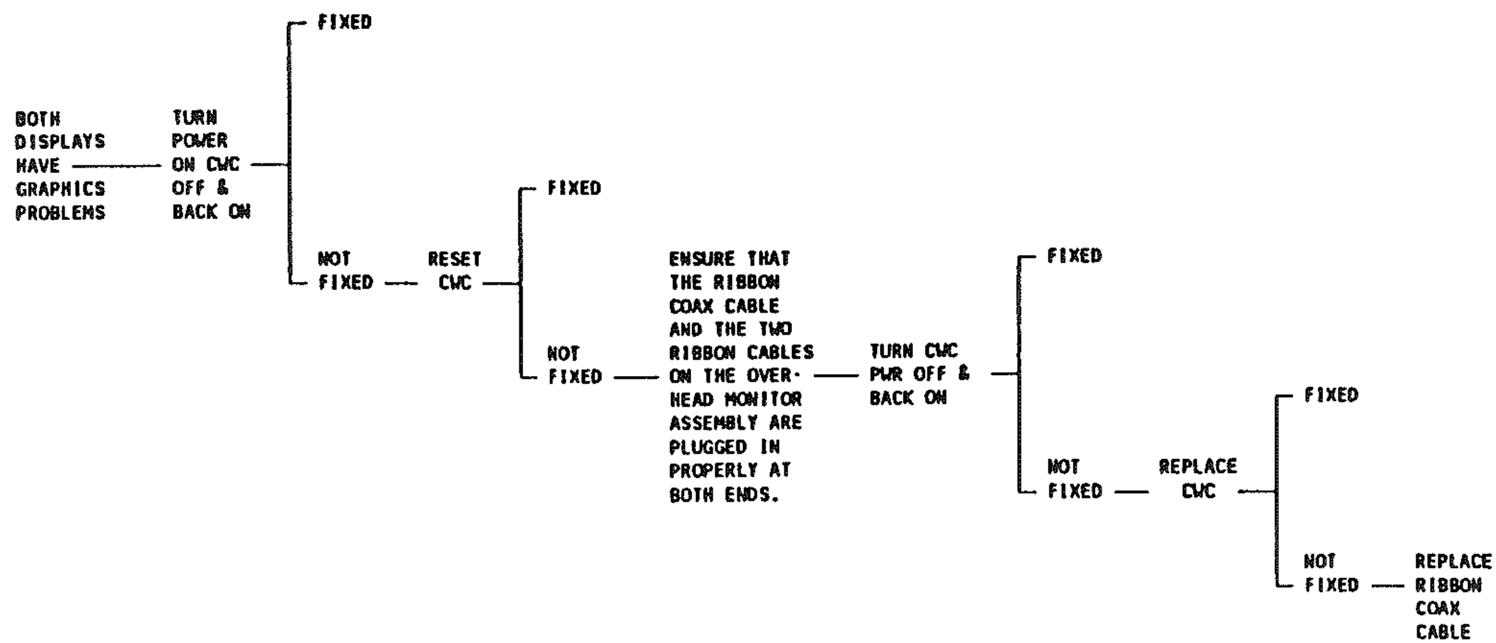
10. BOTH DISPLAYS ARE BLACK

PAGE 1

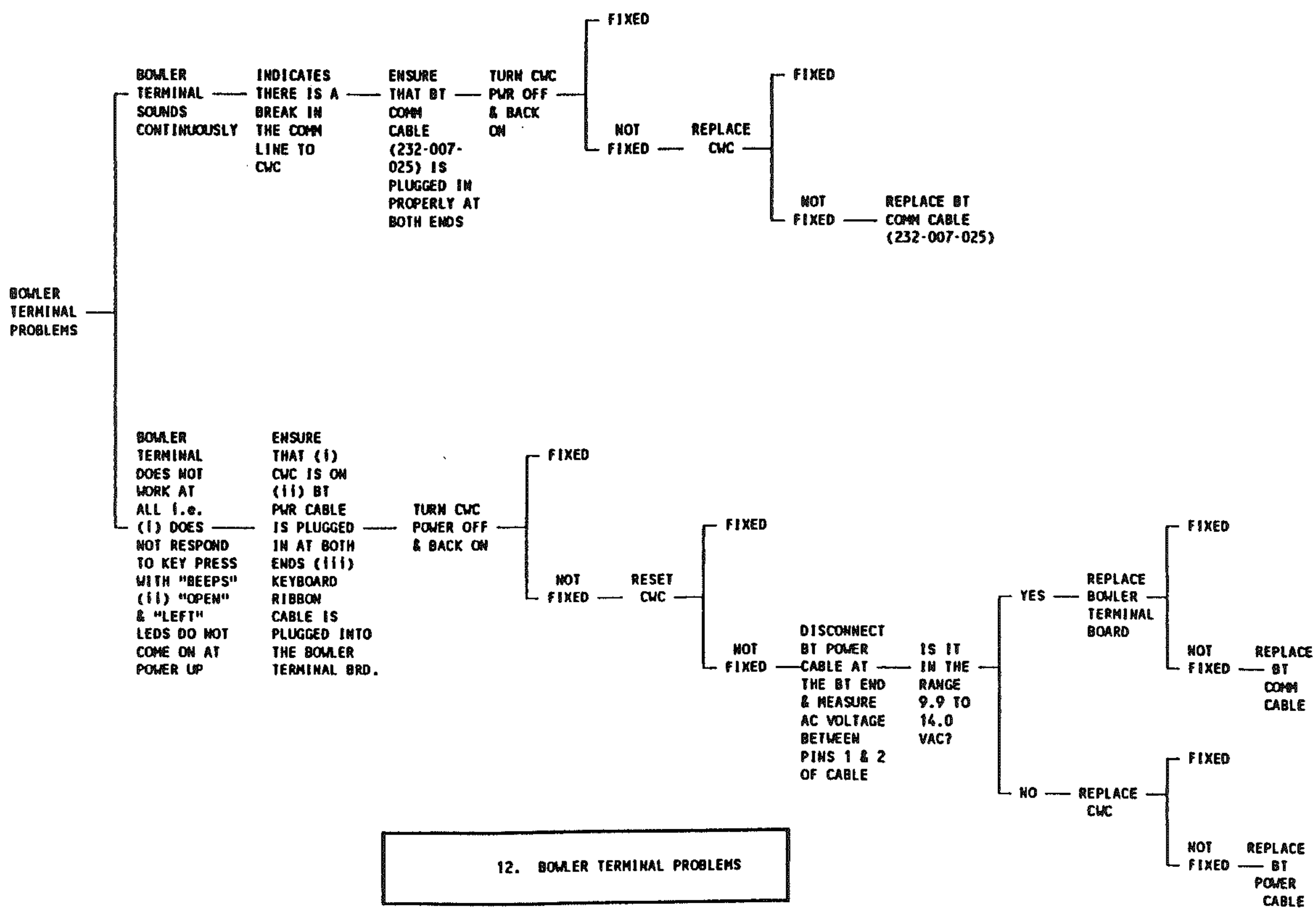


10. BOTH DISPLAYS ARE BLACK

PAGE 2



11. BOTH DISPLAYS HAVE GRAPHIC PROBLEMS



12. BOWLER TERMINAL PROBLEMS

SCREEN PRINTED FROM SSDR05 ON 06/10/97 @164701 OPID=KLAUCKC TERM #072

******** ******** ******** ********   ******** ******** ******** ********

205-10   BOSS/3000   Inventory Control

Plant	Item-ID	Description	Unit
100	808539240	SCR-BT CP10-24X1 1/2*SEE NOTE*	EA

Select Action (X) ===> Bin-Locations: Lot-Numbers: Usage-History:
Notes: P/R INVENTORY: P/R ORDERS:

Qty-on-Hand:	450.00	----- CUSTOMER ORDER RESERVATIONS ----			
Qty-Allocated:	.00	Priority-1	Priority-2	Backorders	
Qty-Scrapped:	.00	.00	.00	.00	
Qty-Defective:	.00	Future Customer Orders:		.00	
Qty-in-Inspect:	.00				
Qty-in-Transit:	.00	Lead-Days:	20	Sales-Record:	Y
Qty-ONHD-Max:	.00	Cycle-Count-Days:	0	Make/Buy:	B
Qty-Staged:	.00	Low-Order-PT:	0.00	Serial-Number:	N
Standard-Cost:	0.090	Safety-Stock:	1.00	Lot-Number:	N
Excise-Tax:	0.000	Econ-Order-Qty:	0.00	Produce/Stock:	S
Freight:	.00 %	Forecast-Demand:	0.00	Multi-Bin:	Y
Date-Last-Count:	10/27/93	Date-Last-Use:	02/20/96	Calculate-EOQ:	Y
Date-Last-Adjust:	04/16/96	Date-Last-Transfer:	/ /		
Min Sale Qty:	5.00	G/L Code:	011300000		
Avg-Cost:	0.140	Domestic Price:	0.420		

PICK ACTION(S); FCN-8=PRINT; FCN1=EXIT

***** ******** ******** ********   ******** ******** ******** ********

Exit f2 f3 f4 f5 f6 Help Print

******** ******** ******** ********   ******** ******** ******** ********

HOLD RUBBER MAT
TO PEDESTEL BASE
EA / BOWL TEAM

AMF

ACCUSCORE PLUS C-90
PARTS

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

REVISION: 00
APRIL 1991

ACCUSCORE PLUS PARTS

DESCRIPTION	PART NUMBER
KIT, INST. 8270 MP	612-320-750
KIT, INST. 8270 A/B SS	612-320-751
KIT, INST. 8230	612-320-752
KIT, INST. 82-3000 WO SPARE	612-320-753
KIT, INST. 82-3000 W SPARE	612-320-754
KIT, INST. BRUNS. A2	612-320-755
KIT, INST. BRUNS. A1 115VAC	612-320-756
KIT, INST. BRUNS. AS 230VAC	612-320-757
KIT, INS. BRUNS. A1 SHOTGUN	612-320-758
KIT, INST. BRUNS.-ZOT 115VAC	612-320-759
KIT, INST. BRUNS.-ZOT 230VAC	612-320-760
KIT, INST. BRUNS.-ZOT AIR 115VAC	612-320-761
KIT, INST. BRUNS.-ZOT AIR 230VAC	612-320-762
KIT, INST. BOWL-MOR	612-320-763
KEYBOARD - REPLACEMENT SPEC	612-320-712
KEYBOARD - REPLACEMENT RAISED KEY	612-320-812
KIT SPARE PARTS 115/230	612-320-848
KIT REMOTE CHANNEL INST.	612-320-851
KIT MONITOR 230-115VAC X FORMER	612-320-847
DOUBLE MONITOR SUPPORT FRAME	232-008-040
COVER/GRILL MONITOR C'90	232-008-063
MONITOR BEZEL C'90	232-008-034
ACCUSCORE LOGO STRIPE MONITOR	232-008-043C
LOGO STRIPE BOWLER TERM	232-008-112C
AMF LOGO LENS C'90	232-008-067
LIGHT BULB TUBULAR 25W	751-000-150
CHAIN	705-870-401
CARTRIDGE, FISH LINE	730-049-044
BOWLER TERM CAP	232-008-095
ASSY TURN BUCKLE	232-008-048
REAR MOUNTING BRACKET MONITOR	232-008-033
HANGER SUPPORT ASSY	232-008-071
COVER MOUNTING BRACKET	232-008-036
MONITOR HANGER	232-008-032
COVER MONITOR REAR HOUSING	232-008-037

ACCUSCORE PLUS PARTS

DESCRIPTION	PART NUMBER
PAINT, CHARCOAL BROWN	039-009-800
PAINT LIGHT FAWN	039-009-801
PAINT SHARK'S TOOTH GRAY	039-006-565
PAINT DOVE GREY	039-006-566
VIDEO TERMINATOR PLUG	218-002-606
VOLTAGE ARRESTOR 120 VAC	218-002-608
CUBIC RGU/59 (COAX)	010-103-010
CABLE ASSY COMM. BYPASS	232-007-049
FUSE 1A	748-561-111
FUSE .5A	748-511-721
CONNECTOR COAX	746-014-064
KIT GROUND	612-320-094
AC PWR CORD CWC	232-007-055
DRIVER MANUAL #10	792-837-045
CABLE ASSY. 82-3000 EVEN	232-007-044
CABLE ASSY. 82-3000 SM ODD	232-007-045
CABLE ASSY. 82-3000 SM EVEN	232-007-046
CABLE ASSY. MONITOR RIBBON (INT.)	232-007-054
CABLE ASSY. AC PWR. CORD	232-007-055
KIT, PRINT (115V INST.)	612-320-828
KIT, PRINT (230V INST.)	612-320-829
ACCUSCORE PLUS SERV. MANUAL	610-023-224

ACCUSCORE PLUS PARTS

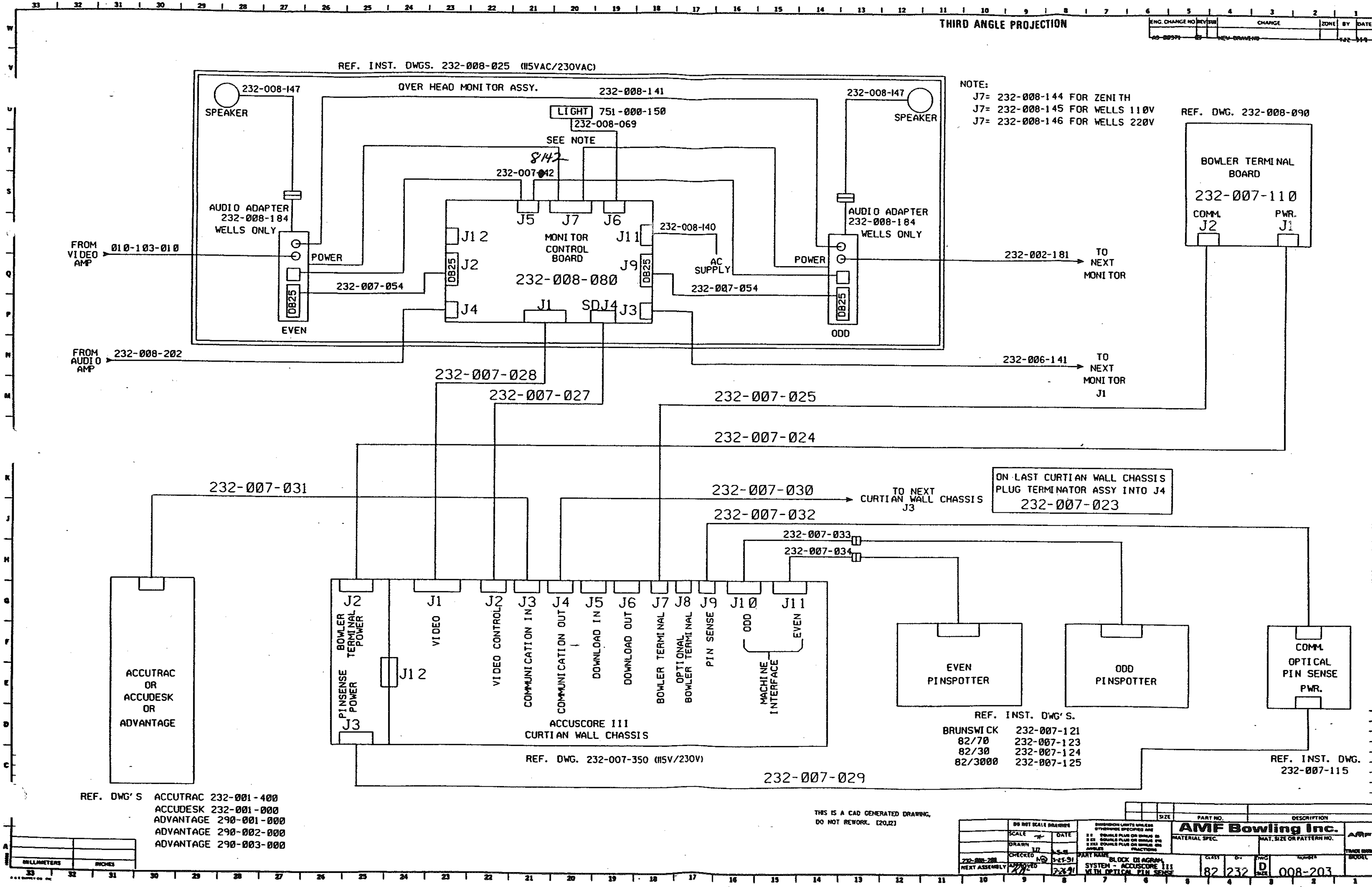
DESCRIPTION	PART NUMBER
CWC 115/230 VAC 50/60 HZ	232-007-350
EPROM MODULE -ENGLISH/PINDICATION	232-007-265
EPROM MODULE -JAPANESE/PINDICATION	232-007-271
EPROM MODULE -GERMAN/PINDICATION	232-007-270
EPROM MODULE -FRENCH/PINDICATION	232-007-269
EPROM MODULE -SWEDISH/PINDICATION	232-007-291
EPROM MODULE -SPANISH/PINDICATION	232-007-268
EPROM MODULE -HEBREW/PINDICATION	232-007-095
EPROM MODULE -DANISH/PINDICATION	232-007-460
EPROM MODULE -ITALIAN/PINDICATION	232-007-462
EPROM MODULE -DUTCH/PINDICATION	232-007-464
BOWLER TERMINAL CONSOLE	612-32-0846
MONITOR FRAME ASSY	612-32-0845
MONITOR COLOR 27" ZENITH	232-008-057
MONITOR COLOR 27" WELLS	232-008-056
RS 485 TERMINATOR ASSY	232-007-023
AMPLIFIER AUDIO	232-008-065
AMP VIDEO DISTRIBUTION	232-007-360
BOWLER TERMINAL BOARD	232-007-110
CABLE ASSY. AUDIO HOME RUN	232-008-202
CABLE ASSY. BT POWER	232-007-024
CABLE ASSY. BT COMMUNICATION	232-007-025
CABLE ASSY. MONITOR CONTROL	232-007-027
CABLE ASSY. MONITOR COAX RIBBON	232-007-028
CABLE ASSY. INTRA CHASSIS	232-007-030
CABLE ASSY. FRONT DESK COMM.	232-007-031
CABLE ASSY. UNI. MACH. ODD	232-007-033
CABLE ASSY. UNI. MACH. EVEN	232-007-034
CABLE ASSY. 8270 MP ODD	232-007-035
CABLE ASSY. 8270 MP EVEN	232-007-036
CABLE ASSY. 8270 A/B SS ODD	232-007-037
CABLE ASSY. 8270 A/B SS EVEN	232-007-038
CABLE ASSY. 8230 ODD	232-007-039
CABLE ASSY. 8230 EVEN	232-007-040
CABLE ASSY. BRUNSWICK ODD	232-007-041
CABLE ASSY. BRUNSWICK EVEN	232-007-042
CABLE ASSY. 82-3000 ODD	232-007-043

ACCUCAM PARTS

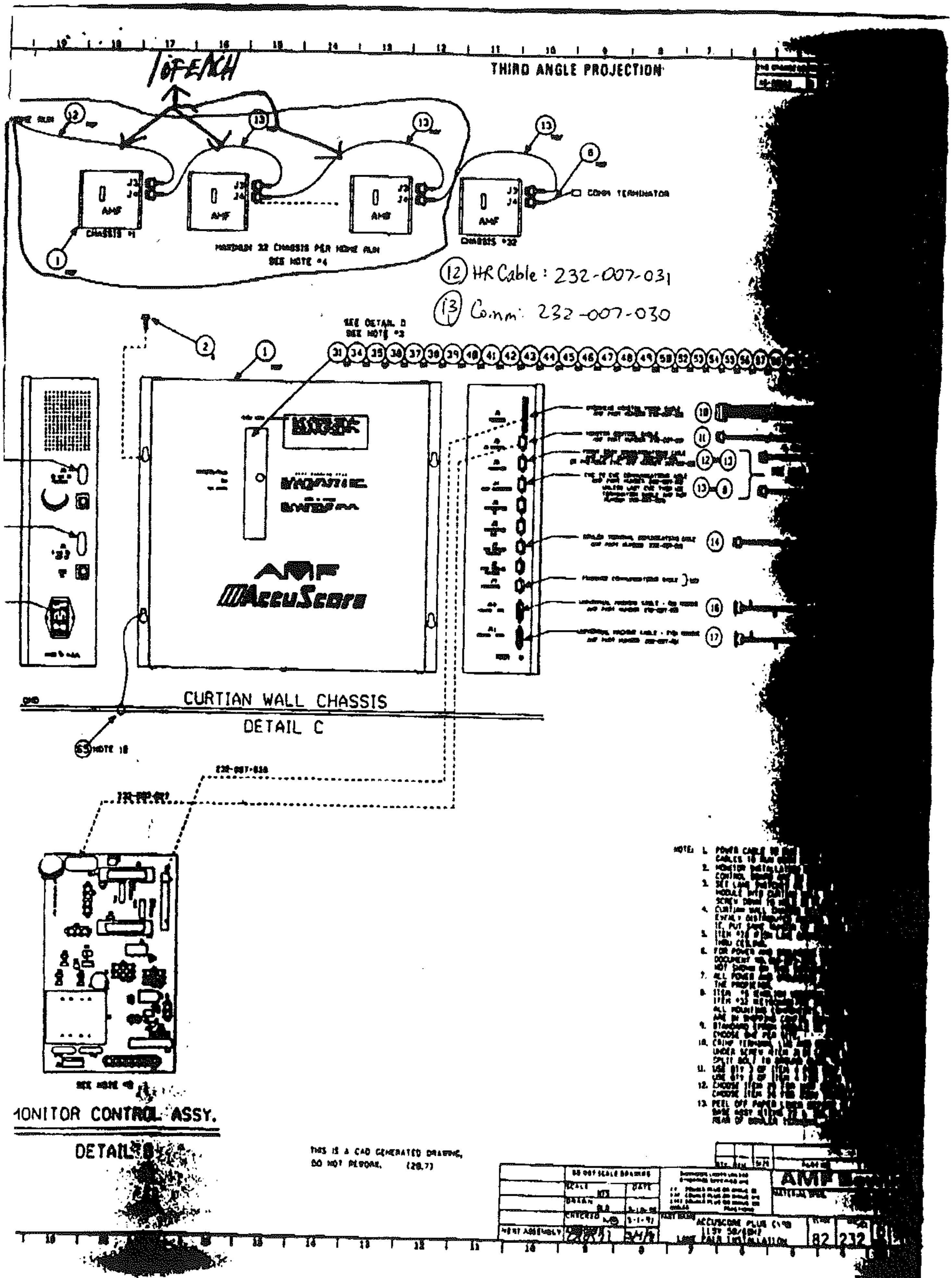
DESCRIPTION	PART NUMBER
OPTICAL PINSENSING UNIT	244-001-000
SHROUD, (AMF LANES ONLY)	244-001-008
SHROUD, (BRUNS. LANES ONLY)	244-001-009
CABLE ASSY. PINSENSE COMM. (ACCUCAM)	232-007-032
CABLE ASSY. PINSENSE POWER (ACCUCAM)	232-007-029
KIT, ALIGNMENT-OPTICAL UNIT	612-320-715

ACCUCAM OVERLANE BALL RETURN PARTS

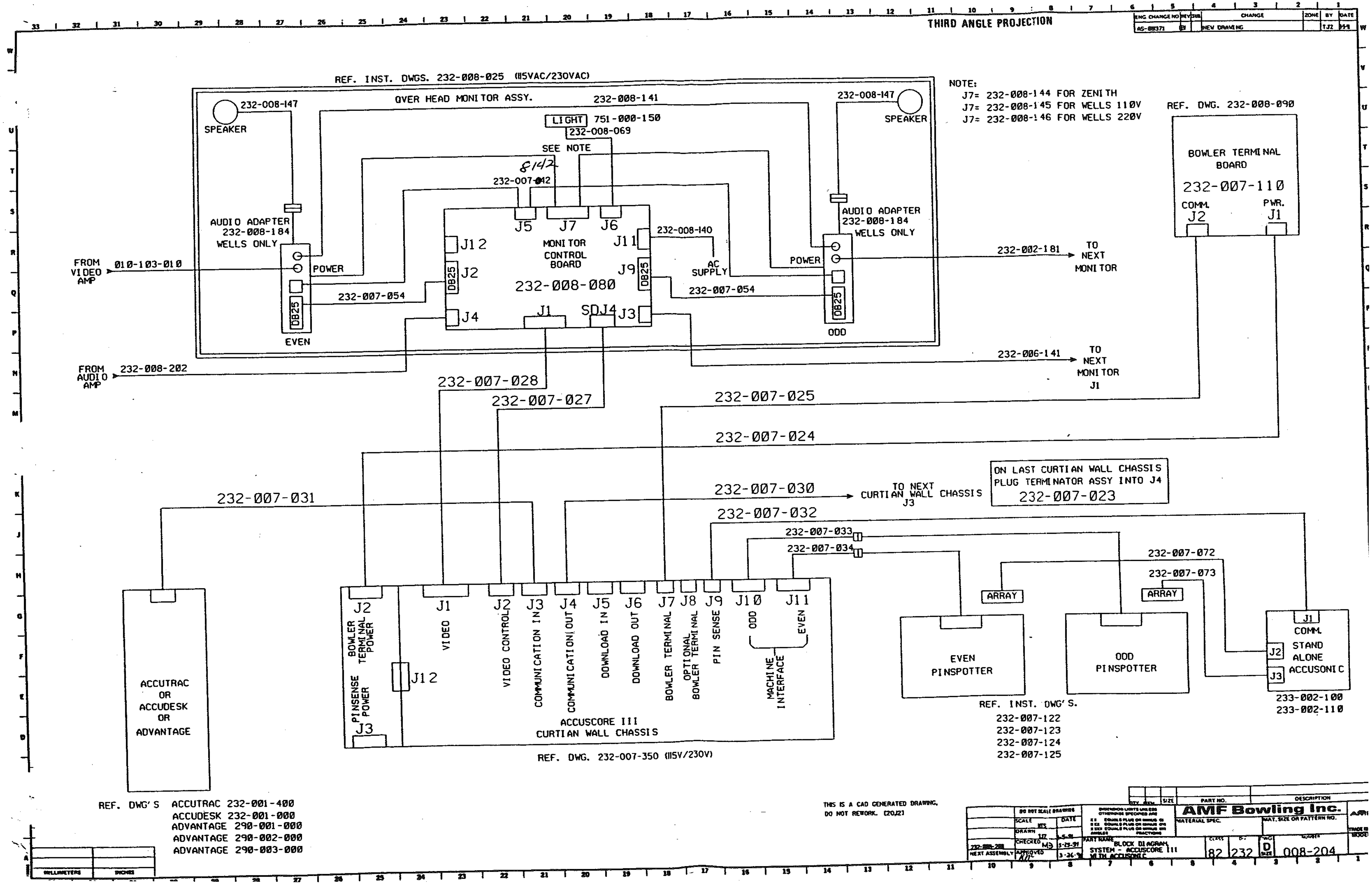
DESCRIPTION	PART NUMBER
OVERLANE CAMERA	244-001-090
OVERLANE HOOP	244-001-091
OVERLANE CAMERA KIT	612-44-0010



THIRD ANGLE PROJECTION
REF. INST. DWGS. 232-008-025 (115VAC/230VAC)
OVER HEAD MONITOR ASSY.
232-008-147
SPEAKER
232-008-141
LIGHT 751-000-150
232-008-069
SEE NOTE
8142
232-007-042
J5 J7 J6
AUDIO ADAPTER
232-008-184
WELLS ONLY
POWER
J12
MONITOR CONTROL BOARD
J11
232-008-140
J2
DB25
232-008-080
J9
AC SUPPLY
232-007-054
J4
J1
SDJ4
J3
EVEN
ODD
FROM VIDEO AMP
010-103-010
FROM AUDIO AMP
232-008-202
232-002-181
TO NEXT MONITOR
232-006-141
TO NEXT MONITOR J1
NOTE:
J7= 232-008-144 FOR ZENITH
J7= 232-008-145 FOR WELLS 110V
J7= 232-008-146 FOR WELLS 220V
REF. DWG. 232-008-090
BOWLER TERMINAL BOARD
232-007-110
COMM. J2
PWR. J1
232-007-028
232-007-027
232-007-025
232-007-024
232-007-031
232-007-030
TO NEXT CURTIAN WALL CHASSIS J3
ON LAST CURTIAN WALL CHASSIS PLUG TERMINATOR ASSY INTO J4
232-007-023
232-007-032
232-007-033
232-007-034
J2 BOWLER TERMINAL POWER
J1 VIDEO
J2 VIDEO CONTROL
J3 COMMUNICATION IN
J4 COMMUNICATION OUT
J5 DOWNLOAD IN
J6 DOWNLOAD OUT
J7 BOWLER TERMINAL
J8 OPTIONAL BOWLER TERMINAL
J9 PIN SENSE
J10 ODD
J11 EVEN
MACHINE INTERFACE
J12
PINSENSE POWER
J3
ACCUSCORE III
CURTIAN WALL CHASSIS
REF. DWG. 232-007-350 (115V/230V)
ACCUTRAC OR ACCUDESK OR ADVANTAGE
EVEN PINSPOTTER
ODD PINSPOTTER
COMM.
OPTICAL PIN SENSE
PWR.
REF. INST. DWG'S.
BRUNSWICK 232-007-121
82/70 232-007-123
82/30 232-007-124
82/3000 232-007-125
REF. INST. DWG.
232-007-115
232-007-029
REF. DWG'S ACCUTRAC 232-001-400
ACCUDESK 232-001-000
ADVANTAGE 290-001-000
ADVANTAGE 290-002-000
ADVANTAGE 290-003-000
THIS IS A CAD GENERATED DRAWING, DO NOT REWORK.
AMF Bowling Inc.
BLOCK DIAGRAM SYSTEM - ACCUSCORE III WITH OPTICAL PIN SENSE
82 232 D 008-203



THIRD ANGLE PROJECTION
1 of EACH
HOME RUN
CHASSIS #1
CHASSIS #32
COMM TERMINATOR
MAXIMUM 32 CHASSIS PER HOME RUN
SEE NOTE #4
(12) HR Cable: 232-007-031
(13) Comm: 232-007-030
SEE DETAIL D
SEE NOTE #3
AMF
AccuScore
CURTIAN WALL CHASSIS
DETAIL C
NOTE 10
232-007-030
MONITOR CONTROL ASSY.
DETAIL B
THIS IS A CAD GENERATED DRAWING,
DO NOT REVORK. (28.7)
DO NOT SCALE DRAWING
SCALE
DATE
DRAWN
CHECKED
NEXT ASSEMBLY
ACCUSCORE PLUS
LANE PAIR INSTALLATION
82
232


THIRD ANGLE PROJECTION
REF. INST. DWGS. 232-008-025 (115VAC/230VAC)
OVER HEAD MONITOR ASSY.
232-008-147
SPEAKER
232-008-141
LIGHT 751-000-150
232-008-069
SEE NOTE
8142
232-007-042
AUDIO ADAPTER
232-008-184
WELLS ONLY
POWER
EVEN
ODD
J5 J7 J6
J12
J11
J2
J9
J4
J1
SDJ4
J3
DB25
MONITOR CONTROL BOARD
232-008-080
232-008-140
AC SUPPLY
232-007-054
FROM VIDEO AMP
010-103-010
FROM AUDIO AMP
232-008-202
232-002-181
TO NEXT MONITOR
232-006-141
TO NEXT MONITOR J1
NOTE:
J7= 232-008-144 FOR ZENITH
J7= 232-008-145 FOR WELLS 110V
J7= 232-008-146 FOR WELLS 220V
REF. DWG. 232-008-090
BOWLER TERMINAL BOARD
232-007-110
COMM. J2
PWR. J1
232-007-028
232-007-027
232-007-025
232-007-024
232-007-031
232-007-030
TO NEXT CURTIAN WALL CHASSIS J3
ON LAST CURTIAN WALL CHASSIS PLUG TERMINATOR ASSY INTO J4
232-007-023
232-007-032
232-007-033
232-007-034
232-007-072
232-007-073
ARRAY
ARRAY
J2 J1 J2 J3 J4 J5 J6 J7 J8 J9 J10 J11
BOWLER TERMINAL POWER
VIDEO
VIDEO CONTROL
COMMUNICATION IN
COMMUNICATION OUT
DOWNLOAD IN
DOWNLOAD OUT
BOWLER TERMINAL
OPTIONAL BOWLER TERMINAL
PIN SENSE
ODD
EVEN
MACHINE INTERFACE
J12
PINSENSE POWER
J3
ACCUSCORE III CURTIAN WALL CHASSIS
REF. DWG. 232-007-350 (115V/230V)
ACCUTRAC OR ACCUDESK OR ADVANTAGE
EVEN PINSPOTTER
ODD PINSPOTTER
REF. INST. DWG'S.
232-007-122
232-007-123
232-007-124
232-007-125
J1
COMM.
STAND ALONE ACCUSONIC
J2
J3
233-002-100
233-002-110
REF. DWG'S ACCUTRAC 232-001-400
ACCUDESK 232-001-000
ADVANTAGE 290-001-000
ADVANTAGE 290-002-000
ADVANTAGE 290-003-000
THIS IS A CAD GENERATED DRAWING, DO NOT REWORK.
AMF Bowling Inc.
BLOCK DIAGRAM SYSTEM - ACCUSCORE III WITH ACCUSONIC
82 232 D 008-204
NEW DRAWING

AMF

ACCUSCORE PLUS
PRE-INSTALLATION REQUIREMENTS

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

PART NUMBER 610-32-0241

REVISION: E
APRIL 1991

TABLE OF CONTENTS

ACCUSCORE
PRE-INSTALLATION
ELECTRICAL & ARCHITECTURAL SPECIFICATIONS

1. PRE-INSTALLATION OF PHYSICAL FACILITIES

1.1. PRE-INSTALLATION OF OVERHEAD STRUCTURE FOR MONITORS

Each AccuScore display consists of two 27 inch monitors mounted in tandem on a frame which is suspended from a suitable overhead structure by two 1/8" steel chains. The chains are located so that the monitors are centered over the ball return area of the approach as specified by Illustration 1-1.

Before the monitors can be installed, the proprietor must provide a valid certificate that the overhead structure of the bowling center will support the weight of the monitors. This certification must be in the form of a letter from a registered architect, licensed engineer, or building contractor.

The letter must be on the certifier's letterhead and must include a registration or license number. The following information must be included: (1) name and address of the bowling center, (2) a statement that the bowling center has been inspected and the date of the inspection, and (3) a specific certification that the overhead structure will support at least a three hundred pound load with an adequate safety factor for each pair of lanes.

1.2. PRE-INSTALLATION OF CURTAIN WALL

The customer is also required to certify that the curtain wall will support 50 pounds per lane pair.

1.2.1. INSTALLATION OF CHASSIS MOUNTING SURFACE

At a mimimum, the surface should consist of a one-half inch thick piece of plywood which is two feet wide by four feet long (2'x4'x1/2" thick). The plywood sheet is offset from the curtain wall by two 2"x2"x4' strips, one at the top and one at the bottom.
The 2"x2"x4' strips should be screwed to three joists. The plywood sheet is centered between the pair of lanes and the screwed to the 2"x2" strips. The height of the plywood should be chosen so that the chassis is at a comfortable level to work on. There will need to be at least a 20" by 20" clear space on the plywood to mount the curtain wall chassis.

1.3. INSTALLATION OF APPROACH AREA

A minimum 1" O.D. conduit for low voltage wiring is required below floor level in the settee area. It is to be at a point 4 feet 8 inches from the edge of the approach and in line with the ball return with a one inch stub above the floor. The concrete must be flat and level within 1/4 inch at 16 inch square area with the conduit at its center. The conduit shall terminate under the approach at the 13 inch drop (end of the approach). There will not be any 120 volt AC wiring required at the Bowler Terminal.

2. PRE-INSTALLATION OF ELECTRICAL FACILITIES

2.1. GENERAL

The bowling center proprietor is responsible for the materials and installation of all AC and grounding requirements outlined in this document. All electrical installations must conform to all existing codes, statutes, or standards as defined by local jurisdiction and/or inspections.

2.2. CIRCUIT PANELS REQUIREMENTS

All of the circuit requirements described in this document should be installed using a dedicated distribution panel with an isolated third wire (green) equipment ground tie down buss. These circuits must not share a panel that is or will be used as a power source for any device other than AMF automatic scoring equipment, this also does not allow pinspotters, ball returns, etc. to share this panel. The dedicated distribution panel should get its power source from at least a building main subpanel, but the main panel is recommended.

2.3. CURTAIN WALL CHASSIS POWER SPECIFICATION

A three wire dedicated 120 volt 20 amp 50/60 Hz circuit with a continuous, insulated, third wire (green) equipment ground connecting to the service entrance positive earth ground for each group of twelve pair of lanes is required. An isolated ground outlet, Arrow Hart IG5262 TVSS (Transient Voltage Surge Suppressor), mounted at each lane pair is also required. Each outlet should be mounted within 36 inches from the location that the power cord exists the AccuScore Curtain Wall Chassis. This circuit shall not be connected to or used by any other equipment. Use no wire smaller than number 12 AWG, rated at 600 volts. Where length of circuit home run exceeds 100 feet use number 10 AWG for home run and number 12 AWG minimum between outlets.

NOTE: Each AccuScore Curtain Wall Chassis requires 0.8 amps per pair of lanes.

2.4. REMOTE MONITORS POWER SPECIFICATION

A three wire dedicated 120 volt 20 amp 50/60 Hz circuit with a continuous, insulated, third wire (green) equipment ground connecting to the service entrance positive earth ground for each group of four pair of lanes is required. An isolated ground outlet, such as Hubbell type IG-2310, at each pair of monitors is also required. Use no wire smaller than number 12 AWG, rated at 600 volts. Where length of home run exceeds100 feet use number 10 AWG for home run and number 12 AWG minimum between outlets. A 14 AWG SO cord with twist lock plug must be provided to run from the plug provided by AMF aon the power control box in the monitor housing to the twist lock receptacle above the monitor housing.

NOTE: Each Monitor Assembly requires 3.3 amps per pair of lanes.

2.5. CONTROL DESK AREA POWER SPECIFICATION

The control desk area electrical requirements depend on what type of system has been purchased.

If an AccuDesk has been purchased, refer only to Section 2.5.3 AccuDesk Devices. If an Advantage/ AccuTrac system has been purchased, refer to section 2.5.2 and 2.5.4 Advantage Front Desk Devices and Back Office Devices. The Audio/Video Equipment will be required with either system.

2.5.1. AUDIO/VIDEO EQUIPMENT

The AccuSystem Video Channel Equipment requires provisions at the control desk or back office to locate the customer's video tape recorder, video tuner, color monitor, and AMF's video amplifier, and stereo preamplifier. A three wire dedicated 120 volt 20 amp 50/60 Hz circuit with a continuous, insulated, third wire (green) equipment ground connecting to the service entrance positive earth ground is required. An isolated ground outlet, Arrow Hart IG5262 TVSS (Transient Voltage Surge Suppressor), is also required. Use no wire smaller than number 12 AWG, rated at 600 volts. Provisions must also be made to route the video and audio cables into the overhead area to the remote monitor housings. The commercial broadcast connections (Cable TV, Antenna, etc.) are the responsibility of the proprietor. The customer's video equipment described above is not available through AMF. The proprietor is responsible for all connections required to hookup to the inputs of the audio preamplifiers and the video amp, which are a standard part of the installation.

NOTE: The Audio/Video equipment described above will probably not exceed 7 amps.

2.5.2. ADVANTAGE FRONT DESK DEVICES

The Advantage front desk equipment requires provisions at the control desk to locate the front desk terminal, ticket printer, and lane interface unit. A three wire dedicated 120 volt 20 amp 50/60 Hz circuit with an isolated ground outlet, Arrow Hart IG5262 TVSS (Transient Voltage Surge Suppressor), with provisions for 4 plugs is required and must be located within 4 feet of where the above equipment is to be installed. This outlet must have a continuous, insulated, third wire (green) equipment ground connecting to the service entrance positive earth ground only. This circuit shall not be connected to or used by any other equipment other than the equipment described above. Use no wire smaller than number 12 AWG, rated 600 volts. Where length of circuit home run exceeds 100 feet use number 10 AWG for home run. Provisions must also be made to route the cables from this equipment to the back office equipment.

NOTE: The Front Desk Equipment described requires 4.5 amps.

2.5.3. ACCUDESK DEVICES

The AccuDesk front desk equipment requires provisions at the control desk to locate the AccuDesk chassis and interface box, front desk terminal, and ticket printer. A three wire dedicated 120 volt 20 amp 50/60 Hz circuit with an isolated ground outlet, Arrow Hart IG5262 TVSS (Transient Voltage Surge Suppressor), with provisions for 4 plugs is required and must be located within 4 feet of where the above equipment is to be installed. This outlet must have a continuous, insulated, third wire (green) equipment ground connecting to the service entrance positive earth ground only. This circuit shall not be connected to or used by any other equipment other than the equipment described above. Use no wire smaller than number 12 AWG, rated at 600 volts. Where length of circuit home run exceeds 100 feet use number 10 AWG for home run. Provisions must also be made to route the cables required to the Curtain Wall Chassis.

NOTE: The AccuDesk equipment above requires 4.2 amps.

2.5.4. BACK OFFICE DEVICES (ADVANTAGE ONLY)

The Advantage back office equipment requires provisions for the DG 386 Computer, printer, and Modem. A three wire dedicated 120 volt 20 amp 50/60 Hz circuit with an isolated ground outlet, Arrow Hart IG5262 TVSS (Transient Voltage Surge Suppressor), with provisions for 8 plugs is required (an outlet strip may be used) and must be located within 4 feet of where the above equipment is to be installed. This outlet must have a continuous, insulated, third wire (green) equipment ground connecting to the service entrance positive earth ground only. This circuit shall not be connected to or used by any other equipment other than the equipment described above. Use no wire smaller than number 12 AWG, rated 600 volts. Where the length of circuit home run exceeds 100 feet use number 10 AWG for home run.

Provisions must also be made to route the required cables to the front desk equipment described previously and to the curtain wall chassis.

NOTE: The above described equipment requires 6.2 amps.

2.5.5. MODEM EQUIPMENT

It is recommended that the modem have a dedicated phone line. The system will not work with some multiline phone systems.

The power for this equipment is to be derived from plugs provided for back office equipment mentioned above.

2.6 MACHINE GROUNDING REQUIREMENTS

The proprietor is to provide two separate ground busses to run as follows: A continuous number 6 AWG green wire runs across the surface of the curtain wall just below where the curtain wall chassis are mounted. Another continuous number 6 AWG green wire runs across the curtain wall with a number 8 AWG green wire spliced to the bus and connected to each pinspotter. The splice connection must be made using a split bolt and must be taped to prevent it from coming in contact with any other ground point. The connection to the pinspotter is made to the frame of the machine and the contact point must be bare metal (scrape off paint).

The ground busses must be run to the incoming power ground and may not be spliced with, make contact with, or be connected to any other ground before reaching the ground point specified.

* FIRST PREFERENCE

  Connection must be made to the main entrance panel ground terminal block if conditions permit.

* SECOND PREFERENCE

  Connection to the conduit at the main entrance panel only if entry into the panel is impossible.

* THIRD PREFERENCE

  Connection may be made to a water pipe only if the first or second method are not feasible. The connection should be made as close as possible to the exit point of the water pipe from the building.

* FOURTH PREFERENCE

  Connection may be made to a ground rod only as a last resort! This connection is very undesirable.

Pre-Installation Requirements

The length of the ground buss is restrictive as follows:

(1) If the total length of the buss is 200 feet or less use a number 6 AWG wire for entire buss.

(2) If the total length of the buss is 200 feet to 400 feet use two sections. Use number 4 AWG wire for first section from the ground connection to the first unit and use number 6 AWG wire for the remainder.

2.7 SURGE SUPPRESSORS INSTALLATION

AMF will provide three surge suppressors with the AccuScore installation in the AccuScore dedicated distribution panel. (One per incoming phase). They are to be installed by the proprietor. Installation instructions will be provided with suppressors.

2.8 EQUIPMENT CURRENT RATINGS

AccuSonic Curtain Wall Chassis	0.5A @ 120V 50/60 Hz
AccuScore Curtain Wall Chassis	0.8A @ 120V 50/60 Hz
Remote Monitors Assembly	3.3A @ 120V 50/60 Hz
Audio Video Equipment w/AMF VCR System	5.1A @ 120V 50/60 Hz
Advantage Front Desk Equipment	4.5A @ 120V 50/60 Hz
Advantage Back Office Equipment	6.2A @ 120V 50/60 Hz
AccuDesk Equipment	4.2A @ 120V 50/60 Hz

NOTE:

For 220 volt 50/60 HZ operation, current ratings of circuit breakers can be one half of the above stated valves. However, wire sizes and number of units per circuit must remain the same for the proper operation of the equipment.

2.9. Measurement of System Grounds

The insulated (green) equipment ground wires can be connected to the neutral (white) wires only at the building incoming power grounds, listed under section 2.6. Before any equipment is plugged into the new wiring, the isolation of ground vs neutral must be measured. Remove main power from the dedicated electrical panel and open all circuit breakers. Individually disconnect each of the neutral (white) wires and measure their resistance to the isolated ground bus (green wires) in the panel. The resistance must be at least 100K ohms, if not the neutral is shorted at some point and must be repaired.

The building incoming power ground method selected in section 2.6 must be checked for proper earthing resistance. Check, clean, tighten, all electrical connections to buss strips, ground rods, water pipes, etc. An earthing resistance of 100 ohms or less is desirable, as measured with a "Megger". Improvements to the earthing resistance of the building incoming power ground will make significant difference in the equipments immunity to electrical noise, static, and lightning.

If the customer chooses to hook up to cable TV, the following additional measurement must be made. Measure the CATV cable shield resistance vs an isolated ground from one of the audio/video equipment dedicated outlets. The CATV cable must be grounded where it enters the building. The CATV cable has 2.7 ohms per 1000 ft of resistance. The isolated system ground wire has 1.2 ohm per 1000 ft of resistance in its run back to the building power entry panel. Using these values, estimate if the CATV cable is properly grounded as called for in the National Electrical Code (article 820-33), if not it is the customers responsibility to contact the cable company and have them correct their error.

Pre-Installation Requirements

I, ______________________ have read the attached Pre-Installation Requirements and do hereby understand that it is my responsiblity to abide by the requirements as written.

Signed: ______________________________________

Center Name: _________________________________

Dated: _______________________________________

AMF Bowling, Inc.

Automatic Scoring Division

Remote Monitor Support Certificate

I,____________________________ certify to AMF Bowling, Inc. that I am
Name
a licensed :_________________________________ and that I have examined
Architect or Structural Engineer
the roof or ceiling structure loading specifications for AMF AccuScore Remote Monitors and I have examined the support that is presently in place from which the remote monitors are to be suspended at

____________________________ ____________________________ ______________
Name of Bowling Center Street Address City, State

I certify that the device presently in place is so structured to support the weight of__________ AMF AccuScore Monitor Assemblies with
Quantity
an adequate safety factor.

Note: Load specification requires that the overhead structure will support a 300 pound load for two monitors plus housing, per pair of lanes. These units are located over the approach in the Ball Return area.

I further state that I have inspected the structure of the Curtain Wall (that which is located perpendicular to the Pinspotters from the bowler's view). This structure will support the AccuScore Curtain Wall Chassis and various other control boxes and cables. I do certify that said Curtain Wall will support a weight of 50 pounds over the area of two Pinspotters, with an adequate safety factor.

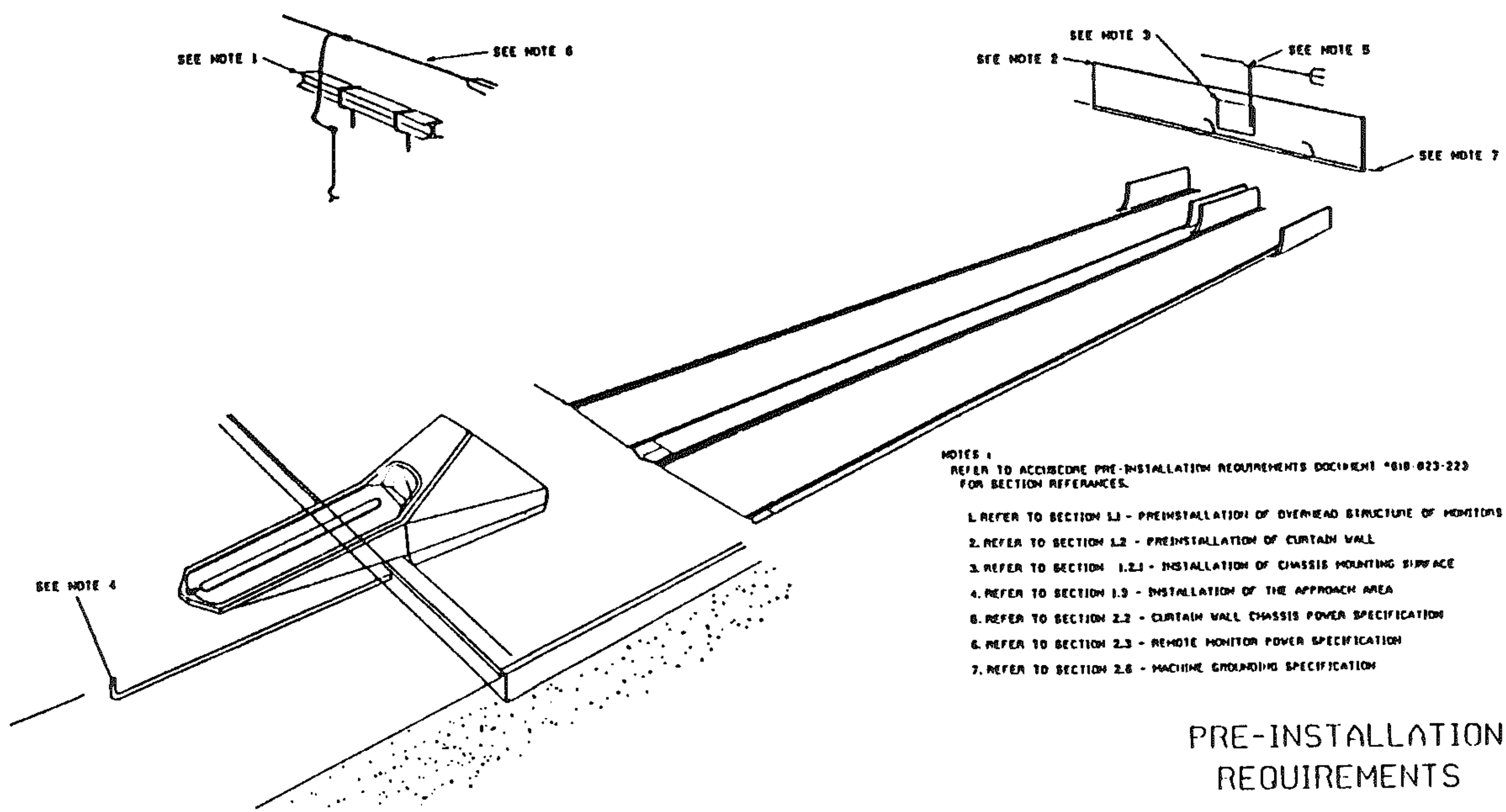
Signature______________________________

Date ______________________________

Title ______________________________

License #______________________________

State of ______________________________

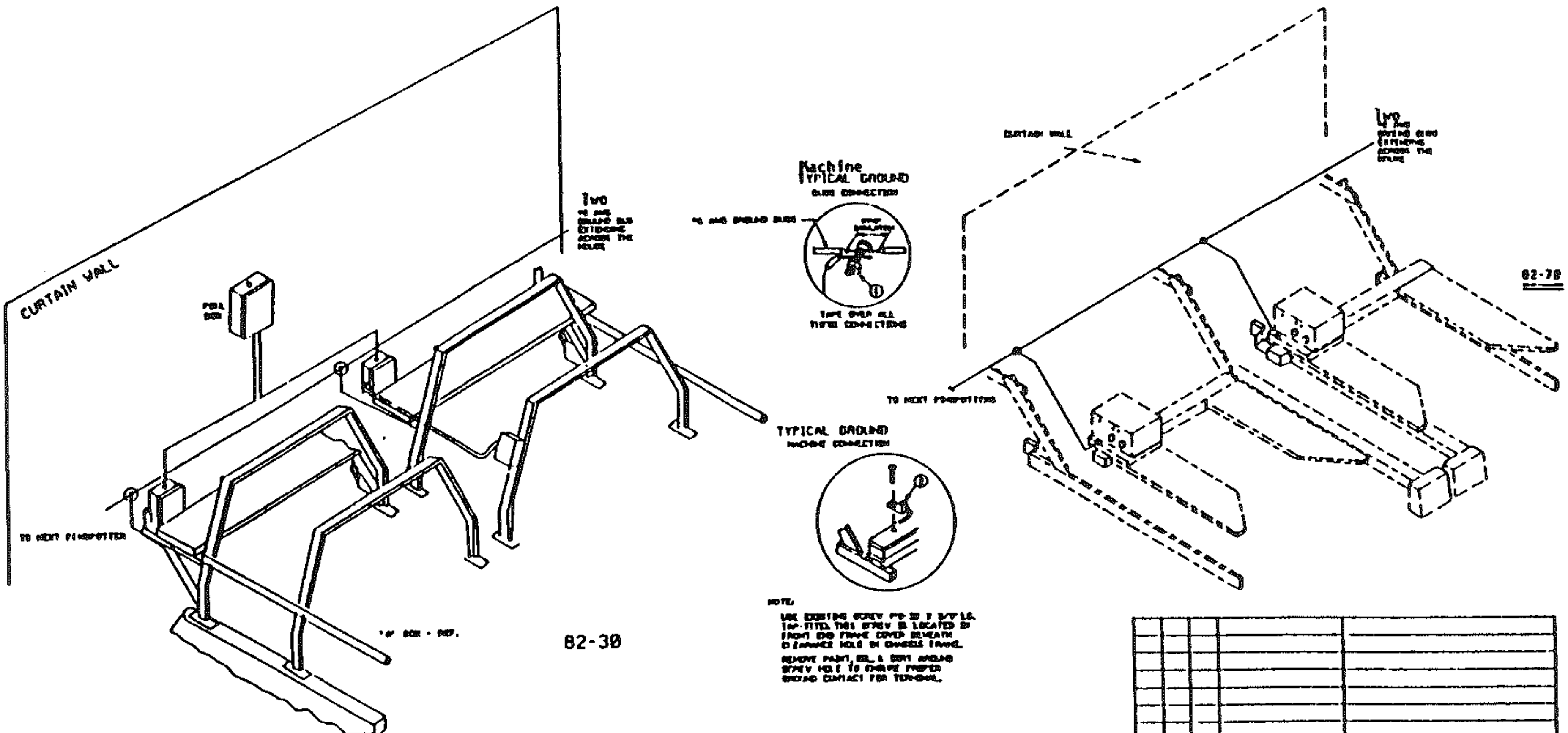


NOTES :
REFER TO ACCUSCORE PRE-INSTALLATION REQUIREMENTS DOCUMENT #610-023-223
FOR SECTION REFERANCES.

1. REFER TO SECTION 1.1 - PREINSTALLATION OF OVERHEAD STRUCTURE OF MONITORS
2. REFER TO SECTION 1.2 - PREINSTALLATION OF CURTAIN WALL
3. REFER TO SECTION 1.2.1 - INSTALLATION OF CHASSIS MOUNTING SURFACE
4. REFER TO SECTION 1.3 - INSTALLATION OF THE APPROACH AREA
5. REFER TO SECTION 2.2 - CURTAIN WALL CHASSIS POWER SPECIFICATION
6. REFER TO SECTION 2.3 - REMOTE MONITOR POWER SPECIFICATION
7. REFER TO SECTION 2.6 - MACHINE GROUNDING SPECIFICATION

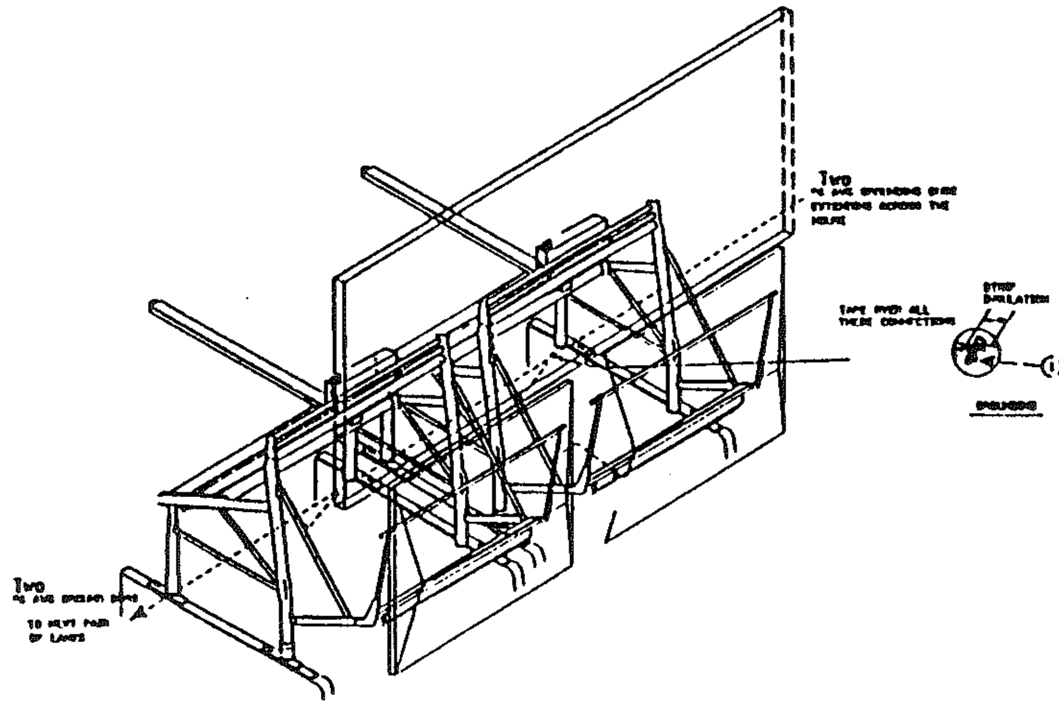
PRE-INSTALLATION
REQUIREMENTS

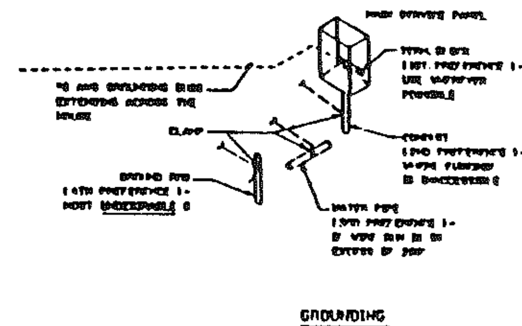
PG 1 OF 3



BT	2		770-033-055	LUG - CONE SCREW
BT	1		770-034-060	CONNECTOR SPLIT-BOLT

PRE-INSTALLATION
REQUIREMENTS





[illegible]	2		77P-033-059	LUG - COMP SCREW
[illegible]	1		77P-034-060	CONNECTION SPLIT-BOLT

PRE-INSTALLATION REQUIREMENTS

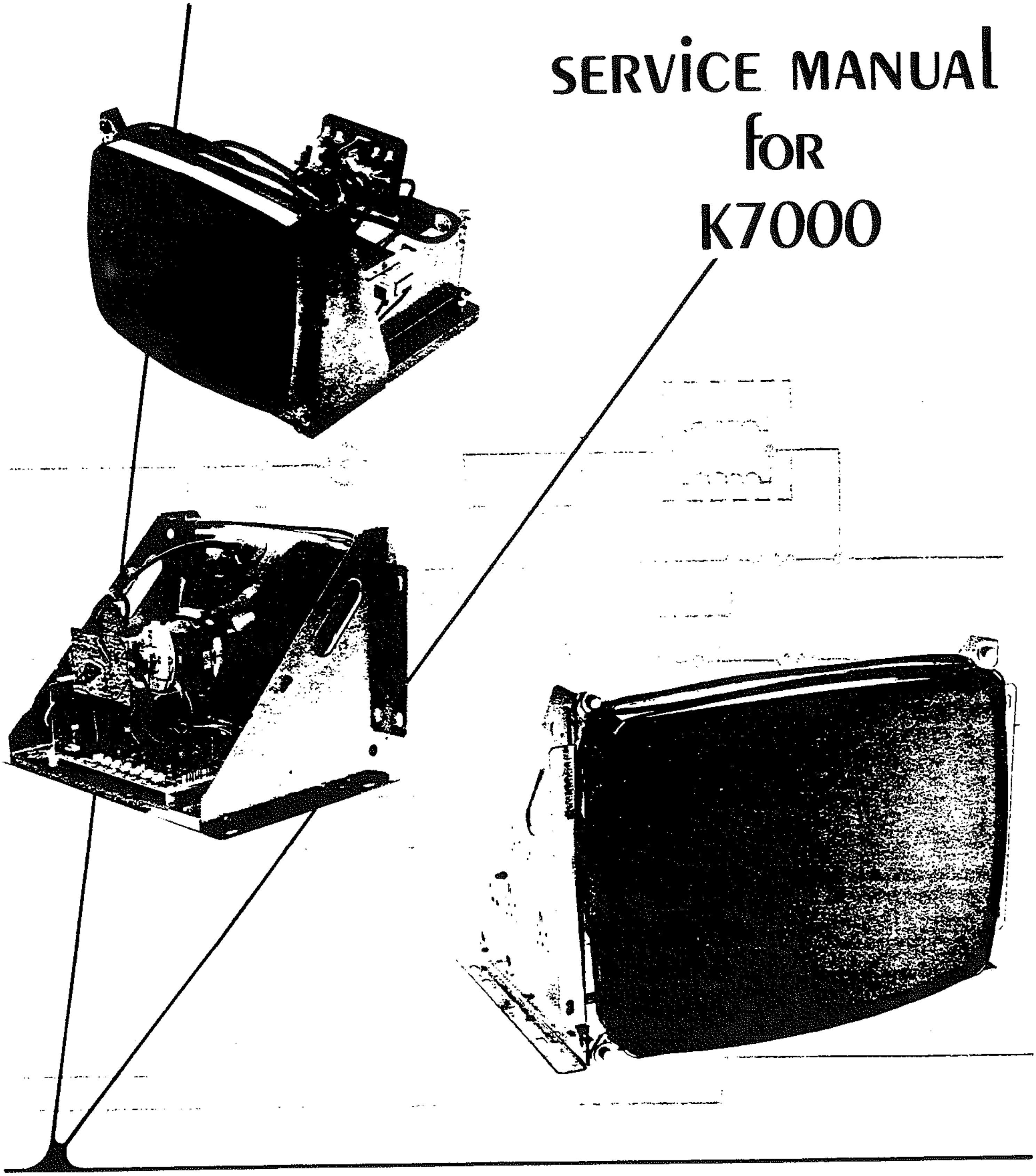
COLOR MONITORS

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

PART NUMBER 610-32-0242

REVISION: NEW
APRIL 1991

SERVICE MANUAL for K7000



WELLS-GARDNER ELECTRONICS CORPORATION
2701 N. KILDARE, CHICAGO, IL 60639
312/252-8220 TELEX: 25-3286
FAX: 312-252-8072

SERVING CONSUMER AND INDUSTRIAL ELECTRONICS FOR MORE THAN 60 YEARS

THE PRISMATIC™

BY

WELLS-GARDNER

COLOR SPECIFICATIONS

CRT

- From 9" to 25" diagonal measure
- **P22 phosphor**
- **Polished faceplate standard:** variety of optional faceplates and transmittances available.
- **Stripe trio spacings (standard):** 0.62 mm (9"), 0.66 mm (13"), 0.82 mm (19"), 0.82 mm (25").
- Optional finer pitches available.

INPUT SIGNALS

- **Video:** RGB analog, 1v to 5v peak-to-peak (adjustable with contrast control), 4.7k ohm input impedance, 40 usec to 50 usec active video.

  Optional inputs available:
- Negative video
- RGB analog 0-0.75v, 75 ohm input impedance
- Composite video (NTSC)
- Both composite video and RGB analog: Both signal sources can be connected to the monitor at the same time. Monitor display can be switched from one to the other, at anytime at pixel or vertical frame rate.
- **Sync:** TTL positive or negative going, separate or composite. Input impedance: 20K ohms for positive going sync; 12K ohms for negative going sync.

HORIZONTAL SCAN

- **Width:** Adjustable with just one coil to accommodate active video from 40 usec to 50 usec.
- **Frequency:** 15.1 kHz to 16.8 kHz standard; higher scan frequencies avaliable.
- **Linearity:** ± 5%

PICTURE SIZE REGULATION

- 2%

VERTICAL SCAN

- **Frequency:** 47 Hz to 63 Hz
- **Linearity:** ± 5%

GEOMETRIC DISTORTION

- ± 2% (max).

VIDEO CHARACTERISTICS

- **Bandwidth (-3 db):** 12 MHz typical
- **Rise Time:** Less than 50 nanoseconds
- **Overshoot (max):** 5%

MECHANICAL

- The 19" monitor is also available in universal mount brackets. The monitor can be mounted in the user's cabinet horizontally or vertically. Contact your sales representative for details.
- The standard Prismatic-25™ 25" monitor is available as a kit - without a frame. Custom frames can be furnished.
- The standard Prismatic-9™ 9" monitor is available as a kit - without a frame: Also available in chassis form - adaptable to individual customer requirements.
- Contact your sales representative for details.

USER ADJUSTABLE CONTROLS AND ADJUSTMENTS

- Brightness, Contrast, Horizontal Hold, Horizontal S Horizontal Raster Position, Horizontal Video Positi Vertical Hold, Vertical Size, Vertical Raster Position, Focus. Custom Control Location available.

POWER INPUT

- 120 VAC +10% −15%, 50-60 Hz, 85W (max). Isolation transformer required; furnished with monitor as an option.

ENVIRONMENTAL CONDITIONS

- Operating temperature 0° to 55°C. Complies with U.L., C.S.A., and D.H.H.S. radiation performance standard (composite video).

RESOLUTIONS

	• Standard CRT	• Fine Pitch CRT
9"	280 Pixels x 240 Lines	410 Pixels x 240 Lines
13"	400 Pixels x 240 Lines	640 Pixels x 240 Lines
19"	400 Pixels x 240 Lines	640 Pixels x 240 Lines
25"	560 Pixels x 240 Lines	N. A.

**** **SPECIFICATIONS ARE SUBJECT TO CHANGE IN ORDER TO ASSURE YOU THE LATEST IN DISPLAY TECHNOLOGY.******

THIS MANUAL APPLIES TO THOSE MONITORS WITH SERIAL NUMBERS OF 576001 AND ABOVE.

WARNINGS

1. Power Up Warning–

An isolation transformer must be used between the AC supply and the AC plug of the monitor before servicing, testing, or operating the monitor since the chassis and the heat sink are directly connected to one side of the AC line which could present a shock hazard.

Before servicing is performed, read all the precautions labelled on the CRT and chassis.

2. X-RAY RADIATION WARNING NOTICE

WARNING: PARTS WHICH INFLUENCE X-RAY RADIATION IN HORIZONTAL DEFLECTION, HIGH VOLTAGE CIRCUITS AND PICTURE TUBE ETC. ARE INDICATED BY (★) IN THE PARTS LIST FOR REPLACEMENT PURPOSES. USE ONLY THE TYPE SHOWN IN THE PARTS LIST.

3. High Voltage–

This monitor contains HIGH VOLTAGES derived from power supplies capable of delivering LETHAL quantities of energy. Do not attempt to service until all precautions necessary for working on HIGH VOLTAGE equipment have been observed.

4. CRT Handling–

Care must be taken not to bump or scratch the picture tube as this may cause the picture tube to implode resulting in personal injury. Shatter proof goggles must be worn when handling the CRT. High voltage must be completely discharged before handling. Do not handle the CRT by the neck.

5. PRODUCT SAFETY NOTICE

WARNING: FOR CONTINUED SAFETY REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER RECOMMENDED PARTS. THESE PARTS ARE IDENTIFIED BY SHADING AND BY (△) ON THE SCHEMATIC DIAGRAM.

AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

For replacement purposes, use the same type or specified type of wire and cable, assuring the positioning of the wires is followed (especially for H.V. and power supply circuits). Use of alternative wiring or positioning could result in damage to the monitor or in a shock or fire hazard.

AC CONNECTORS AND TERMINALS

ALL MONITORS EXCEPT THOSE WITH MODEL NUMBERS ENDING WITH 2 OR 6:

WELLS-GARDNER END	W.G. Part No.		Molex Part No.
Plug	6A0396-001		19-09-2029
Pins Male	30X0759-001		02-09-2101
USERS' END			
Receptacle			19-09-1029
Pins, Female			02-09-1101*
		or	02-09-1116*

MODEL NUMBERS ENDING WITH 2:

WELLS-GARDNER END	W.G. Part No.		Molex Part No.
Plug	6A0376-002		03-09-2022
Pins, Male	30X0759-001		02-09-2101
USERS' END			
Receptacle			03-09-1022
Pins, Female			02-09-1101*
		or	02-09-1116*

MODELS NUMBERS ENDING WITH 6:

WELLS-GARDNER END	W.G. Part No.		AMP Part No.
Receptacle	6A0402-001		350778-1
Pins, Male	30X0761-001		350538-1
USERS' END			
Plug			350777-1
Pins, Female			350537-1 **
		or	350851-1 **

*-1101 is used for 20-14 AWG wire and insulation diameter range 0.065"-0.160"
-1116 is used for 22-18 AWG wire and insulation diameter range 0.060"-0.120"

** 350537-1 is used for 20-14 AWG wire and insulation diameter range 0.130"-0.200"
350851-1 is used for 24-18 AWG wire and insulation diameter range 0.040"-0.100"

USER ADJUSTMENTS

1. BRIGHTNESS CONTROL VR6

This control has been preset at the factory. However, when the video signal is applied to the monitor, a slight adjustment may be desired. Adjust this control such that the illumination is just barely extinguished from portions of the display which should be black.

2. CONTRAST CONTROL VR7

Adjust the contrast control for the desired picture intensity.

3. FOCUS CONTROL

Adjust the focus control, located on the high voltage unit (T1), for maximum over-all definition and fine picture detail.

4. HORIZONTAL HOLD CONTROL VR2

With the monitor being driven with the display signal, connect one jumper between TP1 and TP2 and another jumper between TP3 and TP4. Adjust the horizontal hold control until the picture stops sliding horizontally. Remove the jumpers. Do not use the horizontal hold control for horizontal centering. (See #5).

NOTE: If the sync signal is composite, use the horizontal sync input of the same polarity as the composite sync signal.

5. HORIZONTAL VIDEO SHIFT CONTROL VR1

Use this control to center the picture horizontally.

6. HORIZONTAL RASTER POSITION ADJUSTMENT

If the picture is off center horizontally (long dimension of picture tube), some compensation can be made by moving the horizontal raster position adjustment jumper either to positions "R" or "L".

7. HORIZONTAL SIZE COIL L1

The horizontal size coil is a hexagonal tuning tool adjustment. This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct horizontal proportions.

8. VERTICAL HOLD CONTROL VR5

Adjust this control until the picture stops rolling and it locks in vertically.

9. 50-60 Hz CONTROL VR9

This control is used to limit the range of vertical size. This control is preset at the factory and should not require readjustment unless the vertical size control or vertical hold control are readjusted from their original factory setttings. In order to set this control, first adjust the vertical size control so that the picture is slightly larger than desired. Turn VR9 so that any vertical foldover which may be present will disappear. If the monitor is to be operated alternately at more than one vertical frequency, then perform this adjustment at the higher frequency.

10. VERTICAL SIZE CONTROL

This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct vertical proportions.

11. VERTICAL RASTER POSITION CONTROL VR3

If the video is off center vertically, (short dimension of picture tube) some compensation can be made by turning the vertical raster position control.

12. CUT OFF AND DRIVE CONTROLS ON NECK BOARD VR201, VR202, VR203, VR204, VR205, VR206.

These controls have been preset at the proper gray scale. Before adjusting any of these controls, refer to Troubleshooting Note 4 and to the White Balance procedure.

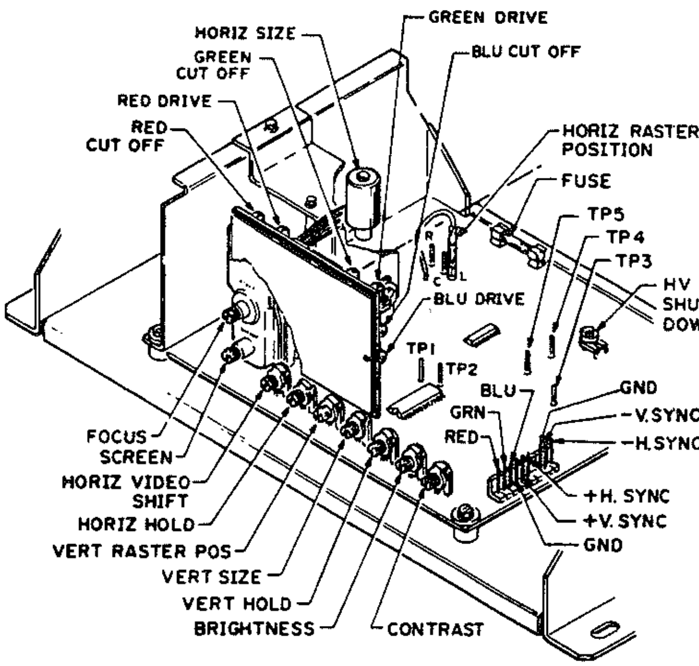


FIG. 1A

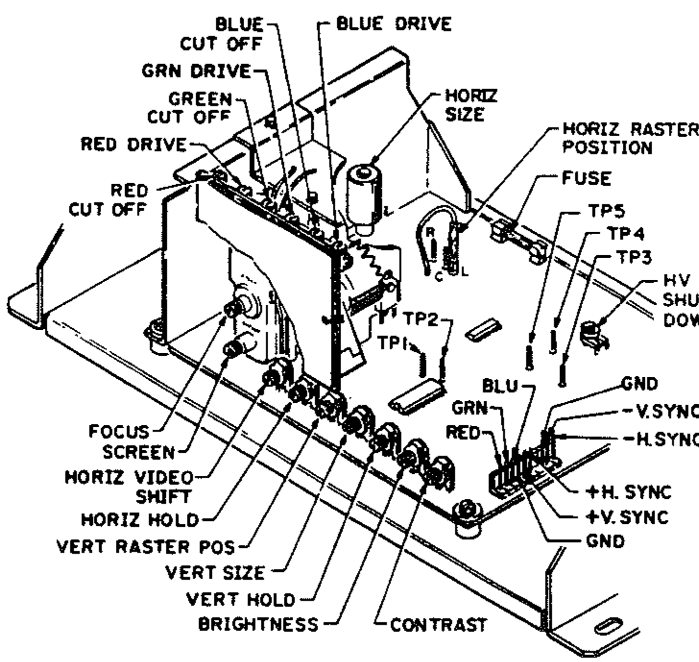


FIG. 1B

INSTALLATION AND SERVICE INSTRUCTIONS

NOTE:
All of the following procedures have been performed at the factory ' should require no further attention. If the monitor is serviced for ıason, it should be observed afterward to determine whether any ɜse procedures need to be performed again.

OUTLINE OF CONVERGENCE AND SET-UP PROCEDURE

DEGAUSSING: Demagnetize the shadow mask and all surrounding metal parts with an external degaussing coil.
PURITY: Adjust the purity magnets and the yoke position.
STATIC CONVERGENCE: Converge Red and Blue on Green in the center of the screen.
DYNAMIC CONVERGENCE: Converge Red and Blue at the edges of the screen.
WHITE BALANCE: Set Gray and White brightness tracking.

NOTE: Purity and convergence adjustment interact.

DEGAUSSING

The monitor is equipped with an automatic degaussing circuit. However, if the CRT shadow mask has become excessively magnetized, it may be necessary to degauss it with a manual coil. Do not switch the coil OFF while the raster shows any effect from the coil.

COLOR PURITY ADJUSTMENT

1 For best results, it is recommended that the purity adjustment be made in the final monitor location. If the monitor will be moved, perform this adjustment with it facing west or east. The monitor must have been operating 15 minutes prior to this procedure.

2 On picture tubes with a 22.5 mm neck diameter, set the ring assembly on the CRT neck with the center line of the purity ring-pair over the gap between grids No. 5 and 6. See Fig. 2A [For picture tubes with a 29 mm neck, use the gap between grids No. 3 and 4. Fig. 2B.]

 ۱ake certain that the magnetic ring-pairs are in their correct start- ɟ positions before beginning this procedure. The correct starting ɔsition for the purity ring-pair is not necessarily the one shown in Figure 2. The correct starting position will vary from ring assemblies from one manufacturer to another. It will be necessary to determine the correct starting position–also known as the zero correction position.

Figure 2 shows a ring assembly in which each of the rings of the purity ring-pair has two tabs–one long and one short. With some ring assemblies of this type, the zero correction position is with the long tab of one ring aligned with the short tab of the other ring. On other ring assemblies of this type, the zero correction position is with the long tab of one ring aligned with the long tab of the other ring. The way to determine which is which is by trying one of these orientations and then rotating the two rings together, as a pair, without changing their orientation with respect to each other. If this rotation of the ring-pair causes no change in the purity, then it is the zero correction position. If the purity does change, then try the other orientation.

A ıird type of ring assembly has only one tab on each of the two purity rings. The zero correction position for this type of assembly is with the tabs of the two purity rings aligned with each other and pointing up toward the anode contact of the CRT.

The correct starting positions for the other ring pairs are as shown in Figure 2. For the other type of ring assembly (not shown), the correct starting position for the other two ring-pairs is with all of the tabs aligned with each other and pointing up, toward the anode contact of the CRT.

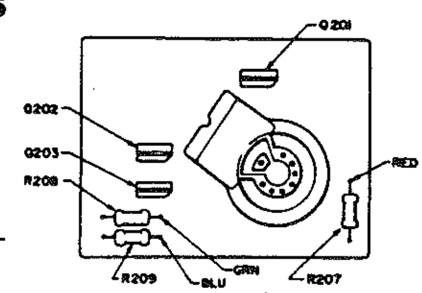
4 Vertical raster position control must be at the center of its rotation.

 ۱emove the R-G-B signal from the monitor.

 ım the Green Cut off Control (VR203) on the Neck Board fully CW. ٍSee Fig. 1).

7 Turn the Red and Blue Cut off Controls (VR201 & VR205) fully CCW.

8 Pull the Deflection Yoke backward so that the Green belt will appear. (See Fig. 4).



P456 VIDEO NECK BOARD

FIG. 3A

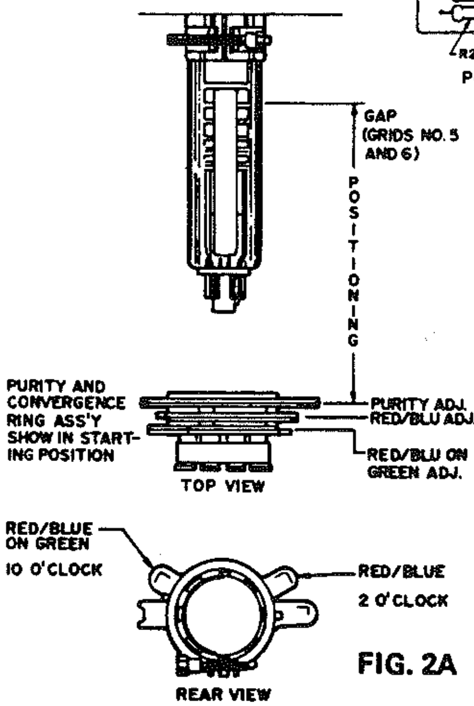
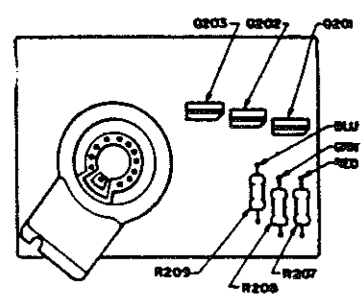


FIG. 2A



P448 VIDEO NECK BOARD

FIG. 3B

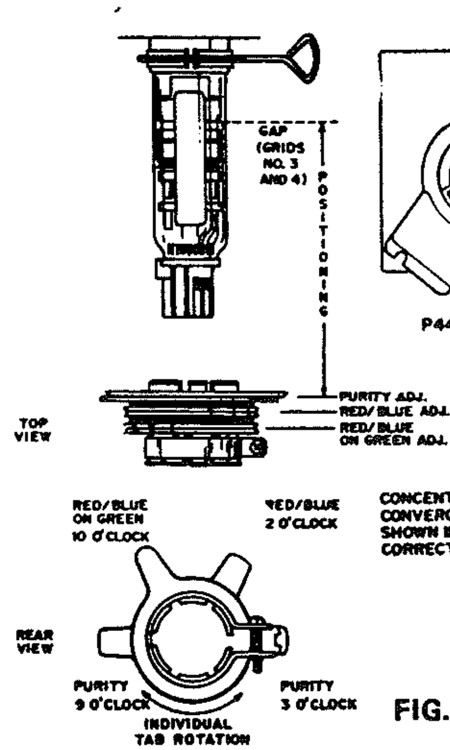


FIG. 2B

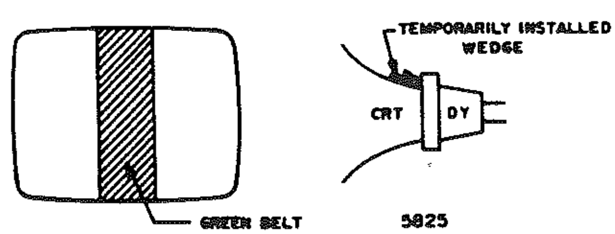


FIG. 4

9 Decrease the horizontal width of the raster, if necessary, in order to be able to see the right and left edges of the raster.

10 Move the two Purity Magnets with respect to each other in order to center the Green belt on the raster horizontally.

11 Push the Deflection Yoke forward gradually and fix it at the place where the Green screen becomes uniform throughout.

12 Turn the cut off and Drive Controls and confirm that each color is uniform.

13 If the color is not uniform, re-adjust it, moving the Purity Magnets slightly.

14 Turn all three cut off controls fully counterclockwise (CCW). Slowly turn up (CW) the Red cutoff control until a Red raster is just barely visible.

15 Slowly turn up the Green and Blue cutoff controls such that their associated colors, mixing with the Red, results in a White or Gray raster.

16 Confirm that the white or gray color is uniform throughout the screen.

17 Insert a wedge temporarily as shown in Fig. 4 and adjust the angle of the Deflection Yoke.

STATIC CONVERGENCE ADJUSTMENT

4-Pole Magnets and 6-Pole Magnets are for static convergence.

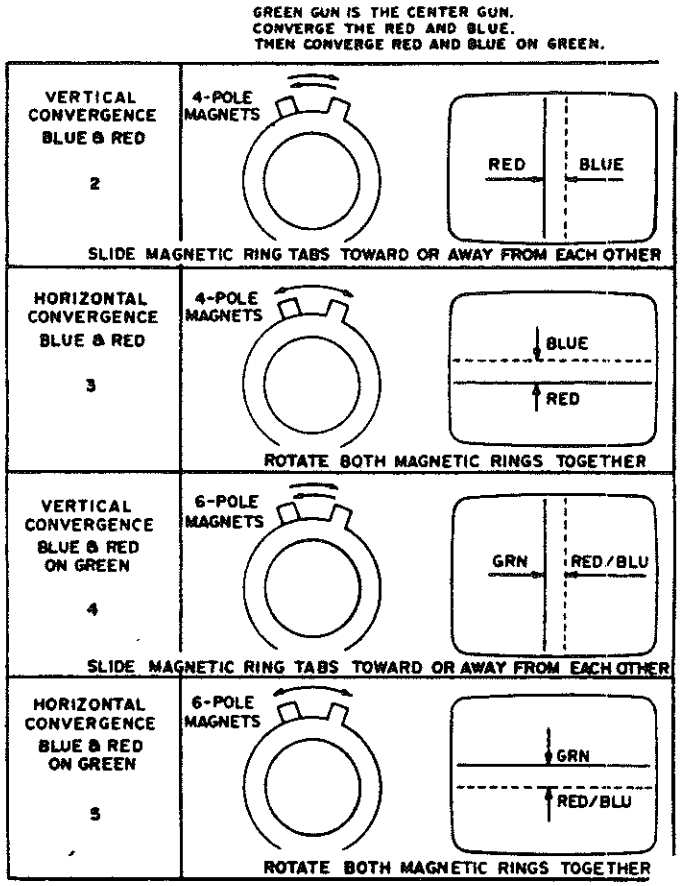
1 A cross hatch signal should be connected to the monitor.

2 A pair of 4-Pole Convergence Magnets is provided and adjusted to converge the blue and red beams (See Fig. 6). When the Pole opens to the left and right 45° symmetrically, the magnetic field maximizes. Red and blue beams move to the left and right (See Fig. 5). Variation of the angle between the tabs adjusts the convergence of red and blue vertical lines.

3 When both 4-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of the red and blue horizontal lines is adjusted.

4 A pair of 6-Pole Convergence Magnets is also provided and adjusted to converge the magenta (red + blue) to green beams (See Fig. 6). When the Pole opens to the left and right 30° symmetrically, the magnetic field is maximized. Red and blue beams both move to the left and right (See Fig. 5). Variation of the opening angle adjusts the convergence of magenta to green vertical lines.

5 When both 6-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of magenta to green horizontal lines is adjusted.



REPEAT 3.2 & 3.3 IF ALL LINES ARE NOT CONVERGED AT CENTER

FIG. 5

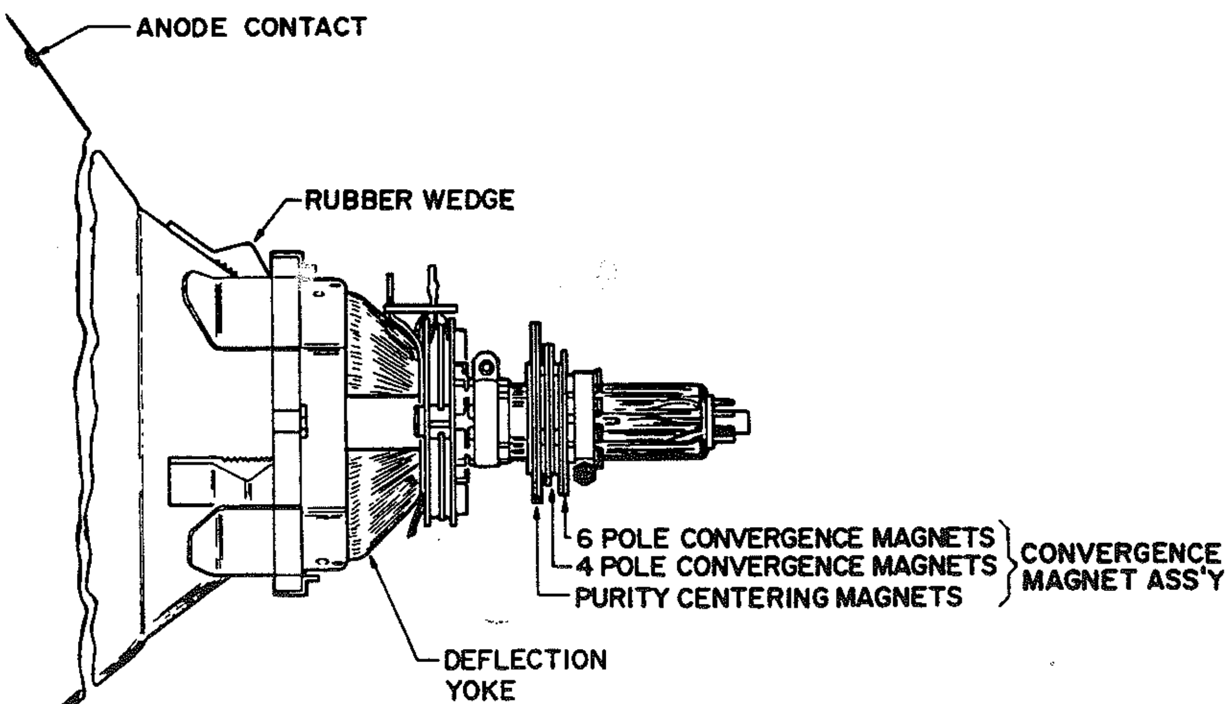


FIG. 6

PRECISE ADJUSTMENT OF DYNAMIC CONVERGENCE

1. Feed a cross hatch signal to the monitor.
2. Insert wedge temporarily and fix the Deflection Yoke so as to obtain the best circumference convergence (See Fig. 8 and 9)
   NOTE:
   The wedges may need to be moved during adjustments.
3. Insert three rubber wedges to the position as shown in

NOTE:

1) Tilting the angle of the yoke up and down adjusts the crossover of both vertical and horizontal red and blue lines. See Fig. 8 (a) and (b).
2) Tilting the angle of the yoke sideways adjusts the parallel convergence of both horizontal and vertical lines at the edges of the screen. See Fig. 9 (a) and (b).
3) Use three rubber wedges (tapered rubber wedges are used for a purpose).
4) The position of each rubber wedge is shown in Fig. 7.
5) Do NOT force the permanent wedges in. They are to be inserted until they just make contact with the yoke–after the yoke has been positioned.
6) Fix the three permanent rubber wedges with chloroprene rubber adhesive.
7) After the adhesive has dried enough to hold the wedges in place, carefully remove the temporarily installed wedge.

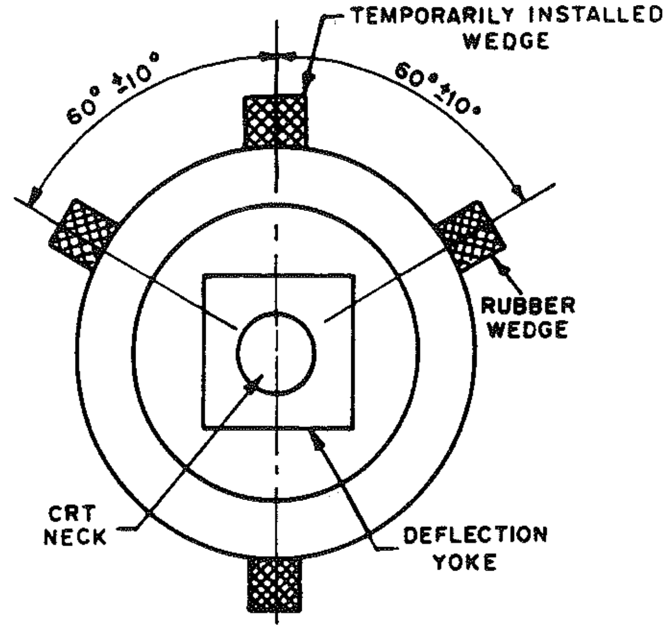


FIG. 7

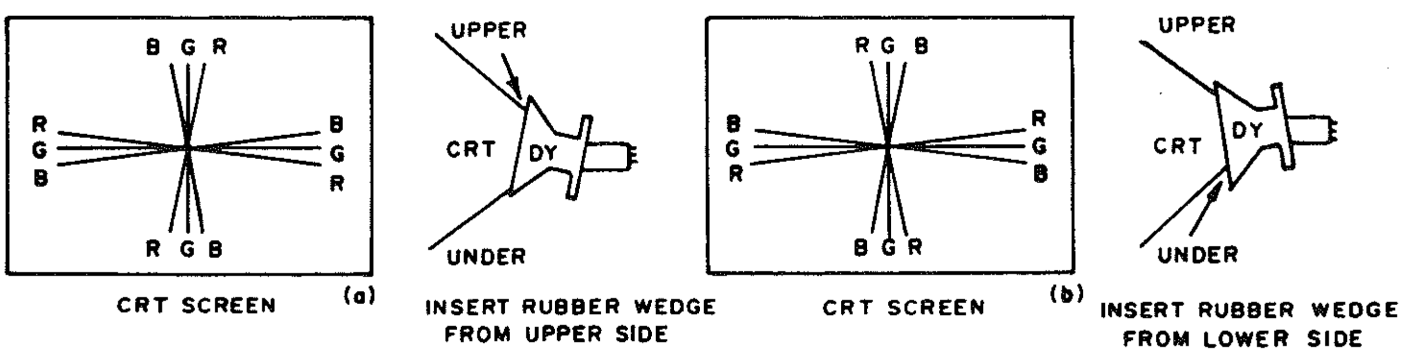


FIG. 8

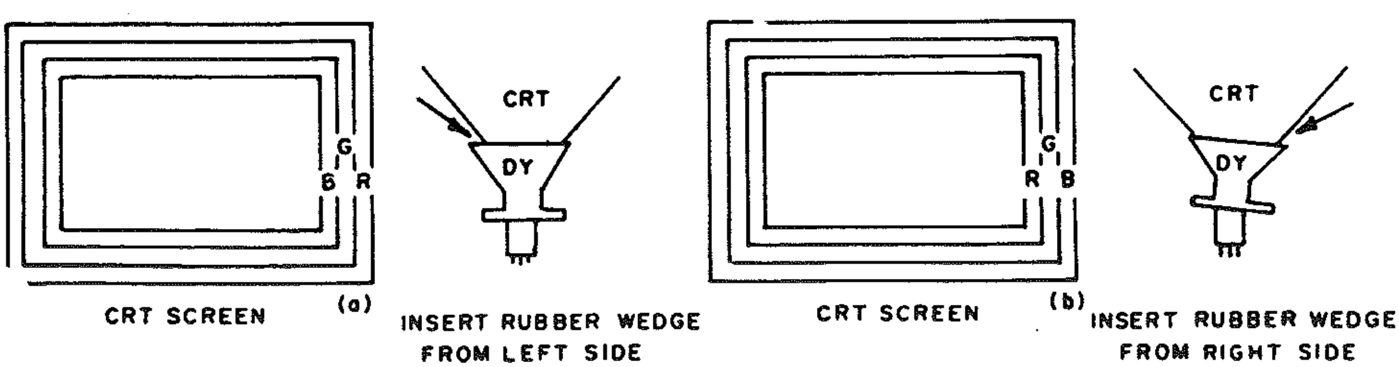


FIG. 9

WHITE BALANCE

1. Equipment Required: An oscilloscope with a DC coupled mode in the vertical amplifier.
2. Referring to Fig. 1 and 3, do the following adjustments in subdued light after degaussing and setting the purity of the CRT.
3. Ground the R/G/B video inputs. Apply sync signals to the sync inputs.
4. Set all three drive controls, VR202, VR204, & VR206, to their midpoints of rotation.
5. Set the screen and R/G/B cutoff controls to their minimum (fully CCW) positions.
6. Connect the oscilloscope to the collector of a video output transistor Q201, Q202, or Q203 or to the end of R207, R208, or R209 indicated on Figure 3 as Red, Green, or Blue.
7. If this white balance procedure is required because the CRT or neck board was replaced, then leave the contrast control at its original setting. If the contrast control is known to be grossly out of adjustment, then set it to its center of rotation. Adjust the brightness control VR6 to obtain the waveform shown in Figure 10. Now remove the scope probe.
8. Slowly turn the screen control CW until the raster is just visible. The color of this raster is called the lead color gun. DO NOT adjust its associated cutoff control. It must remain fully CCW.
9. Adjust the screen control CCW until the raster is just extinguished.
10. Adjust the brightness control for a dim raster. Adjust the two remaining cutoff controls (NOT the lead color gun cutoff control) for best gray uniformity.
11. Adjust the brightness control for a bright raster but not maximum brightness. Adjust the R/G drive controls, if necessary, for best neutral white. Try not to adjust the blue drive control.
12. Repeat steps 10 and 11 until good tracking of white balance is achieved. End with step 10.
13. With the oscilloscope connected to the collector of the lead color video output transistor (See Fig. 3), adjust the brightness control to obtain the waveform in Fig. 10.

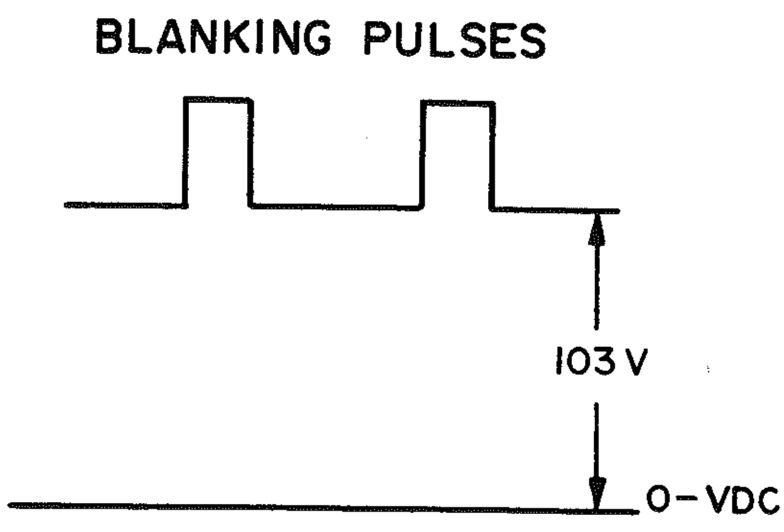


FIG. 10

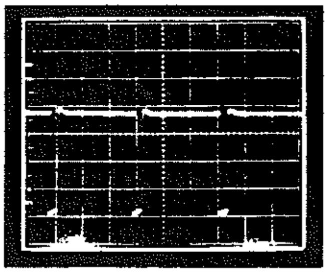
TYPICAL OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown below were observed on a wide band oscilloscope. The input signal was from a crosshatch generator with a horizontal sync frequency of 15.73kHz and a vertical frequency of 60 Hz. If the waveforms are observed on an oscilloscope with a limited high frequency response, the corners of the pulses will tend to be more rounded than those shown, and the amplitude of any high frequency pulse will tend to be less.

Each photograph is numbered. These numbers correspond to the circled numbers on the schematic diagrams.

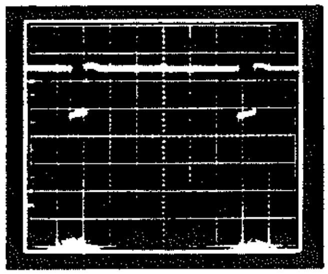
Photographs 12, 13, 14, 15 and 16 are of the red signal at various points along the red video channel. The waveforms at corresponding points along the green and blue video channels will look similar.

1.



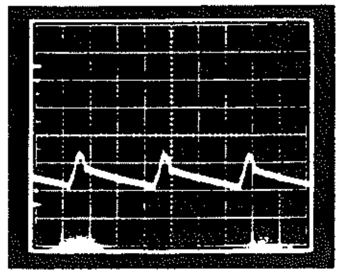
2V/DIV 20 uSEC/DIV

2.



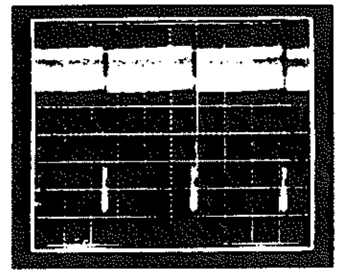
2V/DIV 10 uSEC/DIV

3.



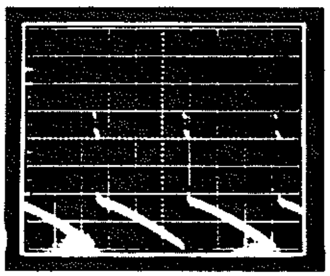
0.5V/DIV 20 uSEC/DIV

4.



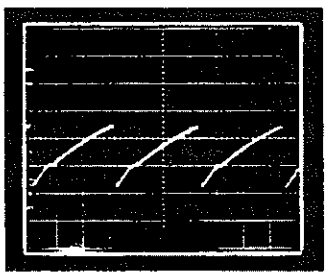
0.2V/DIV 5MSEC/DIV

5.



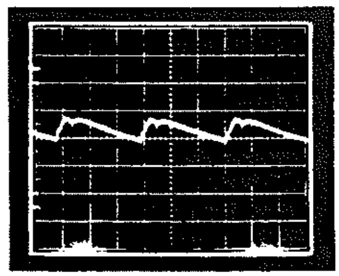
10V/DIV 5MSEC/DIV

6.



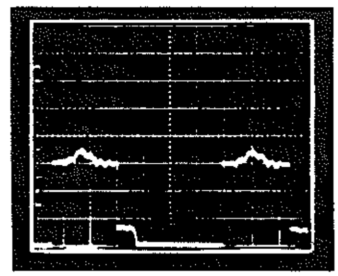
2V/DIV 20 uSEC/DIV

7.



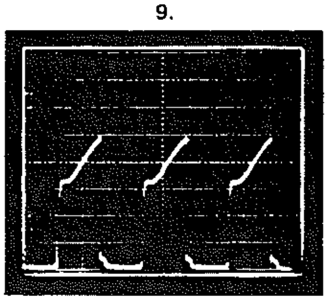
1V/DIV 20 uSEC/DIV

8.



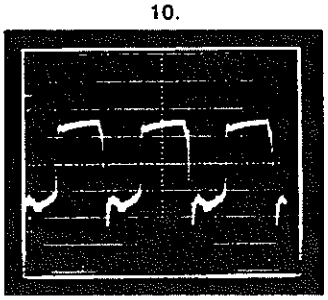
0.5V/DIV 10 uSEC/DIV

9.



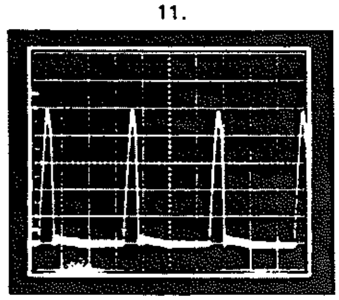
20V/DIV 20 uSEC/DIV

10.



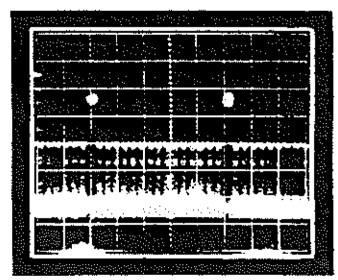
0.5V/DIV 20 uSEC/DIV

11.



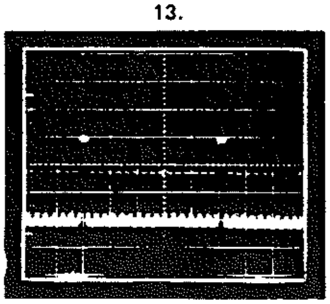
5V/DIV 20 uSEC/DIV

12.



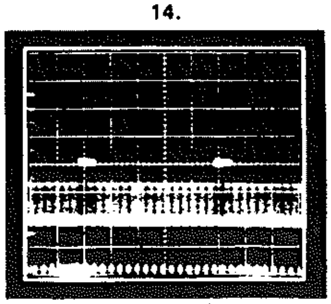
1V/DIV 0.2MSEC/DIV

13.



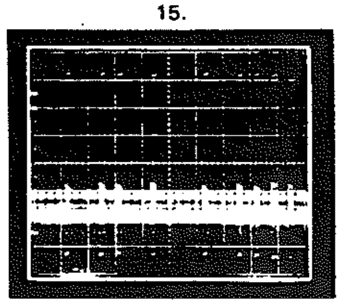
1V/DIV 0.2MSEC/DIV

14.



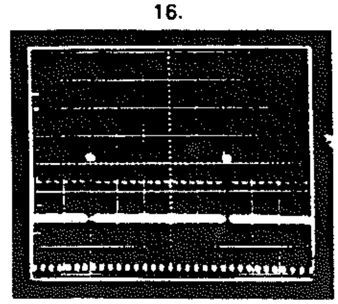
1V/DIV 0.2MSEC/DIV

15.



2V/DIV 0.2MSEC/DIV

16.



1V/DIV 0.2MSEC/DIV

TROUBLESHOOTING NOTES

1. The troubleshooting chart mentions specific components to be checked. It is intended that the entire circuit associated with these components be checked.

2. This chart is a guide to servicing rather than a complete list of each component that could fail. Therefore, troubleshooting should not be limited only to those components mentioned in the chart.

3. It is always useful to begin checking a circuit by measuring the DC voltages and then comparing the measurements to those listed in the Typical DC Voltages chart.

4. The cutoff controls and drive controls on the neck board and the screen control at the bottom of the flyback transformer have been preset at the factory. When servicing the monitor for a lack of video, do not adjust any of these controls unless it is suspected that the problem is a result of these controls having been tampered with. Otherwise do not adjust these controls; if they are so severely out of adjustment that there is a lack of video, then there is something malfunctioning.

5. The Wells-Gardner Service Department does accept telephone calls for servicing assistance. Call 1-312-252-8220, between 7:00am and 3:30pm Central Time. Ask for the Service Department. The Service Department is closed during the first two weeks of July. Telephone assistance is not available during this period. Before calling, be sure to have available the model number of the monitor being serviced and the schematic diagram of the monitor being serviced.

6. Replacement parts may be ordered from the Service Department between 7:00am and 4:30pm Central Time.

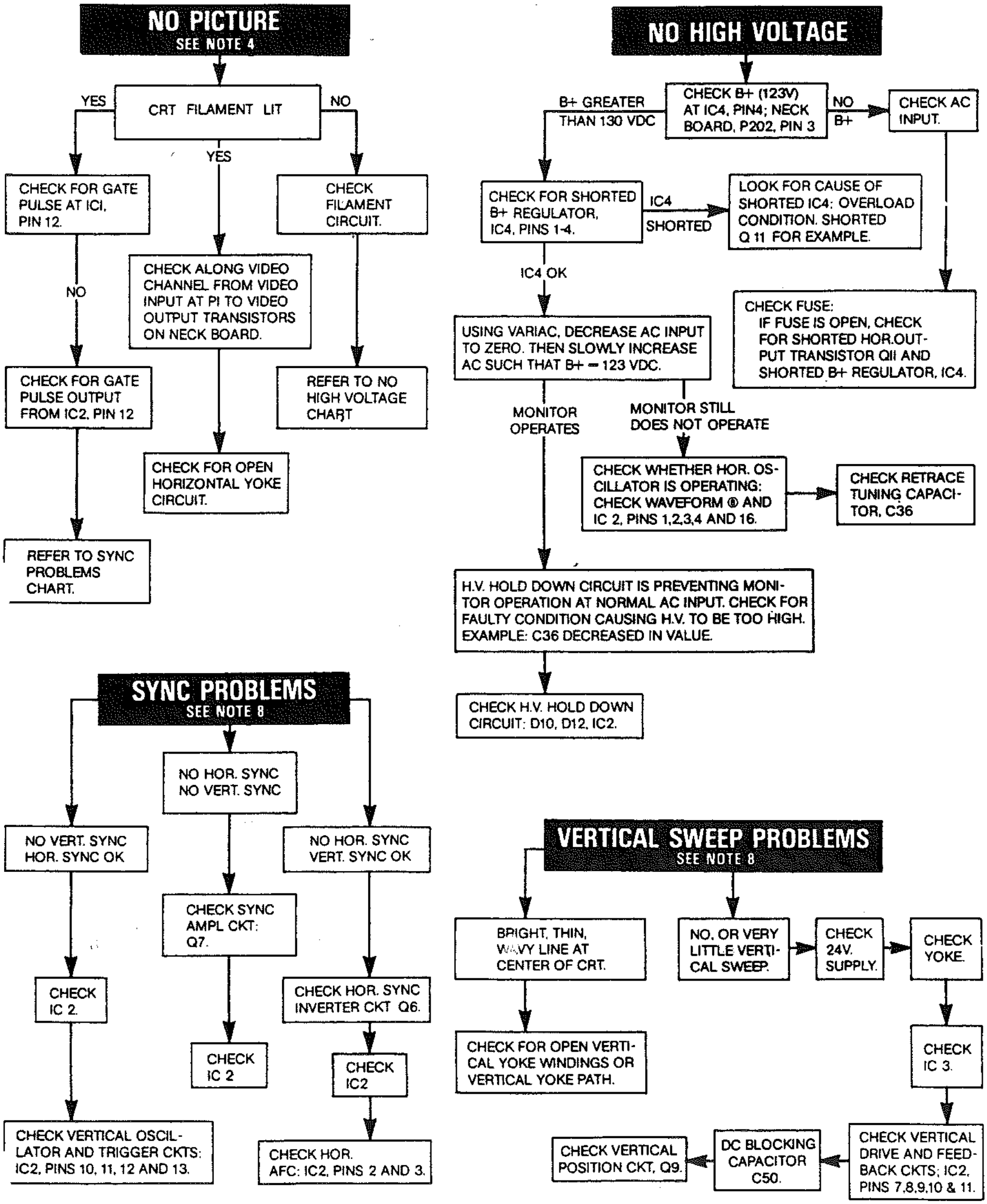
7. All monitors are equipped with automatic degaussing coils which demagnetize the picture tube every time the monitor is turned on after being off for a minimum of 20 minutes. Should any part of the chassis become magnetized it will be necessary to degauss the affected area with a manual degaussing coil. Move the coil slowly around the CRT face area and all surrounding metal parts. Then slowly withdraw for a distance of 6 feet before turning off.

8. **Horizontal vs. Vertical:**

   Some models have the picture tube mounted vertically rather than horizontally. That is, the picture tube is mounted in the frame such that the long dimension of the tube is up and down. Examples of this include (but are not limited to) Models 13K7851 and 19K7951. Other than the physical orientation of the picture tube, there is no electrical difference between these models and their horizontal counterparts. The same circuits, the vertical circuits, produce and control deflection along the short dimension of the tube in all models.

   The same circuits, the horizontal circuits, produce and control deflection along the long dimension of the tube in all models. Therefore, wherever "vertical" appears in this manual or on the monitor, it refers to the short dimension of the picture tube; wherever "horizontal" appears, it refers to the long dimension of the picture tube.

TROUBLESHOOTING CHART



VIDEO INTERFACE AND OUTPUT

The red, green, and blue video inputs come into the monitor at P1. Isolation and attenuation is provided by emitter followers Q1, Q2 and Q3. Forced blanking of the video signals is provided by the circuit of Q4, D5, D6, and D7. The forced blanking causes there to be an interruption in the video signal before it goes to the inputs of IC1. This interruption occurs between scan periods, while retrace is taking place; it is required by IC1. The forced blanking is not necessary for most video signals since they already have an interruption of video (blanking) between scan periods. Some do not; it is to accommodate such signals that the forced blanking circuit is included.

The red, green, and blue signals go into IC1 at pins 2, 4, and 6. Their levels are controlled by the gain of separate channels of the contrast amplifier. The gain is controlled by a DC voltage input to pin 11, which varies with the setting of the contrast control.

IC1 provides blanking of the video during retrace in response to blanking pulses at pin 13, derived from the horizontal and vertical sweep circuits. IC1 also requires a gating signal at pin 12 in order to provide red, green, and blue outputs at pins 21, 19, and 17. If the gating signal is not present, IC1 will not provide video output signals. The gating signal comes from IC2, pin 12 and is derived from horizontal sync.

The brightness is varied by varying the DC level of the outputs at pins 17, 19, and 21. This is accomplished by varying the DC voltage input to pin 14.

The video outputs from IC1 are provided via R30, R31, and R32 to the neck board where they are amplified by the video output stages Q201, Q202, and Q203 before being applied to the cathodes of the CRT through R10, R11, and R12.

SYNC

Sync is applied at P1 (positive sync) or at P2 (negative sync). Composite sync should be applied only to the horizontal sync input of the appropriate polarity. Positive sync is inverted by Q5 and Q6 then applied through D3, D4 and R51 to the sync amplifier Q7.

The sync amplifier output is applied through C22, R53, and R55 to pin 14 of IC2. Pin 14 is the sync separation input.

The sync separator extracts the horizontal and vertical sync from each other–providing horizontal sync to the horizontal AFC circuit in the IC. A composite sync output is provided at pin 12. This output signal is used for gating IC1 the video interface IC and for triggering the vertical oscillator.

HORIZONTAL OSCILLATOR AND OUTPUT

The horizontal AFC circuit of IC2 receives a horizontal sync input from the sync separator and a feedback signal at pin 1, derived from the horizontal output. Slight differences in frequency and phase of the two signals will cause the AFC to generate a correction voltage at pin 2.

The horizontal oscillator in IC2 has its free running frequency determined by the RC time constant of C19, R56, R57, R58, and VR2, the horizontal hold control. The horizontal hold control varies the horizontal frequency by varying the RC time constant. Slight correction in frequency is provided by a correction voltage at IC2, pin 3 which comes from pin 2 through R60.

The oscillator output at pin 4 is amplified and shaped by the horizontal drive stage Q10. The drive signal is then coupled to the base circuit of the horizontal output transistor Q11 by the horizontal drive transformer T2. T2 is used for impedance transformation to provide the Q11 base circuit with the low impedance source that it requires.

The horizontal output transistor Q11 is operated as a switch. It is either on or off. It is turned on and off at the scan rate which is determined by the horizontal oscillator frequency which is ultimately determined by the incoming horizontal sync frequency. A yoke current with a sawtooth waveform is needed to deflect the beam linearly across the CRT. The beam begins at the center of the CRT and is deflected from center to right. This center-to-right deflection occurs when Q11 is turned on. The deflection yoke coupling capacitor C38, also known as the S-shaping capacitor, begins to discharge through the yoke; the discharge current causes the beam to be deflected to the right CRT edge. At this time, Q11 is turned off, and the current provided by C38 stops. As the current falls to zero, a voltage is induced across the yoke windings as the magnetic field collapses; an oscillation is produced by the yoke windings and C36, the retrace tuning capacitor. During the first half cycle of oscillation, the induced voltage is impressed on the collector of Q11, C36, and the primary of they flyback transformer T1. This induced voltage is stepped up by the flyback transformer's secondary winding. This high voltage is then rectified and applied to the high voltage anode of the CRT. When this induced voltage occurs, the electron beam is deflected from the right edge of the CRT face to the left edge. This is called retrace. During the second half cycle of the oscillation (of C36 and the yoke windings), the voltage at the Q11 collector tries to go negative or below ground. When this happens, the damper diode (include in same package with Q11) becomes forward biased. The conduction of the damper diode allows energy stored in the horizontal system to decay linearly to zero, thus allowing the beam to return to the center of the CRT face.

The focus voltage and the screen, G2, voltage are obtained from the anode voltage with a resistor divider network within the T1 assembly. An auxiliary winding (pin 10) provides feedback to the horizontal AFC through R71, R70, and C29. This signal is also used to furnish the horizontal blanking input to IC1 via C28, R69, and R68. The signal from the auxiliary winding at pin 5 of T1 is rectified by D14 and filtered to provide the +12VDC supply for the video interface and sync circuits. The auxiliary winding of pins 3 and 4 produces a signal which is rectified by D13 and filtered to produce the +24VDC supply for the vertical output circuit.

The horizontal linearity coil L2 is a magnetically biased coil which shapes the yoke current for optimum linearity. The horizontal size coil L1 is a variable series inductor which is used to vary the horizontal size of the display.

HIGH VOLTAGE HOLD-DOWN CIRCUIT

The high voltage hold down circuit is part of the main PC board P447 of this monitor. The +12V DC supply is sensed via D10. Since the +12V DC supply is flyback pulse derived, the +12V DC supply will rise as the high voltage rises. If the +12V DC exceeds a threshold which is set with VR8, then D12 will conduct, thereby providing drive to IC2, pin 5–holddown input of deflection oscillator IC. The drive being applied to pin 5 causes the horizontal oscillator within the IC to shut down–thus preventing the generation of high voltage.

The horizontal oscillator will remain in its OFF state, even if the input to IC2, pin 5 is removed, unless and until AC power is removed from the monitor input. The power may then be reapplied.

VERTICAL OSCILLATOR AND OUTPUT

The composite sync ouput of IC2, pin 12 is filtered through the network of R65, C25, C24 and R66 so that only vertical sync is applied to the vertical trigger input at pin 11. The vertical oscillator frequency is controlled by the vertical hold control and its input to pin 10.

The vertical drive output at IC2, pin 7 is applied to pin 4 of IC3, the vertical output IC. Output current from IC3, pin 2 flows through the yoke to cause vertical deflection. During upward deflection, current flows out of pin 2, through the yoke, and into C50 to charge it. Downward deflection is caused by C50 discharging through the yoke in the opposite direction and back into IC3, pin 2. AC feedback is provided through the wiper of the vertical size control VR4 to IC2, pin 8 in order to control the drive amplitude. DC feedback at IC2, pin 9 maintains good vertical linearity at all sizes.

DC current from the +24V supply flows through R83 and through the yoke to provide downward raster shift. Some of this DC current is diverted from the yoke through the collector of Q9. The amount of this current which is diverted from the yoke can be varied by varying the base drive to Q9 by adjusting VR3, the vertical position control, thus providing manual adjustment of the vertical position of the display.

The drive signal at IC3, pin 2 is also used to furnish the vertical blanking input to IC1, pin 13 via R63 and C14.

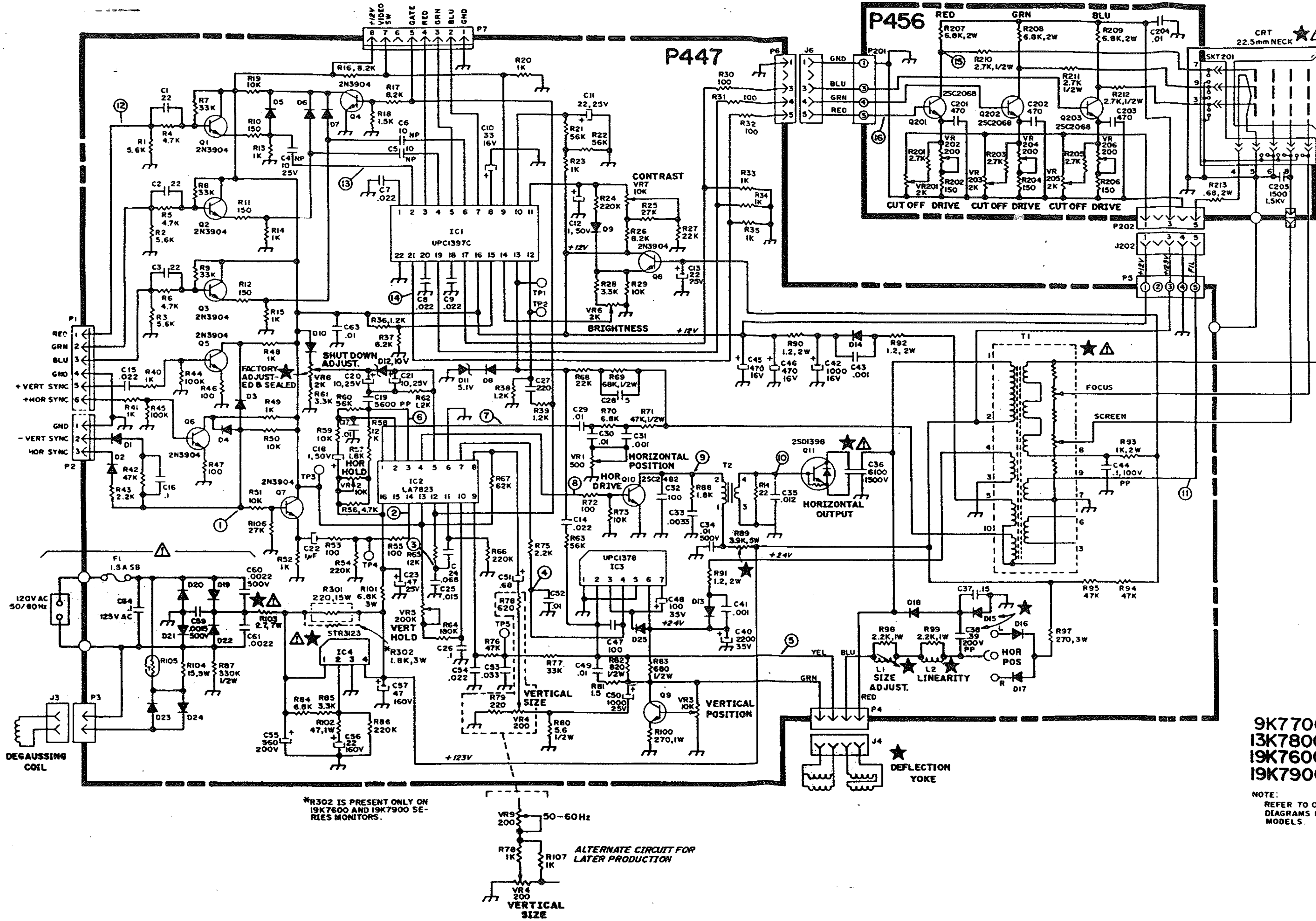
AUTOMATIC DEGAUSSING ADG

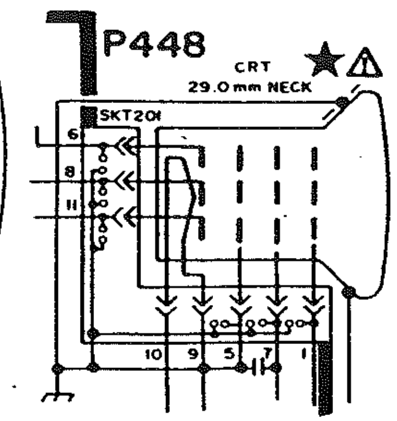
The ADG circuit automatically demagnetizes the CRT. This circuit is activated only when the monitor is initially powered up after having been off for at least 20 minutes.

R105 is a positive temperature coefficient device. When it is cold, it has a very low resistance. As it gets warm, its resistance increases. If the monitor is cold when AC power is applied, then R105 with a low resistance allows current to pass through it, D23, D24, and the degaussing coil. As current flows through R105, it heats up and eventually has a very high resistance, allowing very little current to flow through it. The residual current now flowing through R105 produces a voltage drop across R104 of less than 0.6 volts. This is not enough to forward bias D23 and D24, so there is no current through the degaussing coil.

The process of initially having a large current through the degaussing coil and then having the current decay to zero is what produces the degaussing action. The degaussing current decays to zero before the CRT warms up, so the degaussing is completed before the picture comes on.

K7000 COLOR MONITOR SCHEMATIC DIAGRAM





ALTERNATE CRT AND NECK BOARD

NOTES:

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE INDICATED.
2. CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS. ABOVE 1 IN PICOFARADS UNLESS OTHERWISE INDICATED.
3. CIRCLED NUMBERS INDICATE LOCATIONS CERTAIN WAVEFORM READINGS.

⚠ CAUTION SAFETY CRITICAL COMPONENT.

★ X-RAY RADIATION RELATED COMPONENT.

REPLACE ONLY WITH SAME TYPE PARTS AS SHOWN IN PARTS LIST.

9K7700 SERIES
13K7800 SERIES
19K7600 SERIES
19K7900 SERIES

NOTE:
REFER TO OTHER SCHEMATIC DIAGRAMS FOR CERTAIN UNIQUE MODELS.

GENERAL REPLACEMENT PARTS LIST

For all K7000 models except where noted.

This monitor contains circuits and components included specifically for safety purposes.

For continued protection no changes should be made to the original design, and components shown in shaded areas of schematic, or ⚠ ★ on parts list should be replaced with exact factory replacement parts.

The use of substitute parts may create a shock, fire, radiation or other hazard. Service should be performed by qualified personnel only.

P447 MAIN BOARD

RESISTORS

Ref. No.	Part No.	Description
R1	340X2562-934	5.6K Ohm 5% 0.25W
R2	340X2562-934	5.6K Ohm 5% 0.25W
R3	340X2562-934	5.6K Ohm 5% 0.25W
R4	340X2472-934	4.7K Ohm 5% 0.25W
R5	340X2472-934	4.7K Ohm 5% 0.25W
R6	340X2472-934	4.7K Ohm 5% 0.25W
R7	340X2333-934	33K Ohm 5% 0.25
R8	340X2333-934	33K Ohm 5% 0.25
R9	340X2333-934	33K Ohm 5% 0.25
R10	340X2151-934	150 Ohm 5% 0.25W
R11	340X2151-934	150 Ohm 5% 0.25W
R12	340X2151-934	150 Ohm 5% 0.25W
R13	340X2102-934	1.0K Ohm 5% 0.25W
R14	340X2102-934	1.0K Ohm 5% 0.25W
R15	340X2102-934	1.0K Ohm 5% 0.25W
R16	340X2822-934	8.2K Ohm 5% 0.25W
R17	340X2822-934	8.2K Ohm 5% 0.25W
R18	340X2152-934	1.5K Ohm 5% 0.25W
R19	340X2103-934	10K Ohm 5% 0.25W
R20	340X2102-934	1.0K Ohm 5% 0.25W
R21	340X2563-934	56K Ohm 5% 0.25W
R22	340X2562-934	5.6K Ohm 5% 0.25W
R23	340X2102-934	1.0K Ohm 5% 0.25W
R24	340X2224-934	220K Ohm 5% 0.25W
R25	340X2273-934	27K Ohm 5% 0.25W
R26	340X2822-934	8.2K Ohm 5% 0.25W
R27	340X2223-934	22K Ohm 5% 0.25W
R28	340X2332-934	3.3K Ohm 5% 0.25W
R29	340X2103-934	10K Ohm 5% 0.25W
R30	340X2101-934	100 Ohm 5% 0.25W
R31	340X2101-934	100 Ohm 5% 0.25W
R32	340X2101-934	100 Ohm 5% 0.25W
R33	340X2102-934	1.0K Ohm 5% 0.25W
R34	340X2102-934	1.0K Ohm 5% 0.25W
R35	340X2102-934	1.0K Ohm 5% 0.25W
R36	340X2122-934	1.2K Ohm 5% 0.25W
R37	340X2822-934	8.2K Ohm 5% 0.25W
R38	340X2122-934	1.2K Ohm 5% 0.25W
R39	340X2122-934	1.2K Ohm 5% 0.25W
R40	340X2102-934	1.0K Ohm 5% 0.25W
R41	340X2102-934	1.0K Ohm 5% 0.25W
R42	340X2473-934	47K Ohm 5% 0.25W
R43	340X2222-934	2.2K Ohm 5% 0.25W
R44	340X2104-934	100K Ohm 5% 0.25W
R45	340X2104-934	100K Ohm 5% 0.25W
R46	340X2101-934	100 Ohm 5% 0.25W
R47	340X2101-934	100 Ohm 5% 0.25W
R48	340X2102-934	1.0K Ohm 5% 0.25W
R49	340X2102-934	1.0K Ohm 5% 0.25W
R50	340X2103-934	10K Ohm 5% 0.25W
R51	340X2103-934	10K Ohm 5% 0.25W
R52	340X2102-934	1.0K Ohm 5% 0.25W
R53	340X2151-934	150 Ohm 5% 0.25W
R54	340X2224-934	220K Ohm 5% 0.25W
R55	340X2101-934	100 Ohm 5% 0.25W
R56	340X2472-934	4.7K Ohm 5% 0.25W
R57	340X2182-934	1.8K Ohm 5% 0.25W
R58	340X2123-934	12K Ohm 5% 0.25W

RESISTORS (Cont.)

Ref. No.	Part No.	Description
R59	340X2103-934	10K Ohm 5% 0.25W
R60	340X2563-934	56K Ohm 5% 0.25W
R61	340X2332-934	3.3K Ohm 5% 0.25W
R62	340X2122-934	1.2K Ohm 5% 0.25W
R63	340X2563-934	56K Ohm 5% 0.25W
R64	340X2184-934	180K Ohm 5% 0.25W
R65	340X2123-934	12K Ohm 5% 0.25W
R66	340X2224-934	220K Ohm 5% 0.25W
R67	340X2623-934	62K Ohm 5% 0.25W
R68	340X2223-934	22K Ohm 5% 0.25W
R69	340X3683-231	68K 5% 0.5W CAR
R70	340X2682-934	6.8K Ohm 5% 0.25
R71	340X3473-234	47K 5% 0.5W
R72	340X2101-934	100 Ohm 5% 0.25W
R73	340X2103-934	10K Ohm 5% 0.25W
R74	340X2220-934	22 Ohm 5% 0.25W
R75	340X2222-934	2.2K Ohm 5% 0.25W
R76	340X2473-934	47K Ohm 5% 0.25W
R77	340X2333-934	33K Ohm 5% 0.25
R78	340X2102-934	1.0K Ohm 5% 0.25W
R80	340X3056-934	5.6 5% 0.5W
R81	340X2150-934	15 Ohm 5% 0.25W
R82	340X3821-934	820 Ohm 5% 0.5W
R83	340X3681-934	680 Ohm 5% 0.5W
R84	340X2682-934	6.8K Ohm 5% 0.25
R85	340X2332-934	3.3K Ohm 5% 0.25W
R86	340X2224-934	220K Ohm 5% 0.25W
R87	340X3334-844	330K 10% 0.5W
R88	340X4182-633	1.8K 5% 1W
★R89	043X0476-002	3.9K 5% 5W MO
R90	043X0486-002	1.2 5% 2W MF
R91	043X0486-002	1.2 5% 2W MF
R92	043X0486-002	1.2 5% 2W MF
R93	420X5102-324	1.0K 5% 2W
R94	340X2473-934	47K Ohm 5% 0.25W
R95	340X2473-934	47K Ohm 5% 0.25W
R96	420X6182-325	1.8K Ohm 5% 3W, WW
R97	420X6271-325	270 5% 3W
R98	340X4222-633	2.2K Ohm 5% 1W
R99	340X4222-633	2.2K Ohm 5% 1W
R100	340X4271-633	270 5% 1W
R101	420X6682-325	6.8K 5% 3W
R102	340X4470-633	47 5% 1W
⚠★R103	043X0483-001	2.7 Ohm 5% 7W
R104	043X0484-001	15 Ohm 5% 5W
R105	043X0485-001	Thermister
R106	340X2273-934	27K Ohm 5% 0.25W
R107	340X2102-934	1.0K Ohm 5% 0.25W
R301	043X0481-003	220 Ohm 15W WW
VR1	040X0653-002	CTRL 500
VR2	040X0653-005	CTRL 10K
VR3	040X0653-005	CTRL 10K
VR4	040X0653-001	CTRL 200
VR5	040X0653-006	CTRL 200K
VR6	040X0653-003	CTRL 2K
VR7	040X0653-005	CTRL 10K
★VR8	040X0639-006	Trim Pot 2K Ohm 0.3W
VR9	040X0655-001	Trim Pot 200 Ohm

REPLACEMENT PARTS LIST

P456 NECK BOARD (used with CRT's with a 22.5mm neck diameter)

RESISTORS

Ref. No.	Part No.	Description
R201	340X2272-934	Res 2.7K Ohm 5% 0.25W
R202	340X2151-934	Res 150 Ohm 5% 0.25W
R203	340X2272-934	Res 2.7K Ohm 5% 0.25W
R204	340X2151-934	Res 150 Ohm 5% 0.25W
R205	340X2272-934	Res 2.7K Ohm 5% 0.25W
R206	340X2151-934	Res 150 Ohm 5% 0.25W
R207	340X5682-633	Res 6.8K 2W MO
R208	340X5682-633	Res 6.8K 2W MO
R209	340X5682-633	Res 6.8K 2W MO
R210	340X3272-244	Res 2.7K Ohm 10% 0.5W
R211	340X3272-244	Res 2.7K Ohm 10% 0.5W
R212	340X3272-244	Res 2.7K Ohm 10% 0.5W
R213	340X5689-333	Res .68 Ohm 5% 2W
VR201	040X0653-003	CTRL 2K
VR202	040X0653-001	CTRL 200
VR203	040X0653-003	CTRL 2K
VR204	040X0653-001	CTRL 200
VR205	040X0653-003	CTRL 2K
VR206	040X0653-001	CTRL 200

CAPACITORS

Ref. No.	Part No.	Description
C201	080X0090-006	Cap 470PF 10% Z5F CER
C202	080X0099-006	Cap 470PF 10% Z5F CER
C203	080X0099-006	Cap 470PF 10% Z5F CER
C204	080X0099-221	C Disc .01 10% Y5P 500V
C205	080X0099-225	C Disc .0015 1.5KV

SEMICONDUCTORS

Ref. No.	Part No.	Description
Q201	086X0184-001	TRSTR 2SC2068LB/LBBK
Q202	086X0184-001	TRSTR 2SC2068LB/LBBK
Q203	086X0184-001	TRSTR 2SC2068LB/LBBK

MISCELLANEOUS

Ref. No.	Part No.	Description
P202	006A0429-005	Plug Header
SKT201	003A0636-001	Pix Socket
J6	013X1243-001	Cable Assy 4 Wire 350mm
	030X0797-001	Plug V Pin

P448 NECK BOARD (Used with CRT's with a 29mm neck diameter)

Same as P456 NECK BOARD except:

SKT201 003A0651-001 SOC CRT

FINAL ASSEMBLY PARTS

Ref. No.	Part No.	Description
	9K7700 SERIES (9")	
⚠★	88X0218-506	CRT Toshiba A23JAN99X
★	9A2865-001	Deflection Yoke
	2A0690-001	Purity & Convergence Ring Assembly
	9A2864-001	Degaussing Coil Assembly
	8X0378-001	Rubber Wedge
	13K7800 SERIES (13")	
⚠★	88X0236-506	CRT Orion A34JLL00X
★	9A2860-001	Deflection Yoke
	2A0690-001	Purity & Convergence Ring Assembly
	9A2856-001	Degaussing Coil Assembly
	8X0378-001	Rubber Wedge
	19K7600 and 19K7900 SERIES (19")	
⚠★	88X0237-506	CRT Philips MVA48ABK05X
★	9A2862-001	Deflection Yoke
	2A0690-001	Purity & Convergence Ring Assembly
	9A2857-001	Degaussing Coil Assembly
	208X2400-901	Rubber Wedge

TYPICAL DC VOLTAGES WITH INPUT SIGNAL

Voltages shown below are for reference only.
Voltages may vary with input signal and with control adjustment.

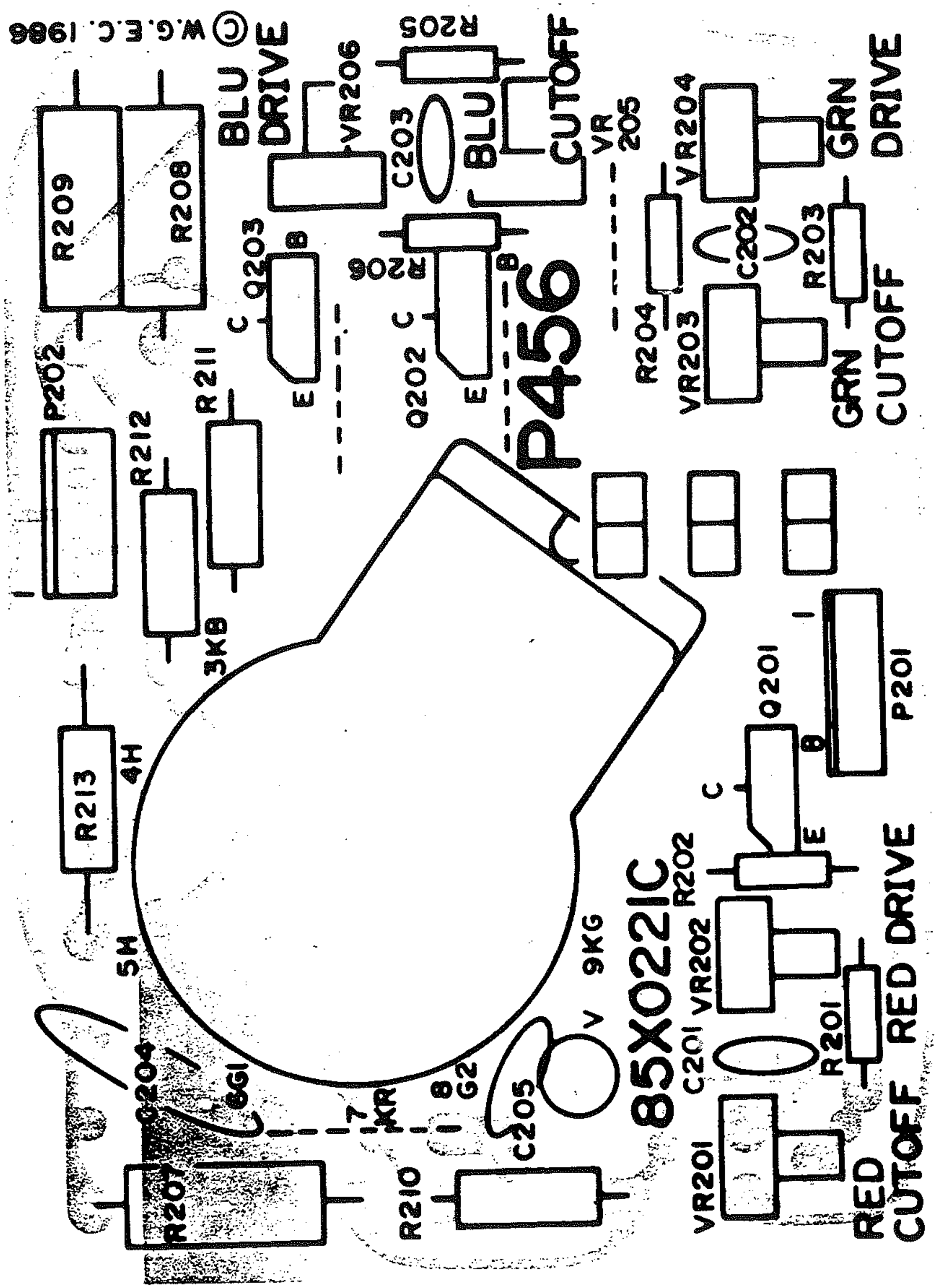
TRANSISTOR NUMBER	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q201	Q202	Q203
COLLECTOR	12.0	12.0	12.0	10.7	11.0	11.0	12.0	12.0	12.3	40.6	*	107.8	107.8	107.8
BASE	1.7	1.7	1.7	0.1	0.2	0.2	6.0	12.8	3.3	0.4	0.03	1.7	1.7	1.7
EMITTER	1.0	1.0	1.0	0	0.01	0.01	5.4	12.0	2.6	0	0	1.4	1.4	1.4

* DO NOT MEASURE

DIODE NO.	ANODE	CATHODE
D1	8.5	9.1
D2	8.5	9.1
D3	8.5	11.0
D4	8.5	11.0
D5	0.9	10.7
D6	0.9	10.7
D7	0.9	10.7
D8	0.55	2.6
D9	7.7	12.0
D10	12.0	11.4
D11	0	2.6
D12	0.05	9.8
D13	----	24.0
D14	0.17	12.2
D15	0	8.0
D16	----	123
D17	123	----
D18	8	*
D19	----	164.3
D20	0	---
D21	0	----
D22	----	164.3
D23	----	---
D24	----	----
D25	24.0	23.6

IC NO.	1	2	3	4
TERMINAL NUMBER				
1	3.0	4.3	0	163.5
2	2.0	6.8	12.2	125.2
3	2.7	6.7	23.6	0
4	2.0	0.6	0.8	123.0
5	2.7	0.5	0	
6	2.0	0.3	24.0	
7	2.7	0.9	2.2	
8	2.7	3.5		
9	1.3	0.3		
10	10.4	6.2		
11	7.9	0.6		
12	0	1.3		
13	0.55	12.0		
14	2.1	13.7		
15	10.5	0.8		
16	12.0	12.8		
17	1.7			
18	3.0			
19	1.7			
20	3.0			
21	1.7			
22	0			

* DO NOT MEASURE



VIEW OF COMPONENT SIDE

FIG. 12

MAIN PC BOARD LAYOUT

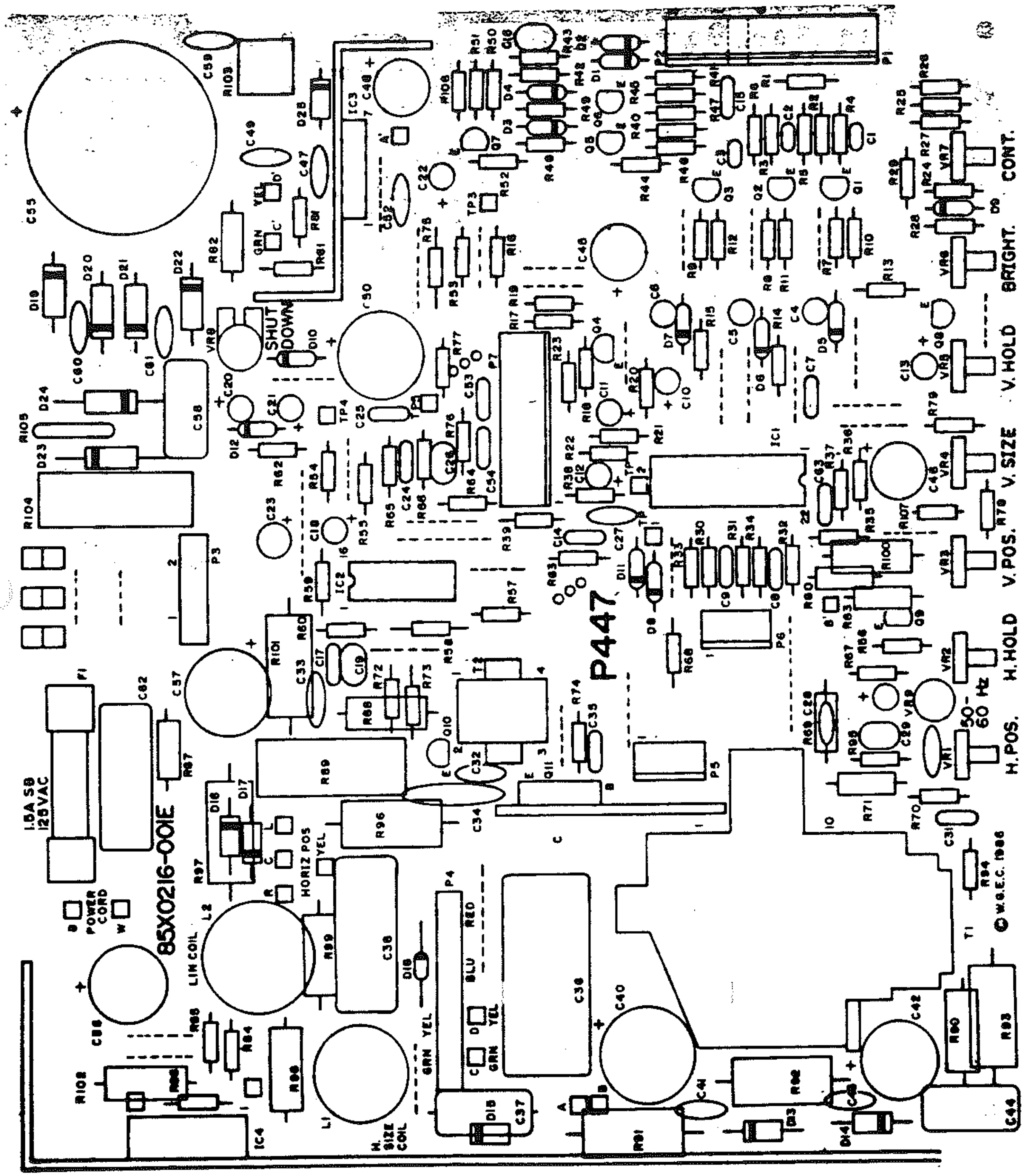


FIG. 14

AMF

ZENITH SCHEMATIC

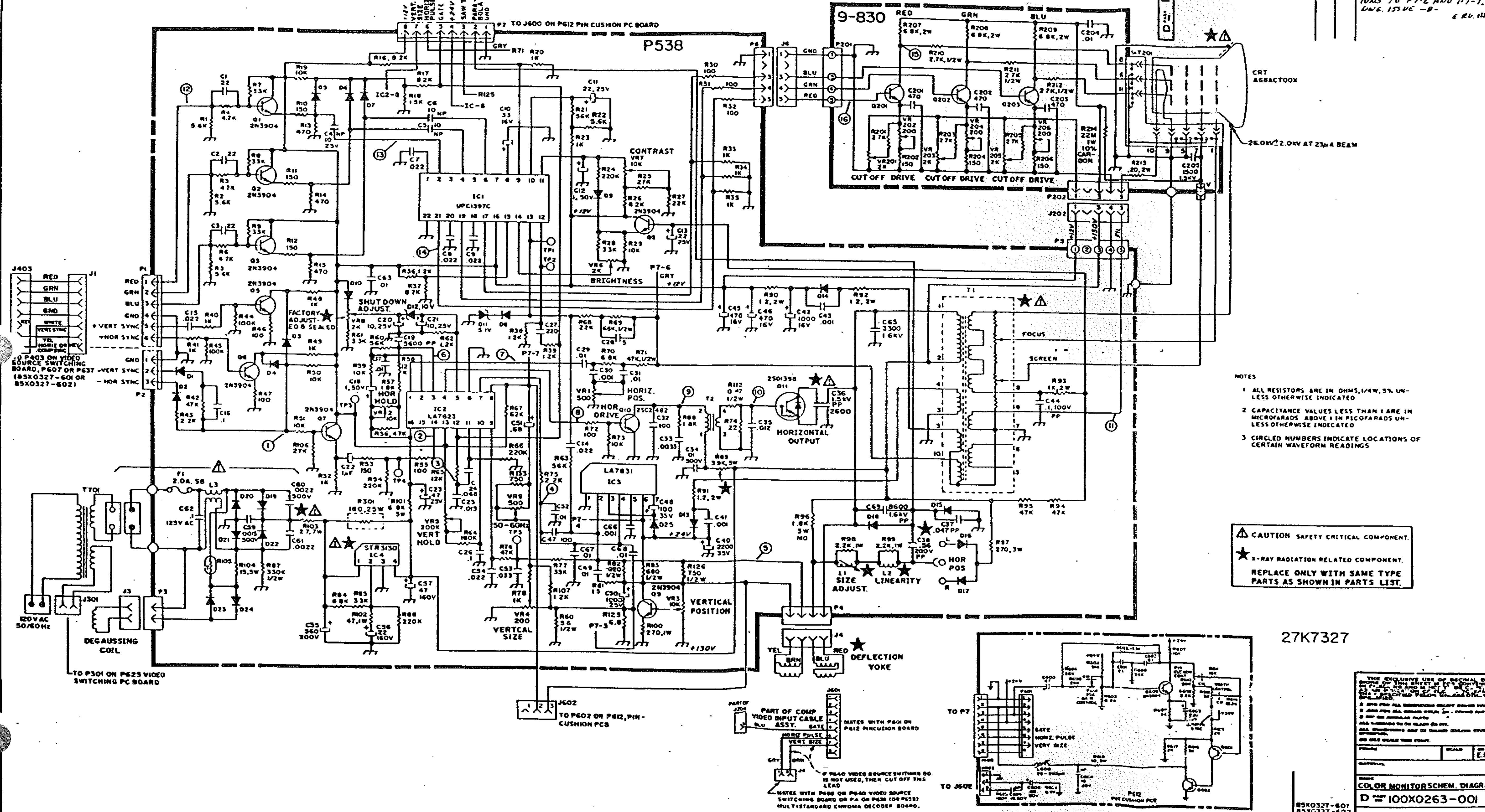
AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

PART NUMBER 610-32-0242

REVISION: NEW
APRIL 1991

WELLS GARDNER ELECTRONICS CORPORATION CHICAGO ILLINOIS 60639 PHONE: (312) 252-8220

K7000 COLOR MONITOR SCHEMATIC DIAGRAM



NOTES

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE INDICATED
2. CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS ABOVE 1 IN PICOFARADS UNLESS OTHERWISE INDICATED
3. CIRCLED NUMBERS INDICATE LOCATIONS OF CERTAIN WAVEFORM READINGS

⚠ CAUTION SAFETY CRITICAL COMPONENT.

★ X-RAY RADIATION RELATED COMPONENT.

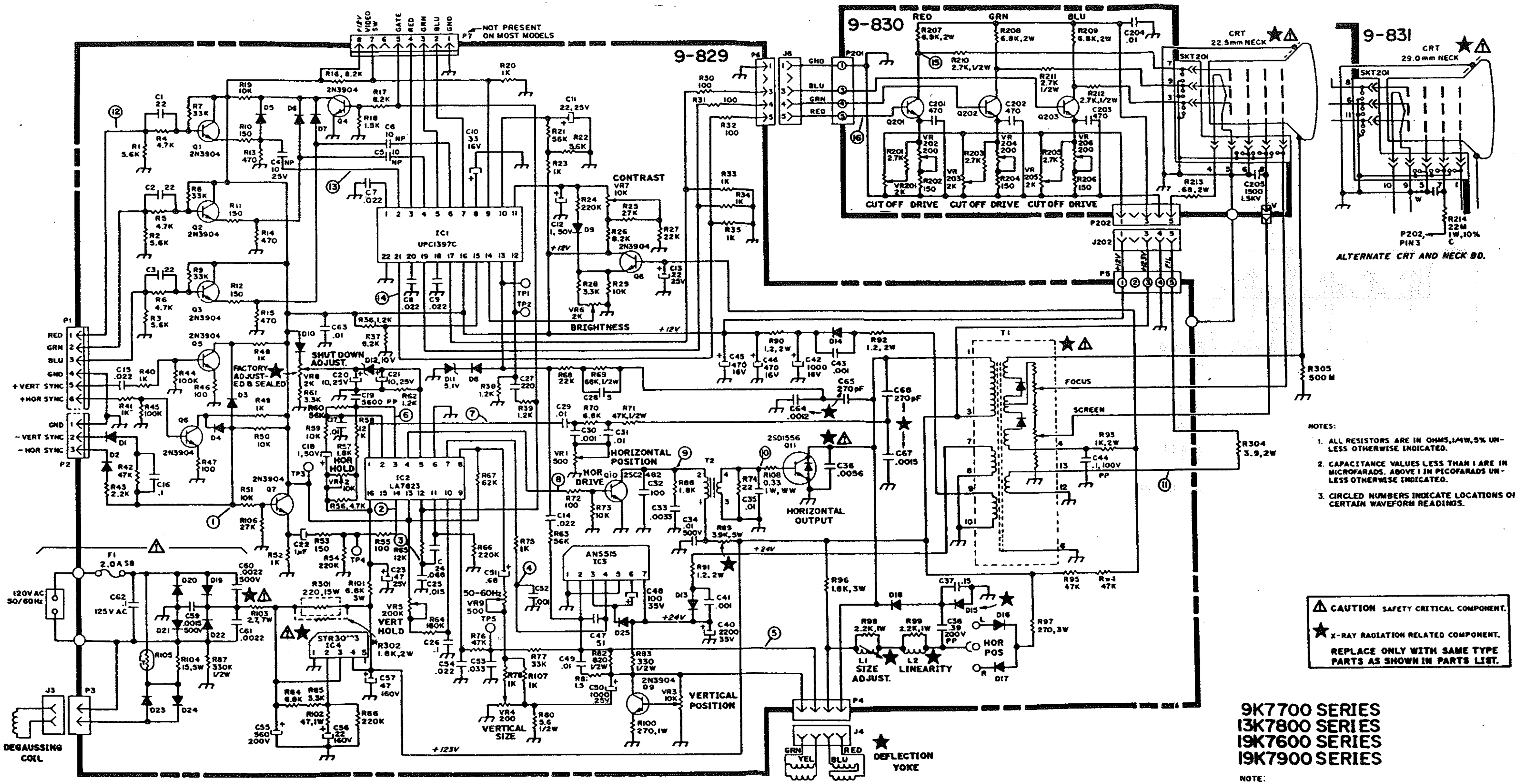
REPLACE ONLY WITH SAME TYPE PARTS AS SHOWN IN PARTS LIST.

COLOR MONITOR SCHEM. DIAGRAM

D 100X0263-001

85X0327-601
85X0327-602

K7000A COLOR MONITOR SCHEMATIC DIAGRAM



NOTES:

1. ALL RESISTORS ARE IN OHMS,1/4W,5% UNLESS OTHERWISE INDICATED.
2. CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS. ABOVE 1 IN PICOFARADS UNLESS OTHERWISE INDICATED.
3. CIRCLED NUMBERS INDICATE LOCATIONS OF CERTAIN WAVEFORM READINGS.

⚠ CAUTION SAFETY CRITICAL COMPONENT.

★ X-RAY RADIATION RELATED COMPONENT.

REPLACE ONLY WITH SAME TYPE PARTS AS SHOWN IN PARTS LIST.

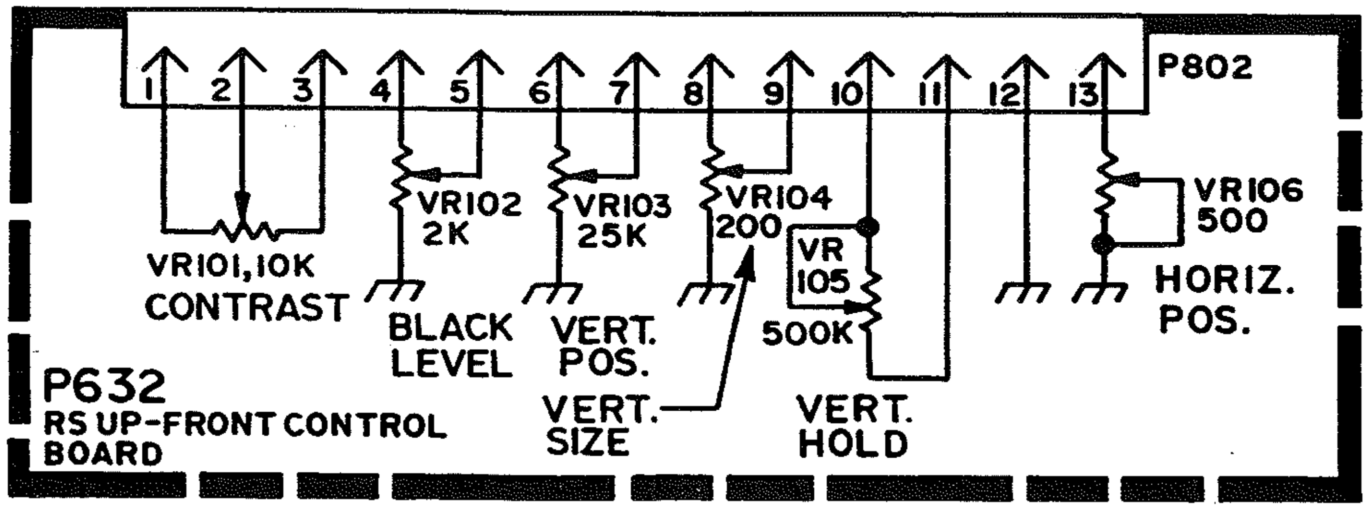
9K7700 SERIES
13K7800 SERIES
19K7600 SERIES
19K7900 SERIES

NOTE:
REFER TO OTHER SCHEMATIC DIAGRAMS FOR CERTAIN UNIQUE MODELS.

*R302 IS PRESENT ONLY ON 19IN. AND LARGER MONITORS.

FRONT CONTROL BOARD

P632



K7000A REPLACEMENT PARTS LIST

Use General Parts List of K7000 except for following:

9-829 MAIN BOARD (P447)

R83	340X3331-934	330 ohm	5% 0.5w
R108	043X0477-008	.33 ohm	5% 1w ww
△★C36	046X0536-027	5600PF	2% 1600v Polypropylene
C47	080X0099-240	51PF	5% 100v Z5F CER
C52	047X0786-504	.001 UF	10% 50v P-Estr
C59	080X0099-724	Disc .0015	10% Y5P 500v CER
C64	080X0099-241	1200 PF	10% Y5P 500v CER
C65	080X0098-050	270 PF	5% N2200 3Kv CER
C67	080X0099-724	Disc .0015	10% Y5P 500v CER
C68	080X0098-050	270PF	5% N2200 3Kv CER

TRANSFORMER AND COIL

△★T1	053X0605-001	Transf - Flyback

SEMICONDUCTORS

D18	066X0125-001	Diode GI Type DG3 1400v 3A
Q11	086X0310-001	TRSTR 2SD1556 Toshiba
IC3	086X0311-001	IC Vert Output AN5515
IC4	086X0302-002	IC Regulator STR30123

9-830 NECK BOARD (P456)

SEMICONDUCTORS

Q201	086X0312-001	TRSTR	NPN	Vid Out
Q202	086X0312-001	TRSTR	NPN	Vid Out
Q203	086X0312-001	TRSTR	NPN	Vid Out

MISCELLANEOUS

STK201	003A0681-001 Pix Socket

9-831 NECKBOARD (P448)

RESISTORS

R214	340X4226-241	22MEG Ohm 10% 1w Carbon

SEMICONDUCTORS

Q201	086X0312-001	TRSTR	NPN	Vid Out
Q202	086X0312-001	TRSTR	NPN	Vid Out
Q203	086X0312-001	TRSTR	NPN	Vid Out

MISCELLANEOUS

STK201	003A0682-001	Pix Socket

AMF

ACCUCAM INSTALLATION, ALIGNMENT AND TROUBLESHOOTING MANUAL

AMF Bowling, Inc.
AUTOMATIC SCORING DIVISION
RICHMOND, VIRGINIA 23111

PART NUMBER 610-002-440

REVISION:01
APRIL 1991

misc\stcovers.pm4

TABLE OF CONTENTS

ACCUCAM
INSTALLATION, ALIGNMENT AND TROUBLESHOOTING MANUAL

PART I - EXPLANATION

1. GENERAL

The optical pinsensor is designed to be mounted on the ball return capping at a position where it can properly view the two adjacent pin decks. Because of the variations of ball return cappings and distances between adjacent lanes, mounting positions can vary. This procedure describes the installation and alignment technique required for proper operation.

The method of mounting the pinsensor will be dependent upon the type of capping, but in all cases some sort of standard fasteners should be appropriate. A drill template is provided.

The alignment (aiming of the camera head) can be accomplished with minimum tools and little effort. A height gauge and two targets are provided. The height gauge aids in setting the proper camera height. The two targets are placed in the pin deck area for viewing by the pinsensor. The alignment procedure will function with one or two lanes. The pinsensor itself contains the algorithm which examines the field of view with respect to the target position and identifies to the installer which adjustments to make for proper alignment. Light Emitting Diodes (LED's) are used for the indications.

WARNING: The Optical Pinsensor must be kept together as a unit. Never swap main boards inside the unit with a main board from another unit. This applies to repairs or software updates.

2. METHODOLOGY

The positioning of the pinsensor on the ball return capping is determined by the distance between the lanes. The system will accommodate lane separations between 27" and 33", typical of most installations. The wider the separation between lanes, the greater the distance between the pinsensor and the pin deck. The proper mounting location for various lane separations, given in a table, provide the optimum separation of the pins as viewed by the camera.

The proper positioning of the camera head (aiming) is accomplished by first setting the camera to the proper height. Then the targets are placed in their proper positions on the pin deck. The pinsensor system utilizes a pattern recognition algorithm to determine if it is viewing too high or too low on each target, as well as if the targets appear too far to the left or right. The adjustments required are indicated by LED's visible through the side of the chassis.

3. GENERAL TECHNIQUE

3.1 PINSENSOR MOUNTING

The distance between adjacent lanes is first measured. The points at which the measurement should be taken are the inside edge of each lane where the gutter begins. This distance is then used to determine the correct distance from the pinsensor mounting to the pin deck. The line of reference on the pin deck is the last row of pins (7 - 10). Next the drill template is positioned at the proper distance from this reference and centered laterally on the ball return capping. Mounting holes are then drilled and the pinsensor securely fastened. It is extremely important that the capping in this region be rigidly mounted. Failure to do this will result in scoring errors.

3.2 CAMERA HEIGHT ADJUSTMENT

The camera height adjustment is accomplished using the height gauge. This gauge straddles the ball return, one foot resting on each lane. The camera height is properly set when its lower lip is resting on the height gauge cross bar.

3.3 CAMERA ALIGNMENT

The alignment targets are placed at the seven and ten positions of the left and right lanes, respectively. When only one lane is used, the targets should be placed on the seven and ten spots of the single lane.

A bubble level is attached to the camera head to provide initial adjustments during installation and before using the alignment targets. Initial leveling will minimize the adjustment time. In normal installations, leveling alone should bring the alignment to within one or two inches of correct adjustment.

The pinsensor is next powered on and the toggle switch on the rear of the unit is switched to "ALIGN". The mechanical alignment is then adjusted by two thumb nuts and a cap head allen screw. The direction of rotation required for each of these is indicated by three sets of alignment LED's, each set containing three LED's. One LED indicates clockwise (CW) rotation required. The next indicates counterclockwise (CCW) rotation required, while the third indicates correct alignment. Both CW and CCW rotation indications simultaneously identify a gross error that requires the repositioning of the camera head because the alignment targets are not in the field of view.

Once alignment is complete, two additional thumb nuts and two locking screws are tightened to secure the camera in place. The toggle switch is then returned to "RUN", and the pinsensor is ready for operation.

NOTE: The pin deck illumination lamps must be on during alignment.

PART II - INSTALLATION AND ALIGNMENT PROCEDURE

1. TOOLS REQUIRED

1.1 Tape measure - 15' or longer.

1.2 Installation kit - consisting of height gauge, alignment targets and supports, 9/64" allen wrench, drill jig (template), drill, etc.

1.3 Drill motor.

1.4 Slotted screwdriver or 5/16" nutdriver - appropriate for mounting screws.

2. PINSENSOR MOUNTING

IMPORTANT: THE CAPPING ON WHICH THE PINSENSOR IS TO BE MOUNTED MUST BE SECURELY FASTENED TO THE STRUCTURE BELOW. A RIGID CAPPING IS REQUIRED FOR PROPER PINSENSOR PERFORMANCE!

2.1 Measure the distance between the inside edges of the two lanes.

2.2 Center the drill template laterally on the ball return capping at the distance given in the table of Figure 1.

2.3 Drill four pilot holes in the capping using the drill template.

NOTE: The final hole size depends upon the capping construction and the type of fasteners selected. The furnished drill size is adequate for the #10 sheet metal screw furnished for typical wood cappings. For thin wood or metal cappings, #10 machine screws and bolts are recommended (not furnished).

2.4 Secure the pinsensor to the capping using the four mounting screws or bolts.

3. CAMERA HEIGHT ADJUSTMENT

3.1 Assemble the height gauge per the illustration in Fig. 2-B.

3.2 Loosen the height adjustment locking screws (Fig. 3-A, B, Item A) so that the camera head can be moved up and down freely.

3.3 Position the height gauge across the ball return capping as illustrated in Fig. 5. While raising the camera head to a position above the height bar, slide the bar under the lower front lip of the camera so that the head is supported by the bar (Fig. 3-A).

3.4 With the head resting on the bar, the bubble level on the head should indicate the minimal tilt to the left or right. If the level position is acceptable, tighten the height adjustment locking screws and go to the next step.

If the level indicates severe tilt, verify that the camera base is in the center of the return and no severe mounting problems are present before going to the next step. If the pinsensor is centered but tilted, tilt the camera head so that it is level and then secure it with the locking screws. Make certain the vertical height does not change. The center of the lens should be approximately 9 and 5/8 inches above the lane deck.

4. HORIZONTAL AND VERTICAL ALIGNMENT

4.1 Loosen the horizontal locking screws (Fig. 3, Item B) so that their heads are just making complete contact. Next loosen the two top thumb nuts (Fig. 3-A, B, Item C) so that there is approximately 1/4 inch clearance to the washers beneath.

4.2 Adjust the two bottom thumb nuts (Fig. 3-A, B, Item D) so that the front lips of the camera head are approximately 1/4 inch apart and parallel. (This adjustment should not be necessary for new installations since the camera head is shipped in this position.)

4.3 Install the extension arms on the target holders (Fig. 2-A). Next install the alignment targets on the target supports using the guides. Make certain the target is flat and that the bottom edge rests on the base.

4.4 Place one alignment target directly on the center of the seven pin spot on the left lane and the other on the ten spot on the right lane. The targets should be directly facing the bowler approach area. If the camera is to serve one lane only, use the seven and ten pin spots of that lane.

4.5 Apply power to the pinsensor and switch the toggle switch on the rear of the pinsensor to "ALIGN".(On some systems, only the "RUN" position may be identified. The "ALIGN" position is opposite the "RUN" position.)

NOTE: MAKE CERTAIN THE PIN DECK LAMPS ARE ON DURING THIS ENTIRE PROCEDURE.

4.6 Using the left and right lower thumb nuts to tilt the camera head, adjust the position until the bubble level is centered.

4.7 Observe the LED's to verify that the targets have been located. Failure to locate a left or right target is indicated by both the CW and CCW Lamps of that target being on at the same time. The horizontal adjustment (side position) indicator will always indicate a failure unless both targets are found. Be certain there is nothing between the lens and pin deck blocking the field of view. This includes the operator's hands and arms. It is recommended that the installer position himself so that his weight is supported by a lane instead of the gutter ball return capping. This will minimize any shifting of the camera after alignment.

NOTE: BOTH TARGETS MUST BE CLEAN!

4.8 Adjust the horizontal adjustment screw (Fig. 3-A, B, Item E) so that the side position indication is okay. Then slowly turn this screw CCW to the point until an indication of CW is given. Next, rotate the screw CW until a CCW rotation is indicated. Finally, rotate the screw CCW until it is approximately in the mid range of the acceptable position.

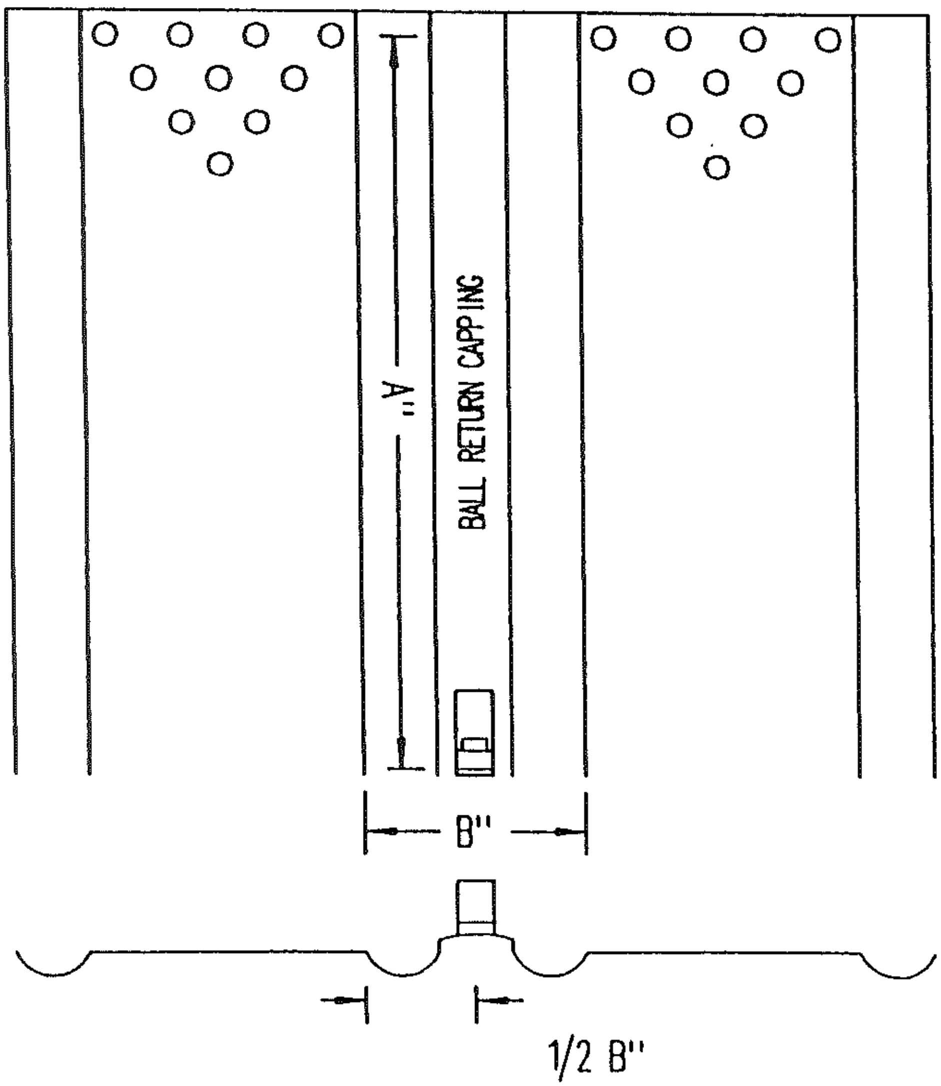
4.9 Rotate the adjustment thumb nuts slowly in the direction indicated by the lamps. Their adjustments are interactive; therefore it is recommended that they alternately be adjusted no more than a third of a turn at a time. Once the left and right vertical positions indicate proper adjustment, reverify the horizontal adjustment described in 4.8.

4.10 Slowly tighten the two horizontal locking screws. If this alters the vertical adjustment, repeat the vertical adjustment to fine tune the alignment with these locking nuts slightly loosened.

4.11 Tighten the upper thumb nuts securely to lock the camera in place.

4.12 Return the toggle switch to the "RUN" position and remove the alignment targets. The system is now operational.

This completes the camera installation and alignment procedure.



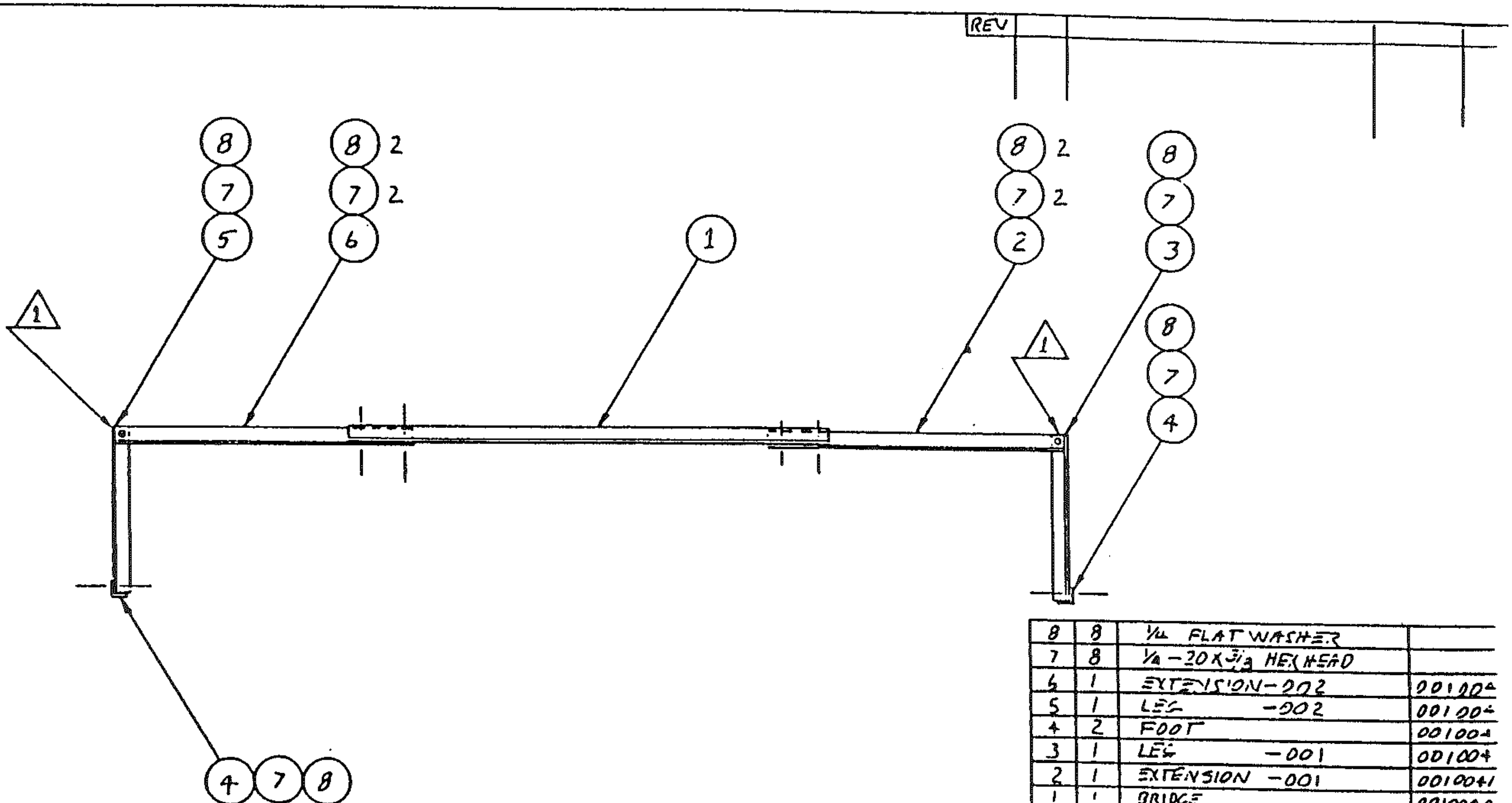
1) MEASURE THE DISTANCE BETWEEN LANES, "B", TO THE NEAREST 1/2".

2) DETERMINE THE DISTANCE "A" THAT CORRESPONDS TO THE MEASURED "B" USING THE TABLE BELOW. "A" IS THE DISTANCE, IN INCHES, FROM THE BACK ROW OF PINS TO THE BACK OF THE PIN SENSOR.

PIN SENSOR LOCATION TABLE

B	A
28" - 29"	157"
29.5" - 30"	158"
30.5" - 31"	159"
31.5" - 32"	161"

FIGURE 1 PIN SENSOR MOUNTING LOCATION



8	8	1/4 FLAT WASHER	
7	8	1/4 -20 X 3/8 HEX HEAD	
6	1	EXTENSION -002	00100[illegible]
5	1	LEG -002	00100[illegible]
4	2	FOOT	00100[illegible]
3	1	LEG -001	001004
2	1	EXTENSION -001	0010041
1	1	BRIDGE	00100[illegible]

SCANTEK, INC.

HEIGHT GAUGE

SCALE 1 = 5 | CHECKED BY | DRAWN BY [illegible]

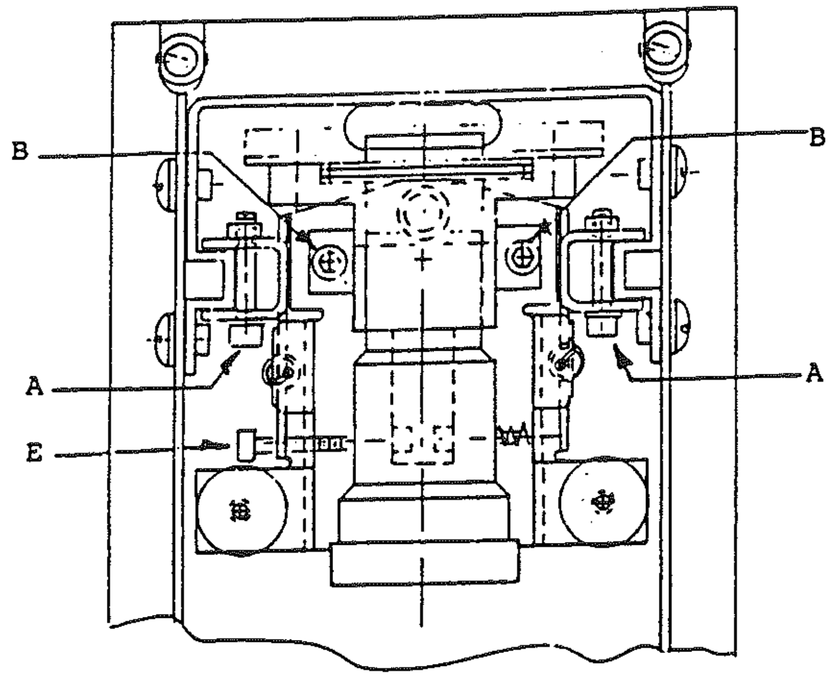
DATE [illegible]

SIZE [illegible] | DRAWING NO. [illegible]

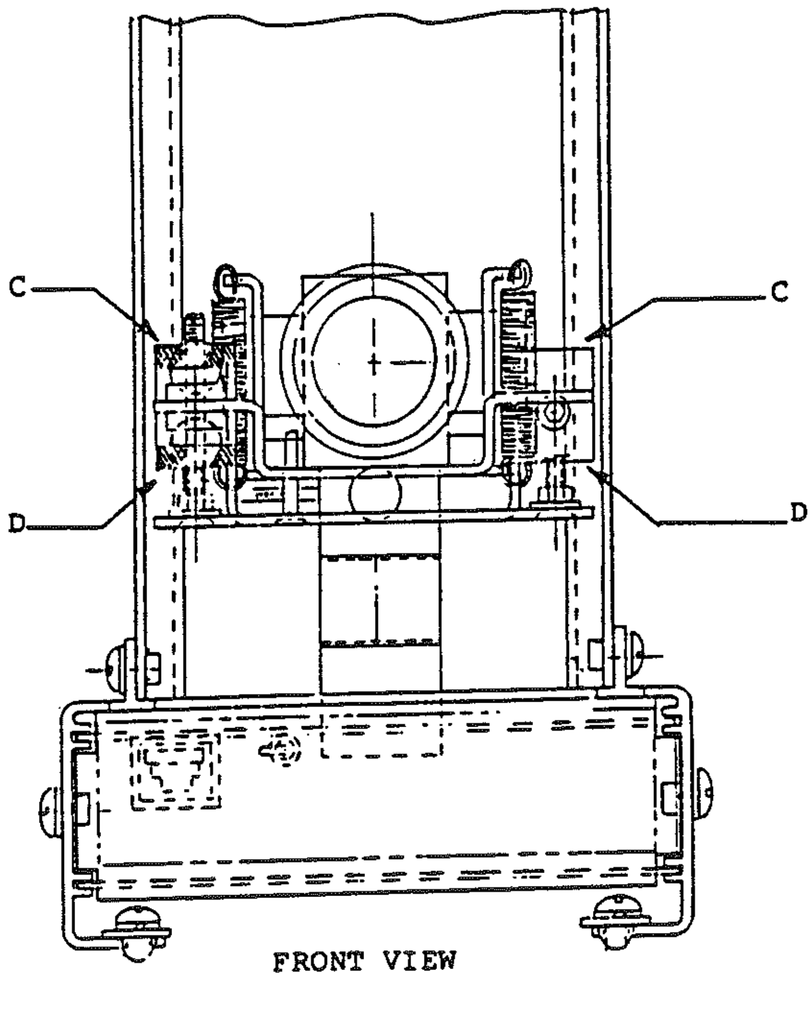
NOTES:

1 ALLOW ITEM "7" TO REST IN LOWEST POSITION OF HOLE IN ITEMS "3" AND "5" BEFORE TIGHTENING.

FIGURE 2

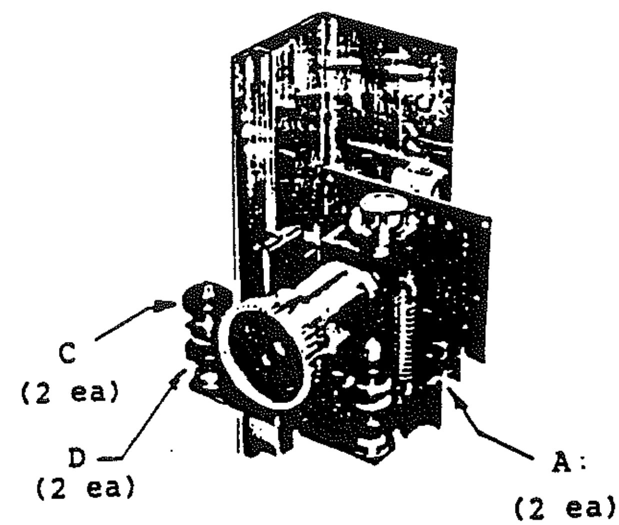


TOP VIEW



FRONT VIEW

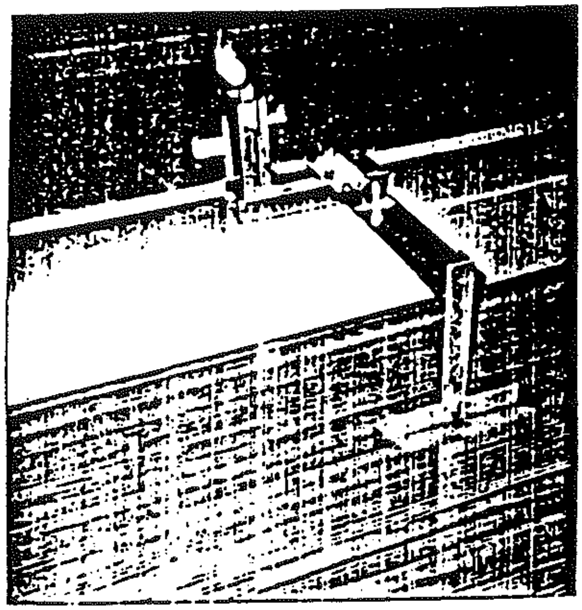
FIGURE 3



CAMERA HEAD ASSEMBLY

CUT-AWAY VIEW

FIGURE 4



POSITIONING OF CAMERA HEIGHT GAGE

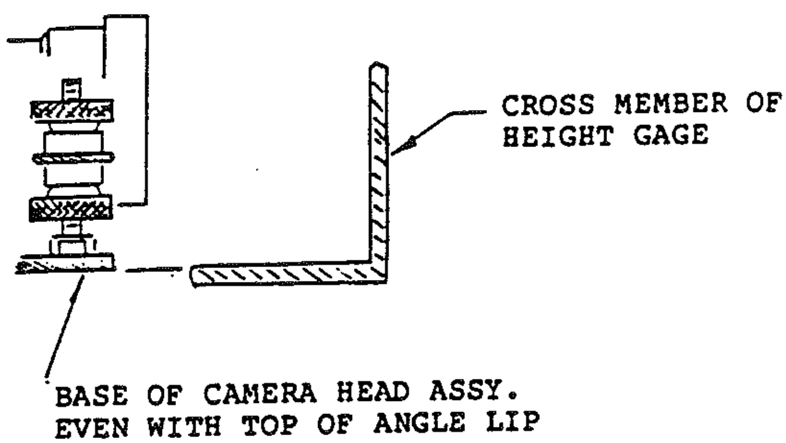


FIGURE 5

5. TROUBLESHOOTING WITH THE LED DISPLAYS

5.1 LED DISPLAY

Nine display LED's, LEDI-LED9, are visible through the side of the pinsensor chassis (Fig. 4). The LED's can indicate several different things, depending upon the internal state of the pinsensor. The different meanings are described below.

5.2 SYSTEM IN ALIGNMENT MODE

LED's 1 through 3 indicate the apparent position of the left target (as seen by the right side of the camera). These LED's indicate which direction to turn the right vertical positioning screw. The valid LED combinations are:

LED 3	2	1	CONDITION
off	off	on	Right side of camera too high. (turn rt. screw CW)
on	off	off	Right side of camera too low. (turn rt. screw CCW)
on	off	on	Camera cannot find left target.
off	on	off	Camera aimed correctly on left target.

LED's 4 through 6 indicate the apparent position of the right target (as seen by the left side of the camera.) These LED's indicate which direction to turn the left vertical positioning screw. The valid LED combinations are:

LED 6	5	4	CONDITION
off	off	on	Left side of camera too high. (turn left screw CW)
on	off	off	Left side of camera too low. (turn left screw CCW)
on	off	on	Camera cannot find right target.
off	on	off	Camera aimed correctly on right side.

LED's 7 through 9 indicate how well the camera is centered (left to right) on the lane. The LED's indicate in which direction to turn the horizontal position adjustment screw. The valid LED combinations are:

LED	9	8	7	CONDITION
	off	off	on	Camera is off center to the left. (turn screw CW)
	on	off	off	Camera is off center to the right. (turn screw CCW)
	off	on	off	Camera cannot determine where targets are.
	off	on	off	Camera is correctly centered.

All other LED combinations are invalid.

5.3 System in normal mode and before the first command is received from the lane chassis.

This occurs either at power up or after the system has been switched from alignment mode.

LED's 3 through 6 display the current value of the exposure interval (binary with LED6 the LSB). At this time, the value is limited to a range of 6 to 15.

LED 1 is on if the exposure level is at maximum or minimum and the head pin illumination is not at the desired level. (This is not necessarily an indication of an error.)

All other LED's are off.

5.4 System in normal mode and after a command has been received from the lane chassis.

LED 6 is on from the time the scan request is received from the lane chassis until the response transmission starts for ball activity on the left lane.

LED 5 is same as LED 6 for the right lane.

LED 4 is on if the last calibrate was bad on the left lane.

LED 3 is on if the last calibrate was bad on the right lane.

LED's 7,8,9 are on if an error condition has occurred. The only error presently detected is receipt of an unknown character from the lane chassis.

SIDE VIEW - PIN SENSOR

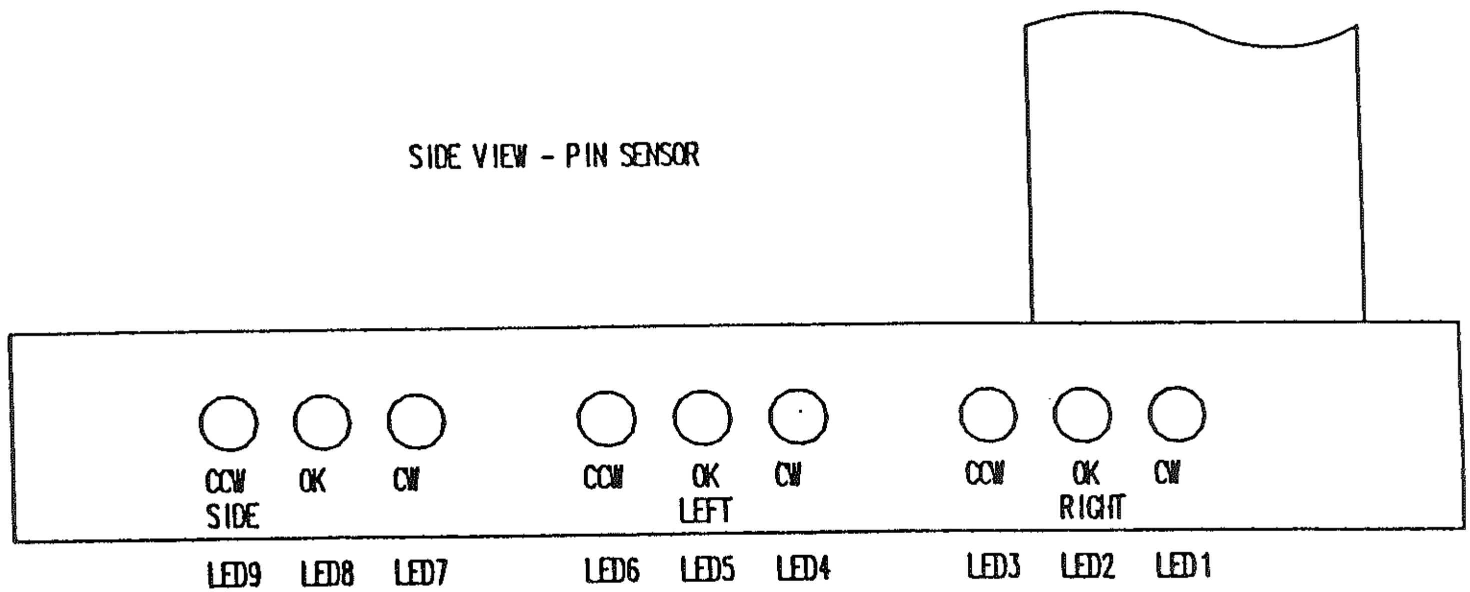
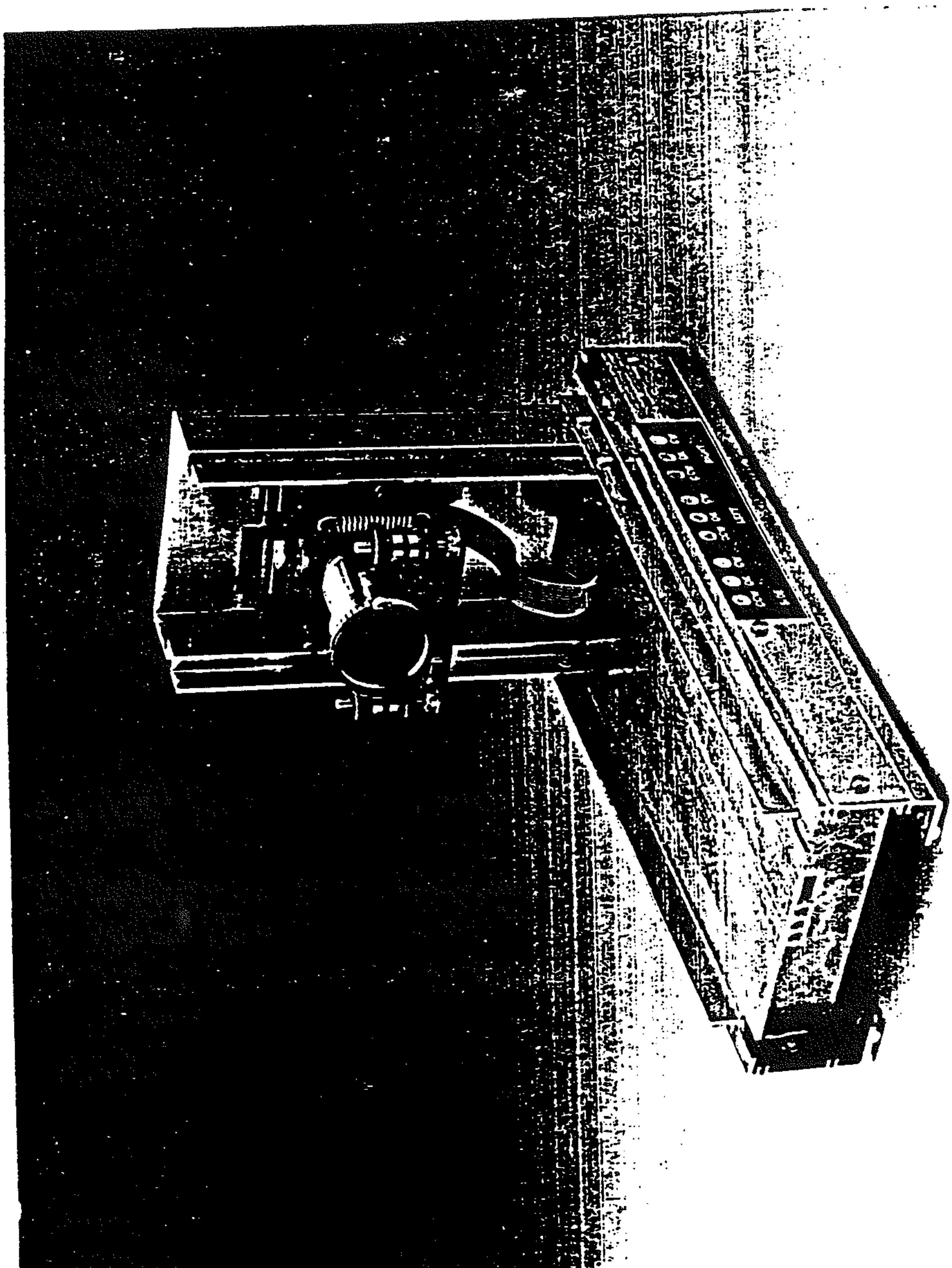


FIGURE 6 LED LOCATIONS



THIRD ANGLE PROJECTION

ENG. CHANGE NO.	REV	SUB	CHANGE	ZONE	BY	DATE
AS-00363	NEW		NEW DRAWING		RLB	10-25-90
AS-00418	A	1	ITEM 19 WAS 935-549-000	BOM	RLB	7-8-91
		2	ITEM 11 QTY WAS 4	BOM		
		3	DELETED ITEM 10	BOM		
		4	ITEM 9 WAS 232-008-048	BOM		
		5	ITEM 4 WAS 232-008-063	BOM		
		6	ITEM 12 QTY WAS 2	BOM		
AS-00686	B	1	ITEM 2 QTY WAS 1	BOM	RLB	9-29-93
		2	ADDED ITEM 10	BOM		
		3	ITEM 20 QTY WAS 6	BOM		
		4	ITEM 21 QTY WAS 4	BOM		
		5	DELETED ITM 24 809849165	BOM		
		6	CHGD TURNBUCKLE DETAIL	EE-9		
AS-05807	C		ITEM 3 WAS 232-008-037		GHB	4-14-94

NOTES:

1) ALL MECHANICAL INSTALLATIONS MUST HAVE CERTIFIED APPROVAL AND CONFORM TO ALL EXISTING CODES, STATUTES OR STANDARDS, AS DEFINED BY LOCAL JURISDICTION, AND/OR INSPECTIONS.

2) IN THE CEILING, ALL A.C. CABLES MUST HAVE A MINIMUM DISTANCE OF 6" FROM ALL OTHER CABLES.

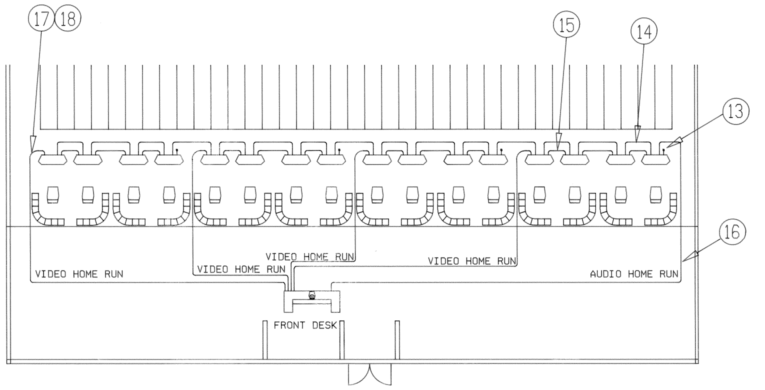
3) ALL A.C. CABLES BETWEEN CEILING AND MONITOR SUPPORT FRAME ARE TO BE ROUTED ALONG THE LEFT STRUCTURAL SUPPORT CHAIN. ALL OTHER CABLES (AUDIO & VIDEO) ARE TO BE ROUTED ALONG THE RIGHT STRUCTURAL SUPPORT CHAIN. (LEFT AND RIGHT REFERENCES AS VIEWED FROM FRONT OF MONITORS.)

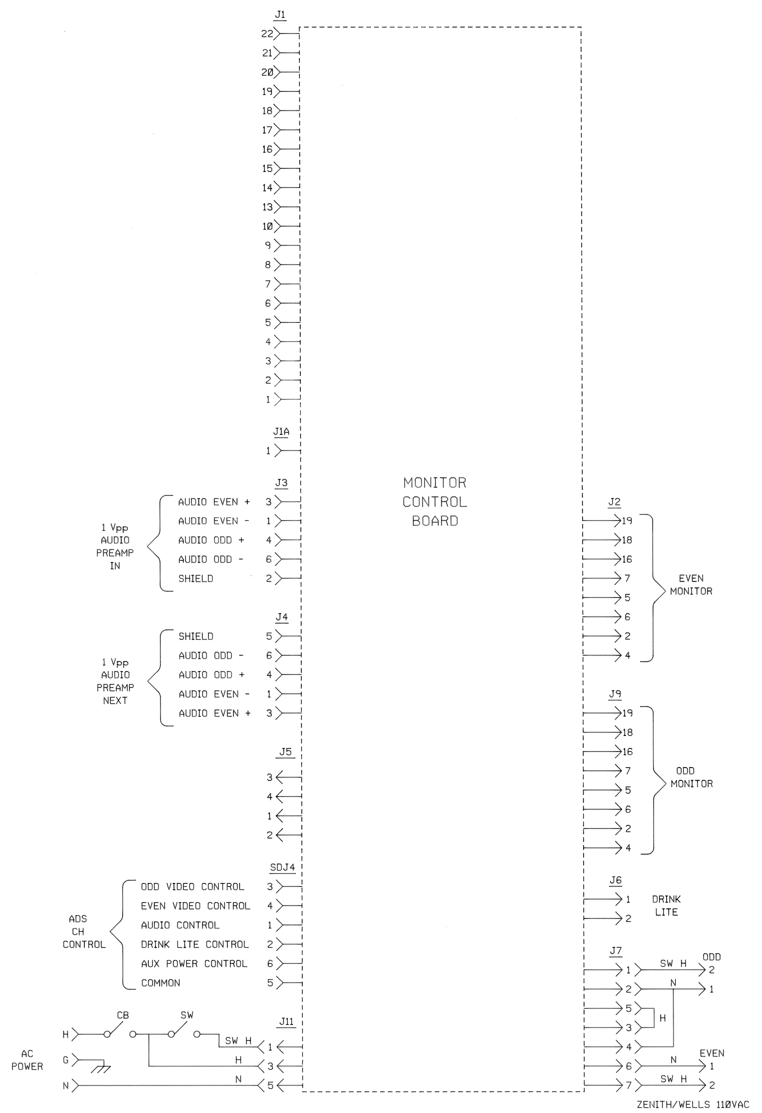
4) A.C. POWER CABLE IS TO BE ROUTED IN CORD CLIPS WHICH ALREADY CONTAIN THE DRINK LIGHT CABLE.

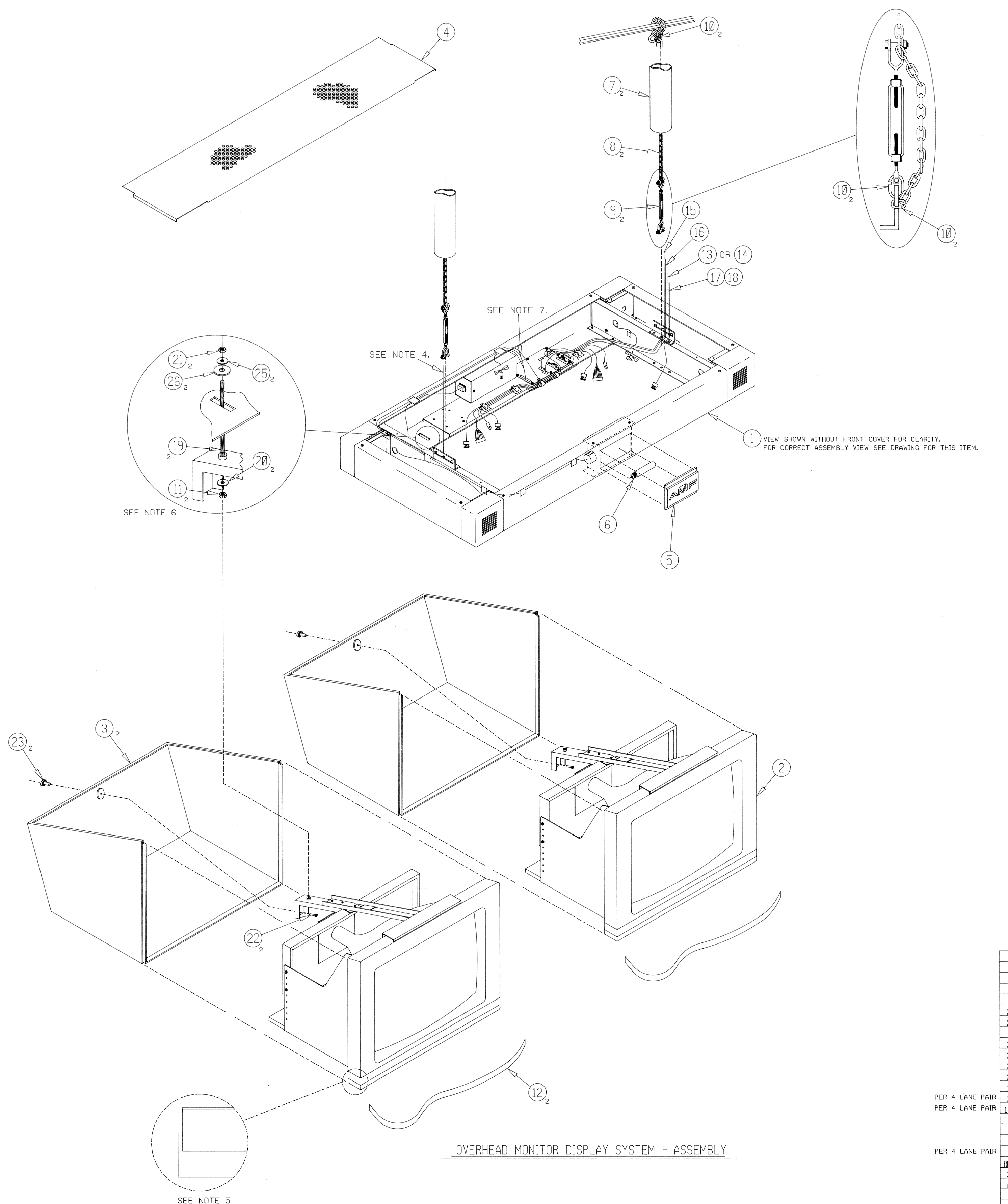
5) MOUNT LOGO STRIPE (ITEM 12) STARTING AT THE LEFT CORNER OF THE BEZEL.

6) TO MOUNT BACK END OF MONITORS TO FRAME, DO THE FOLLOWING:
   A. REMOVE ITEM 11 AND ONE ITEM 20 FROM ROD (ITEM 19).
   B. PUSH ROD THROUGH SLOT ON ITEM 1.
   C. ONCE THE ROD IS THROUGH THE MONITOR SUPPORT FRAME, SCREW ROD THROUGH BRACKET MOUNTED ON MONITORS.
   D. ADJUST MONITORS TO DESIRED ANGLE AND REATTACH ITEMS 11 AND 20.

7) IF INSTALLING THIS UNIT WITH ZENITH MONITORS, USE J7 CABLE #232-008-144.
IF INSTALLING THIS UNIT WITH WELLS-GARDNER 110V MONITORS, USE J7 CABLE #232-008-145.
IF INSTALLING THIS UNIT WITH WELLS-GARDNER 220V MONITORS, USE J7 CABLE #232-008-146.
CABLES ARE PART OF KIT #612-32-0849.







OVERHEAD MONITOR DISPLAY SYSTEM - ASSEMBLY

	QTY	ITEM	SIZE	PART NO.	DESCRIPTION
		31			
		30			
		29			
		28			
		27			
	2	26		945-867-242	WSHR 13/32"ID X 1-1/2"OD
	2	25		000-028-334	WASHR 5/16"ID X 1-1/4"OD
		24			
	2	23	A	713-504-008	KNOB- #10-32
	2	22	A	813-240-244	SCRW-#10-32 X 1-1/2L PAN
	2	21		843-149-002	KEP NUT 1/4-20
	2	20	A	948-753-102	WASHER-9/32"X5/8"X1/16"
	2	19	B	938-949-000	ROD 1/4-20 X 7-1/2L
PER 4 LANE PAIR	2	18	B	746-014-337	CONNECTOR COAX PLUG
PER 4 LANE PAIR	100'	17	B	010-103-010	CBL-COAX RG-59-U
	1	16	C	232-008-202	CBL-AUDIO/MONITOR W10
	1	15	C	232-006-141	CBL-AUDIO DAISY CHAIN
	1	14	B	232-002-181	CBL-ASSY COAX 25 FT.
PER 4 LANE PAIR	1	13	B	218-002-606	ASSY VIDEO TERMINATOR
	REF	12	C	232-008-043	ACCUSCORE LOGO STRIPE
	2	11	A	844-049-002	NUT-STOVR-LK 1/4-20
	6	10	B	730-058-083	QUICK LINK
	2	9	B	730-058-079	TURNBUCKLE
	20'	8	B	705-870-401	CHAIN 1/8PROOF COIL
	2	7	B	232-004-067	COVER-MONITOR CHAIN
	1	6	B	751-000-150	LIGHT BULB, TUBULAR, 25W
	1	5	D	232-008-067	AMF LOGO LENS C`90
	1	4	D	232-008-212	SHIELD COVER - REAR
	2	3	D	232-008-335	COVER-MONITOR CONCEPT 90
	2	2	E	232-008-030	27" MONITOR BRACKET ASSY
	1	1	E	232-008-040	DBL MNTR SUPPORT FRAME

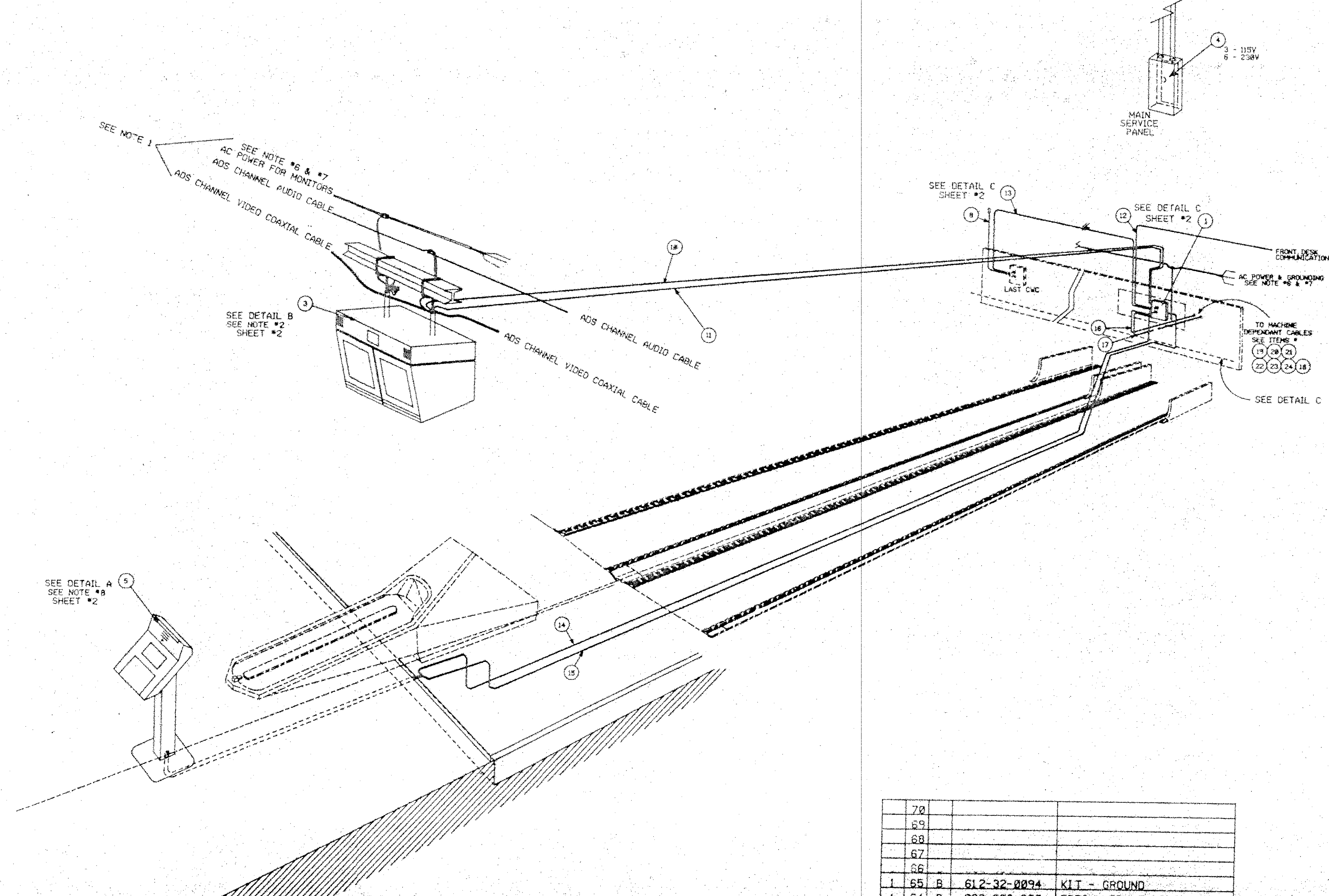
THIS IS A CAD GENERATED DRAWING,
DO NOT REWORK.
[20,7]

	DO NOT SCALE DRAWING		DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE	AMF Bowling Inc.
	SCALE	DATE	X.X EQUALS PLUS OR MINUS .06 X.XX EQUALS PLUS OR MINUS .015 X.XXX EQUALS PLUS OR MINUS .005 ANGLES FRACTIONS	MATERIAL SPEC. / MAT. SIZE OR PATTERN NO. / AMF TRADE MARK
	DRAWN RLB	10-25-90		
232-008-200	CHECKED MG	4/19/94	PART NAME: FINAL ASSEMBLY - 115V DOUBLE MONITOR 27''	CLASS 82 / DIV 232 / DWG. SIZE E / NUMBER 008-025 / MODEL
NEXT ASSEMBLY	APPROVED BRM	4/20/94		

MILLIMETERS | INCHES

THIRD ANGLE PROJECTION

ENG. CHANGE NO.	REV	SUB	CHANGE	ZONE	BY	DATE
AS-00363	[illegible]		NEW DRAWING		RLB	[illegible]
AS-00411	*		ADDED ITMS 7, 51, 64		TJZ	[illegible]



ONLY ONE USED SEE NOTE *9 SHEET *2 (items 34–51)

SEE NOTE *13 (item 33)

SEE NOTE *5 (item 28)

SEE NOTE 12 — PER INSTALLATION (items 26, 25)

ONLY ONE USED (items 18–24)

CHOOSE ONE — ONE PER 32 LANE PAIRS MAX. (item 12)

ONE PER 32 LANE PAIRS MAX. (item 8)

SEE NOTE 11 (item 4)

QTY	ITEM	SIZE	PART NO.	DESCRIPTION
1	51	B	232-007-097	EPROM MODULE, KOREAN
1	50	B	232-007-267	EPROM MODULE, ENG/SP/PIN
1	49	B	232-007-266	EPROM MODULE, ENG/SPANISH
1	48	B	232-007-268	EPROM MODULE, SPANISH/PIN
1	47	B	232-007-094	EPROM MODULE, SPANISH
1	46	B	232-007-295	EPROM MODULE, ENG/FR/PIN
1	45	B	232-007-294	EPROM MODULE, ENG/FRENCH
1	44	B	232-007-269	EPROM MODULE, FRENCH/PINO
1	43	B	232-007-093	EPROM MODULE, FRENCH
1	42	B	232-007-297	EPROM MODULE, ENG/GER/PIN
1	41	B	232-007-296	EPROM MODULE, ENG/GERMAN
1	40	B	232-007-270	EPROM MODULE, GERMAN/PINO
1	39	B	232-007-092	EPROM MODULE, GERMAN
1	38	B	232-007-293	EPROM MODULE, ENG/JAP/PIN
1	37	B	232-007-292	EPROM MODULE, ENG/JAPAN
1	36	B	232-007-271	EPROM MODULE, JAPAN/PINO
1	35	B	232-007-091	EPROM MODULE, JAPANESE
1	34	B	232-007-090	EPROM MODULE, ENGLISH
1	33	D	232-008-109	BASE MAT
REF	32	D	232-007-101	KEYBOARD, ENGLISH
1	31	B	232-007-265	EPROM MODULE, ENGLISH/PIN
1	30	D	232-008-111	BASE BACK
4	29		709-007-037	TAPER BOLT 3/8 X 2 1/4
1	28		730-049-044	CARTRIDGE FISH LINE
1	27	D	232-008-094	BASE FRONT
1	26	C	232-008-216	INST. ADS CHANNEL 230V
1	25	C	232-008-215	INST. ADS CHANNEL 115V
1	24	E	232-007-128	INST. BRUNSWICK
1	23	E	232-007-127	INST. 82-3000 WITH SPARE
1	22	E	232-007-125	INST. 82-3000 W/O SPARE
1	21	E	232-007-124	INST. 82-30
1	20	E	232-007-123	INST. 82-70 AB S.S.
1	19	E	232-007-122	INST. 82-70 MP.
1	18	E	232-007-129	INST. BOWL MOR
1	17	C	232-007-034	CABLE, UNIVERSAL EVEN
1	16	C	232-007-033	CABLE, UNIVERSAL ODD
1	15	C	232-007-024	CABLE, BOWLER TERM. PWR.
1	14	C	232-007-025	CABLE, BOWLER TERM. COMM
1	13	C	232-007-030	CABLE, INTRA CHASSIS
1	12	C	232-007-031	CABLE, FRONT DESK COMM.
1	11	C	232-007-027	CABLE, MONITOR CONTROL
1	10	C	232-007-028	CABLE, VIDEO COAX RIBBON
1	9	B	232-007-055	CABLE, CWC POWER
1	8	C	232-007-023	ASSY. RS485 TERMINATOR
1	7	E	232-008-400	LOWBOY BOWLER TERMINAL
1	6	B	000-029-001	PROPERTY PLATE PURCH.
1	5	E	232-008-090	BOWLER TERM. CONSOLE
3	4	C	218-002-608	VOLTAGE ARRESTOR 120VAC
1	3	E	232-008-025	OVRHD MONITOR INST. C\90
4	2		824-538-162	SCREW, 10-32 X 1 INCH
1	1	E	232-007-350	CWC 115V/230V

ONLY ONE USED SEE NOTE *9 SHEET *2 (items 52–62)

QTY	ITEM	SIZE	PART NUMBER	DESCRIPTION
	70			
	69			
	68			
	67			
	66			
1	65	B	612-32-0094	KIT - GROUND
1	64	B	232-008-300	EPROM MODULE, LOWBOY
2	63	A	813-240-122	SCRW PAN HD *10-32 X 3/4
1	62	B	232-007-465	EPROM MODULE, ENG/DUTCH
1	61	B	232-007-463	EPROM MODULE, ENG/ITALIAN
1	60	B	232-007-462	EPRM MODUL, ITAL OR DUTCH
1	59	B	232-007-461	EPROM MODULE, ENG/DANISH
1	58	B	232-007-460	EPROM MODULE, DANISH
1	57	B	232-017-096	EPROM MODULE, ENG/HEBREW
1	56	B	232-007-095	EPROM MODULE, HEBREW
1	55	B	232-007-299	EPROM MODULE, ENG/SWE/PIN
1	54	B	232-007-298	EPROM MODULE, ENG/SWEDISH
1	53	B	232-007-291	EPROM MODULE, SWEDISH/PIN
1	52	B	232-007-290	EPROM MODULE, SWEDISH

THIS IS A CAD GENERATED DRAWING, DO NOT REWORK. [20,7]

DO NOT SCALE DRAWING

SCALE NTS | DATE

DRAWN RLB 12-10-90

CHECKED WD 6-28-91

NEXT ASSEMBLY | APPROVED [illegible] 6/28/91

DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE:
X.X EQUALS PLUS OR MINUS .06
X.XX EQUALS PLUS OR MINUS .01
X.XXX EQUALS PLUS OR MINUS .005
ANGLES FRACTIONS

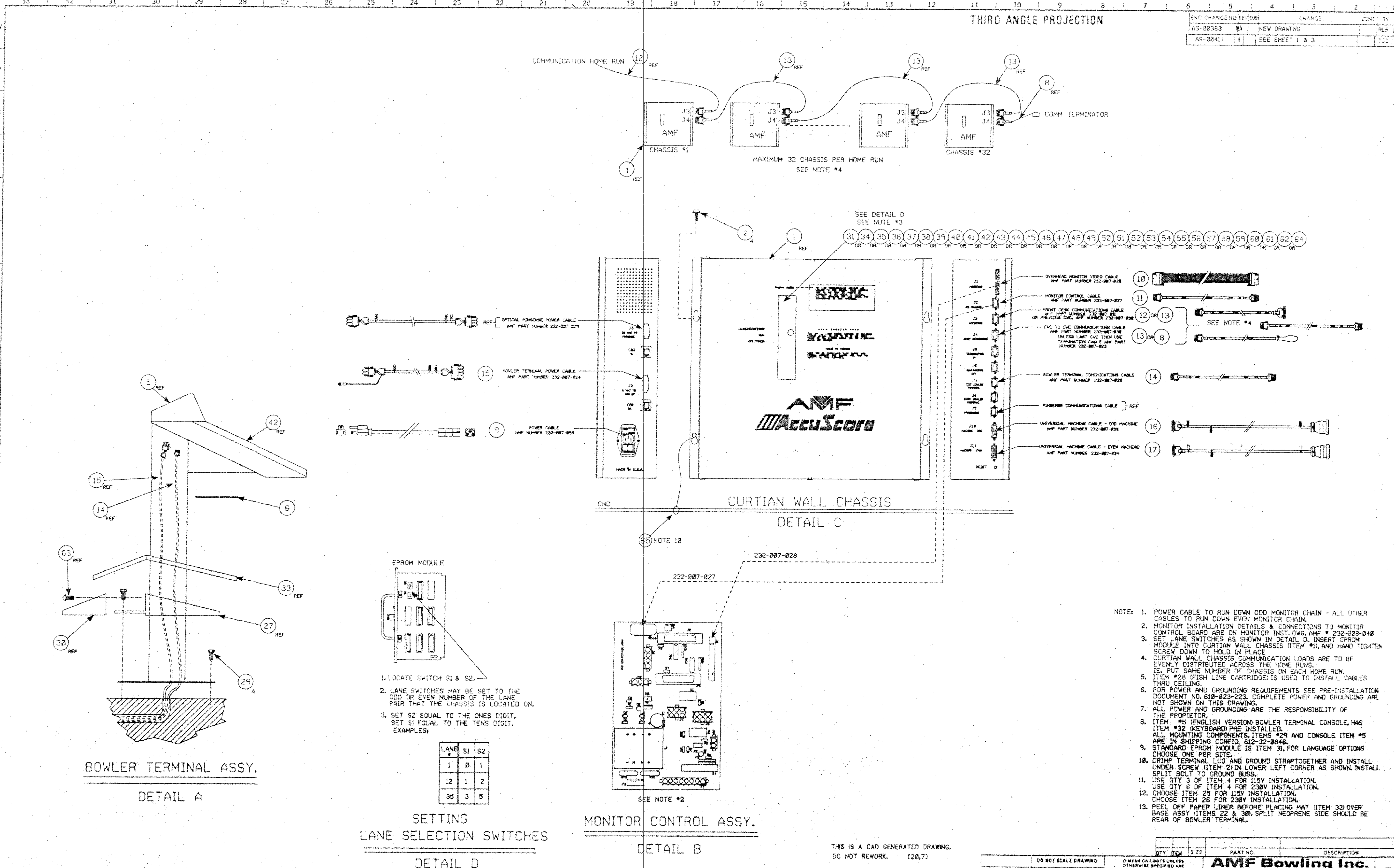
AMF Bowling Inc.

MATERIAL SPEC. | MAT. SIZE OR PATTERN NO.

PART NAME ACCUSCORE PLUS C\90 115V/230V 50/60 HZ LANE PAIR INSTALLATION

CLASS 82 | DIV. 232 | DWG SIZE D | NUMBER 008-200 | SHEET 1 OF 3

MILLIMETERS | INCHES



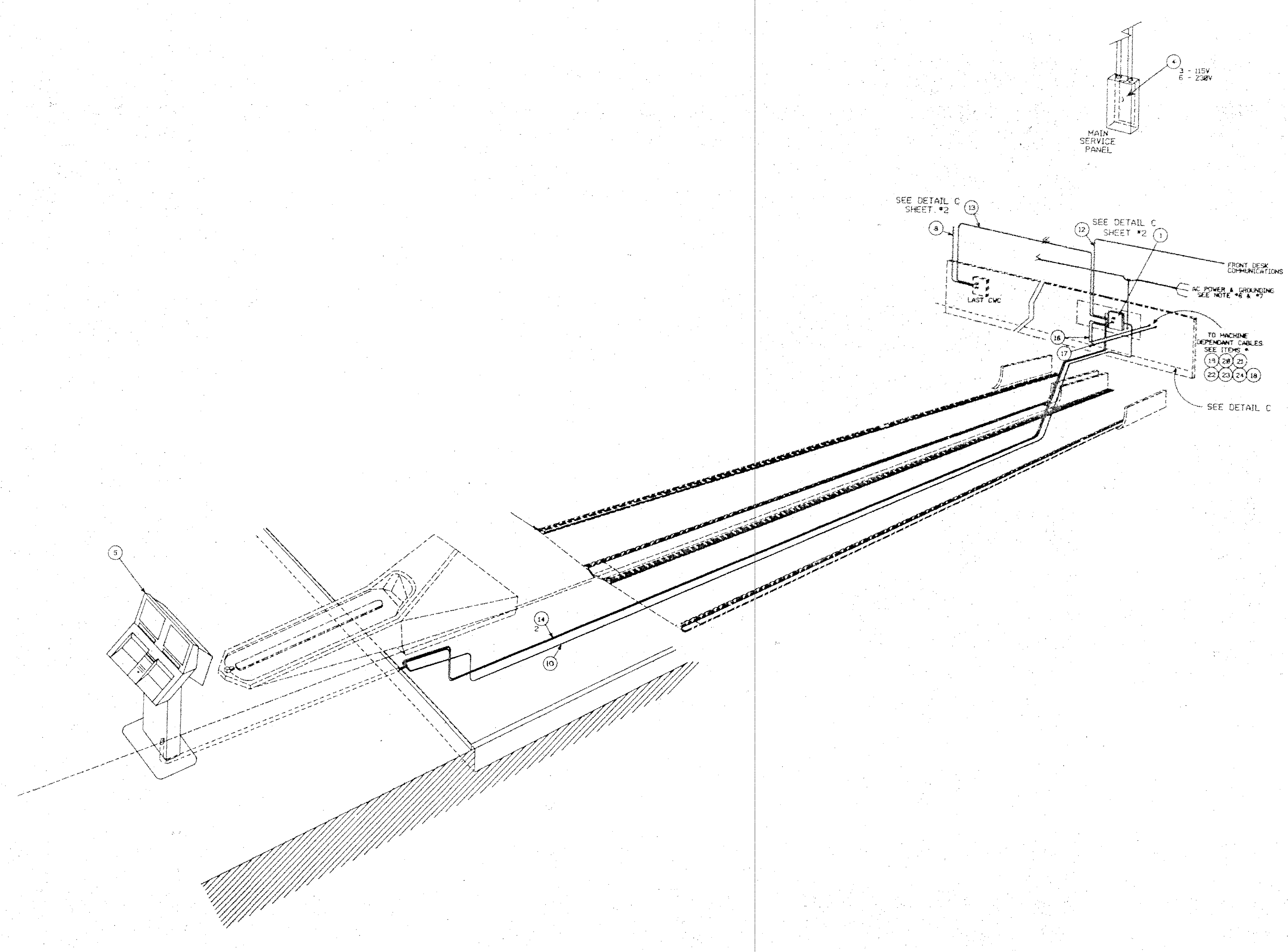
NOTE:
1. POWER CABLE TO RUN DOWN ODD MONITOR CHAIN - ALL OTHER CABLES TO RUN DOWN EVEN MONITOR CHAIN.
2. MONITOR INSTALLATION DETAILS & CONNECTIONS TO MONITOR CONTROL BOARD ARE ON MONITOR INST. DWG. AMF # 232-028-040
3. SET LANE SWITCHES AS SHOWN IN DETAIL D. INSERT EPROM MODULE INTO CURTIAN WALL CHASSIS (ITEM #1), AND HAND TIGHTEN SCREW DOWN TO HOLD IN PLACE
4. CURTIAN WALL CHASSIS COMMUNICATION LOADS ARE TO BE EVENLY DISTRIBUTED ACROSS THE HOME RUNS. IE. PUT SAME NUMBER OF CHASSIS ON EACH HOME RUN.
5. ITEM #28 (FISH LINE CARTRIDGE) IS USED TO INSTALL CABLES THRU CEILING.
6. FOR POWER AND GROUNDING REQUIREMENTS SEE PRE-INSTALLATION DOCUMENT NO. 610-023-223. COMPLETE POWER AND GROUNDING ARE NOT SHOWN ON THIS DRAWING.
7. ALL POWER AND GROUNDING ARE THE RESPONSIBILITY OF THE PROPIETOR.
8. ITEM #5 (ENGLISH VERSION) BOWLER TERMINAL CONSOLE, HAS ITEM #32 (KEYBOARD) PRE INSTALLED. ALL MOUNTING COMPONENTS, ITEMS #29 AND CONSOLE ITEM #5 ARE IN SHIPPING CONFIG. 612-32-0846.
9. STANDARD EPROM MODULE IS ITEM 31, FOR LANGUAGE OPTIONS CHOOSE ONE PER SITE.
10. CRIMP TERMINAL LUG AND GROUND STRAPTOGETHER AND INSTALL UNDER SCREW (ITEM 2) IN LOWER LEFT CORNER AS SHOWN. INSTALL SPLIT BOLT TO GROUND BUSS.
11. USE QTY 3 OF ITEM 4 FOR 115V INSTALLATION. USE QTY 6 OF ITEM 4 FOR 230V INSTALLATION.
12. CHOOSE ITEM 25 FOR 115V INSTALLATION. CHOOSE ITEM 26 FOR 230V INSTALLATION.
13. PEEL OFF PAPER LINER BEFORE PLACING MAT (ITEM 33) OVER BASE ASSY (ITEMS 22 & 30). SPLIT NEOPRENE SIDE SHOULD BE REAR OF BOWLER TERMINAL.

AMF Bowling Inc.

DO NOT SCALE DRAWING
SCALE NTS
DRAWN RLB 12-18-90
CHECKED MQ 6-20-91
NEXT ASSEMBLY
PART NAME: ACCUSCORE PLUS C\90 115V 50/60HZ LANE PAIR INSTALLATION
82 232 D 008-200
SHEET 2 OF 3

THIRD ANGLE PROJECTION

ENG CHANGE NO.	REV. SUB.		CHANGE		CONF.	BY	DATE
AS-00363	NEW		NEW DRAWING			RLB	
AS-00411	A		ADDED SHEET 3			TJE	



THIS IS A CAD GENERATED DRAWING,
DO NOT REWORK. [20,7]

QTY	ITEM	SIZE	PART NO.	DESCRIPTION

DO NOT SCALE DRAWING		DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE X.X EQUALS PLUS OR MINUS .06 X.XX EQUALS PLUS OR MINUS .015 X.XXX EQUALS PLUS OR MINUS .005 ANGLES FRACTIONS
SCALE NTS	DATE	
DRAWN RLB	12-18-90	
CHECKED MD	6-27-91	
NEXT ASSEMBLY	APPROVED	6/28/91

AMF Bowling Inc.

MATERIAL SPEC.

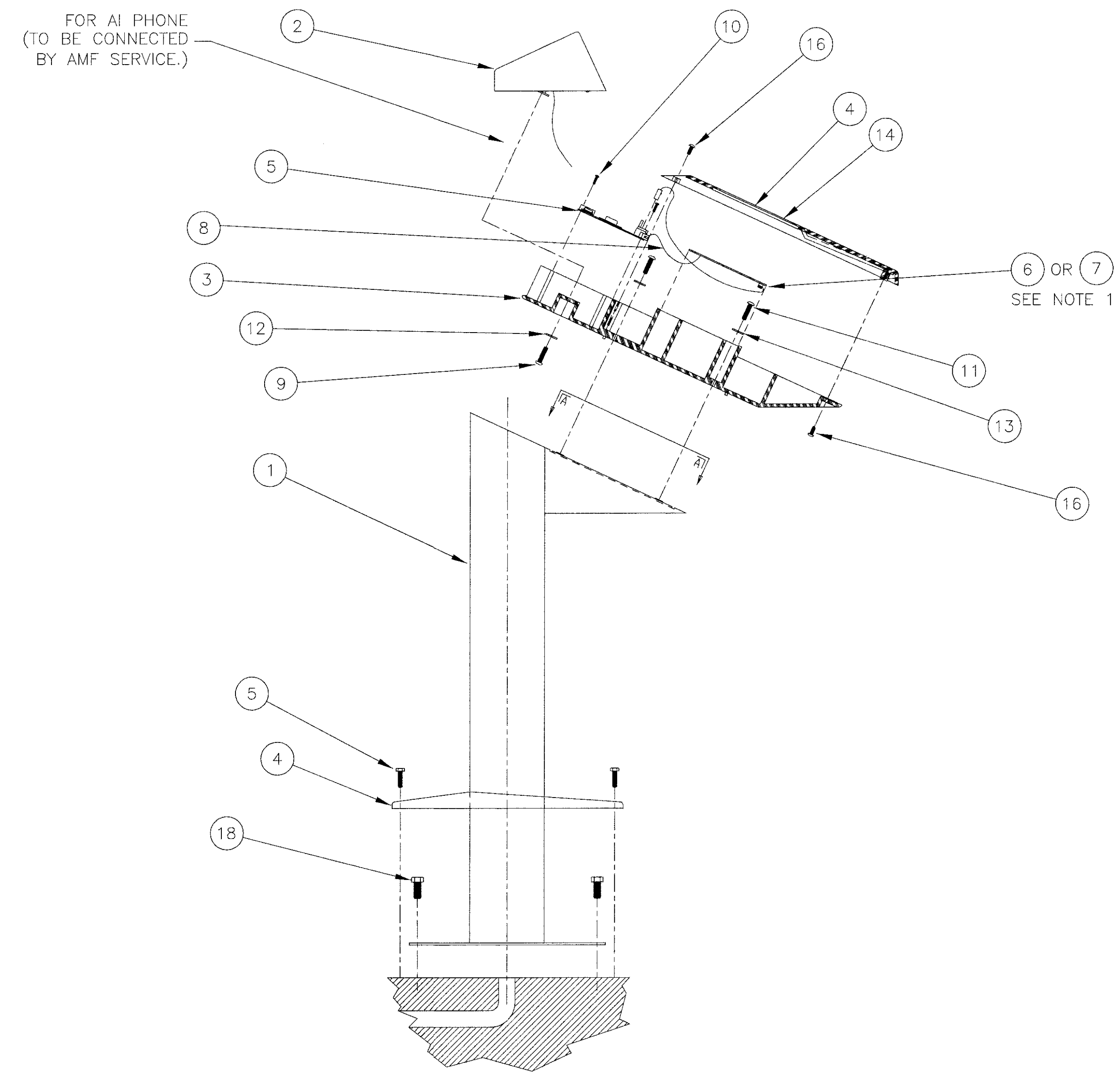
MAT. SIZE OR PATTERN NO.

PART NAME ACCUSCORE PLUS C\90
115V/230V 50/60 HZ
LANE PAIR INSTALLATION

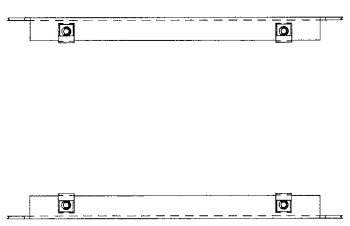
CLASS		DWG SIZE	NUMBER	SHEET
82	232	D	008-200	3 OF 3

NOTES:
1: CHOOSE ITEM 6 FOR ALL CENTERS OR ITEM 7 FOR FAIRLANES CENTERS ONLY.

REVISIONS				
REV	ECR	DESCRIPTION	DATE	BY
NEW	AS-00303	NEW DRAWING	10/16/90	BJR
A	AS-06959	ITEM 18 WSA 709-007-037	2/13/97	JA



DOMESTIC BOWLER TERMINAL - ASSEMBLY



VIEW A-A

18	4	709-013-059	BOLT, HEX FLANGE HEAD
17			
16	4	822-426-087	SCREW 6-32 X .50 LG TYPE BF
15			
14	1	710-008-013	ADHESIVE FOAM GASKET, 3/8 X 1/8
13	4	948-545-072	WASHER #10
12	2	948-631-062	WASHER #6
11	4	813-240-122	SCREW 10-32 X .75 LG PAN HD
10	4	822-420-082	SCREW 4-32 X .50 LG TYPE BF
9	2	818-227-102	SCREW 6-32 X .625 LG PAN HD
8	1	232-006-043	STATIC DRAIN WIRE
7	1	232-007-101	KEYBOARD
6	1	232-008-118	KEYBOARD CONCEPT 90
5	1	232-007-110	PC BOARD BOWLER TERMINAL
4	1	232-008-097	TABLE CONCEPT 90 BT
3	1	232-008-096	BASE CONCEPT 90 BT
2	1	232-008-095	CAP ASSEMBLY CONCEPT 90 BT
1	1	232-008-091	PEDESTAL, CONCEPT 90 BT
ITEM	QTY	PART NUMBER	DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

REMOVE BURRS AND BREAK SHARP EDGES INSIDE CORNERS SURFACE ROUGHNESS √

MATERIAL

GENERAL TOLERANCES

XX DECIMALS	XXX DECIMALS	ANGLES
± .03	± .010	± .5°

INTERPRET DRAWING IN ACCORDANCE WITH ANSI Y14.5M-1982 AND MIL-STD-100

AMF Bowling Products Inc.

DOMESTIC BOWLER TERMINAL ASSEMBLY

ENG APP	[signature]	6/20/97	
CHECKED	FK	6/20/97	
DRAWN BY	BJR	10/16/90	

SIZE	CLASS	DIV	NUMBER	REV
D	82	232	008-090	A

SCALE: NTS WEIGHT: SHEET 1 OF 1

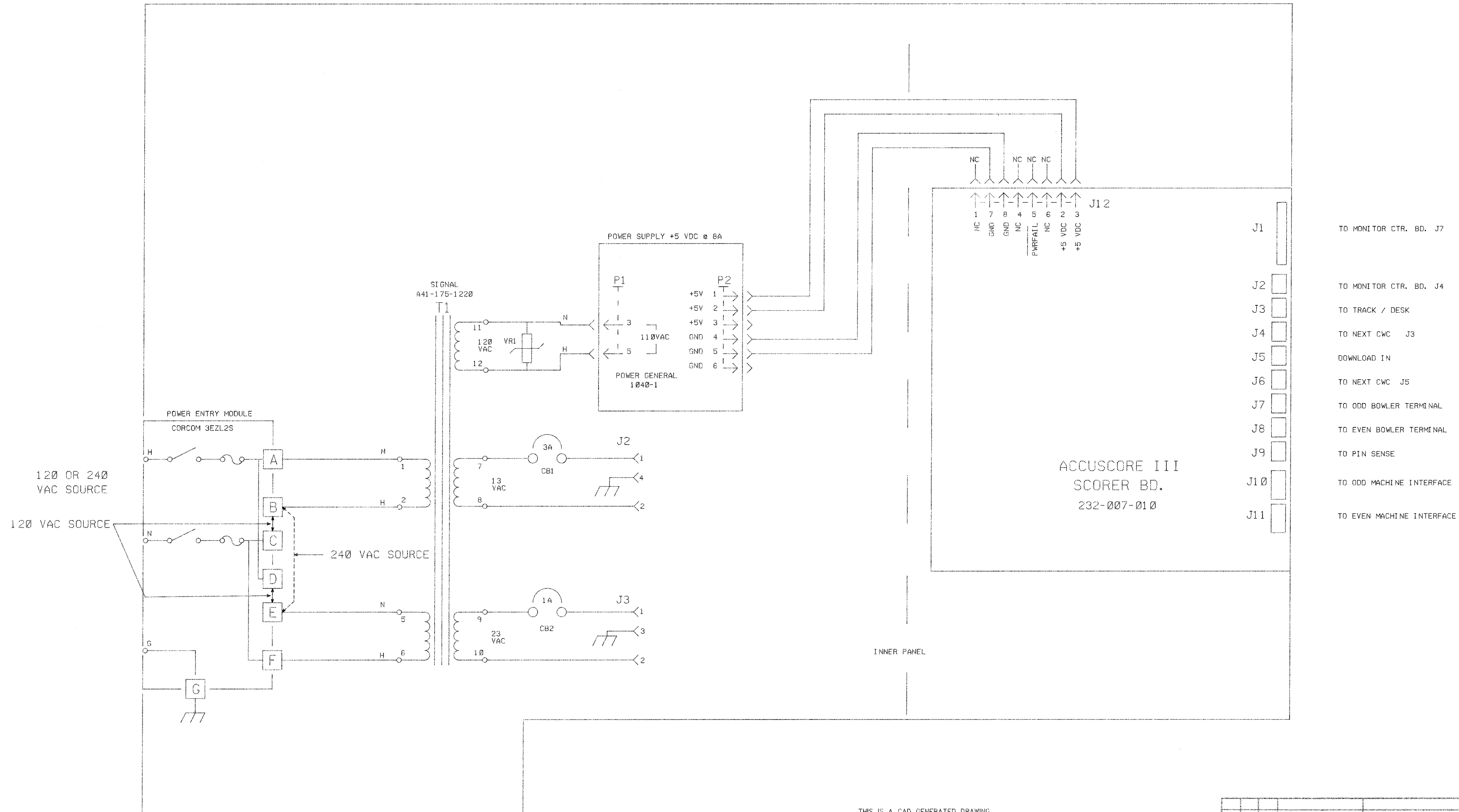
NEXT ASSY

DO NOT SCALE THIS DRAWING

THIRD ANGLE PROJECTION

ENG. CHANGE NO.	REV	SUB	CHANGE	ZONE	BY	DATE
R-15173	NEW		NEW DRAWING		HLP	10/22/87
R-15163	A		UPDATE FOR PRODUCTION		HLP	11/3/87
AS-00185	B		SHOW NEW T1 WIRING		RLB	11/07/89

ACCUSCORE ASPLUS CURTAIN WALL CHASSIS



THIS IS A CAD GENERATED DRAWING,
DO NOT REWORK. [20,12]

SIZE	PART NO.	DESCRIPTION

DO NOT SCALE DRAWING

SCALE NONE | DATE

DRAWN HLP 10/22/87

CHECKED GHH

APPROVED 11/8/89

232-007-150 NEXT ASSEMBLY

DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE
X.X EQUALS PLUS OR MINUS .06
X.XX EQUALS PLUS OR MINUS .015
X.XXX EQUALS PLUS OR MINUS .005
ANGLES FRACTIONS

AMF Incorporated

MATERIAL SPEC. | MAT. SIZE OR PATTERN NO.

TRADE MARK MODEL

PART NAME SCHEMATIC DIAGRAM CURTAIN WALL CHASSIS ACCUSCORE III

CLASS	DIV.	DWG SIZE	NUMBER
82	232	D	007-060

MILLIMETERS | INCHES

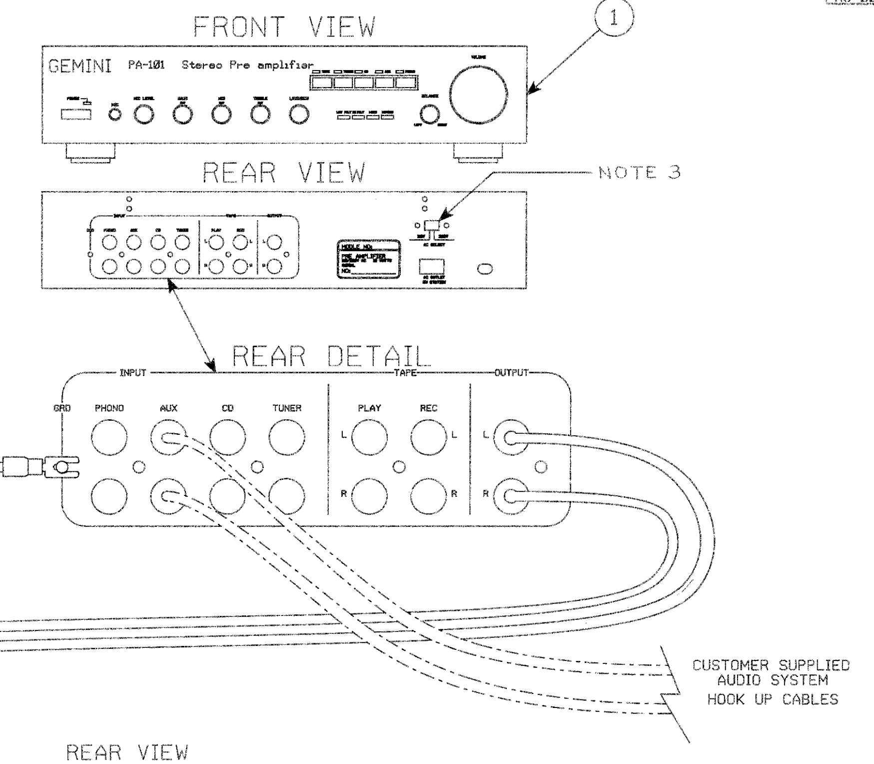
THIRD ANGLE PROJECTION

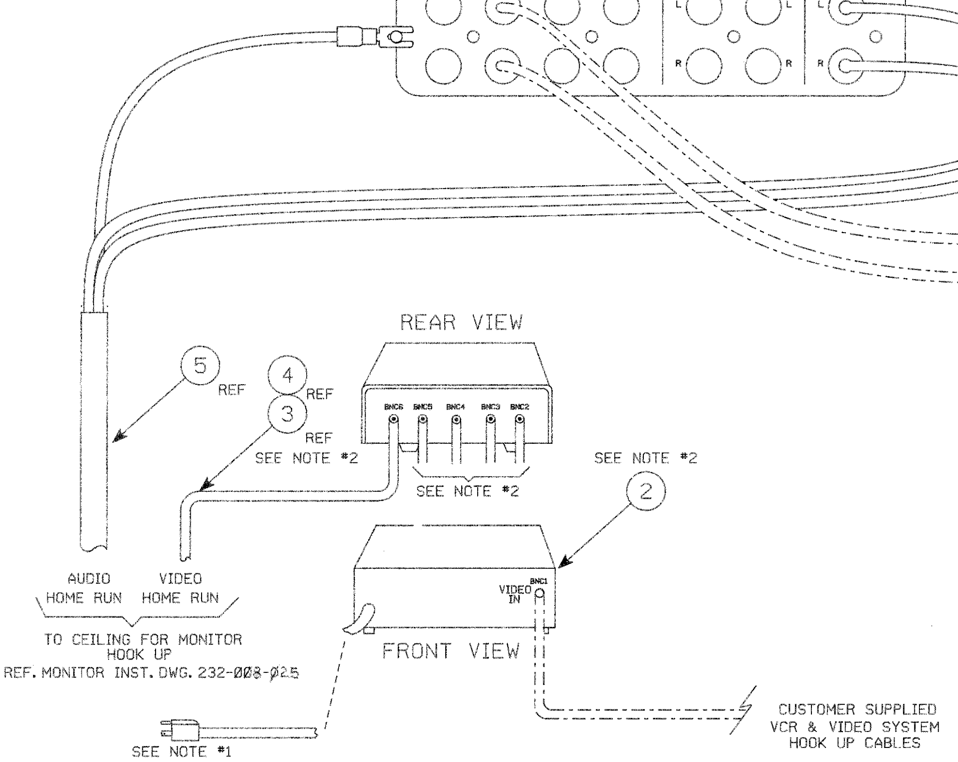
ENG. CHANGE NO	REV	SUB	CHANGE	ZONE	BY	DATE
AS-00363	NEW		NEW DRAWING		TJZ	2-27-91

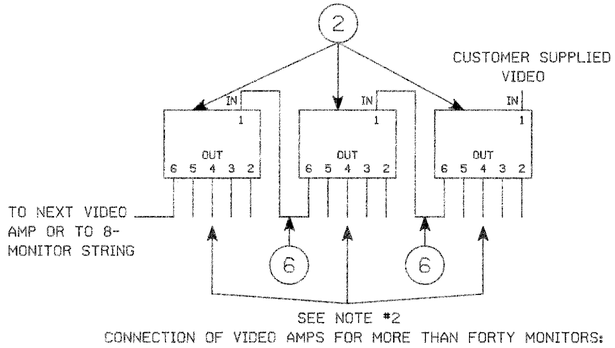
NOTE #1. FOR POWER AND GROUNDING REQUIRMENTS SEE PRE INSTALLATION DOCUMENT # 610-023-223

2. EACH OUTPUT OF ITEM #2 (VIDEO AMP) WILL DRIVE UP TO 8 MONITORS, OR 4 LANE PAIRS. ONE VIDEO AMP WILL DRIVE UP TO 40 MONITORS.

3. SET AC SELECTOR SWITCH FOR 120V OPERATION BEFORE PLUGING UNIT IN.







QTY	ITEM	SIZE	PART NO.	DESCRIPTION
1	6		232-002-173	CABLE ASSY COAX 3 1/2'
REF	5		232-008-202	CABLE, AUDIO 250'
REF	4		746-014-640	CONNECTOR, COAX CRIMP
REF	3		010-103-010	CABLE, RG59U
1	2	D	232-007-360	AMPLIFIER, VIDEO
1	1		232-008-065	AMPLIFIER, AUDIO

1 PER 40 LANES

THIS IS A CAD GENERATED DRAWING, DO NOT REWORK. [25,12] C90ADS

DO NOT SCALE DRAWING

SCALE NTS

DRAWN TJZ — DATE 2-27-91

CHECKED MD — 2-27-91

APPROVED — 3/4/91

NEXT ASSEMBLY 232-007-105

DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE: X.X EQUALS PLUS OR MINUS .06; X.XX EQUALS PLUS OR MINUS .015; X.XXX EQUALS PLUS OR MINUS .005; ANGLES; FRACTIONS

AMF Bowling Inc.

MATERIAL SPEC.

MAT. SIZE OR PATTERN NO.

TRADE MARK MODEL

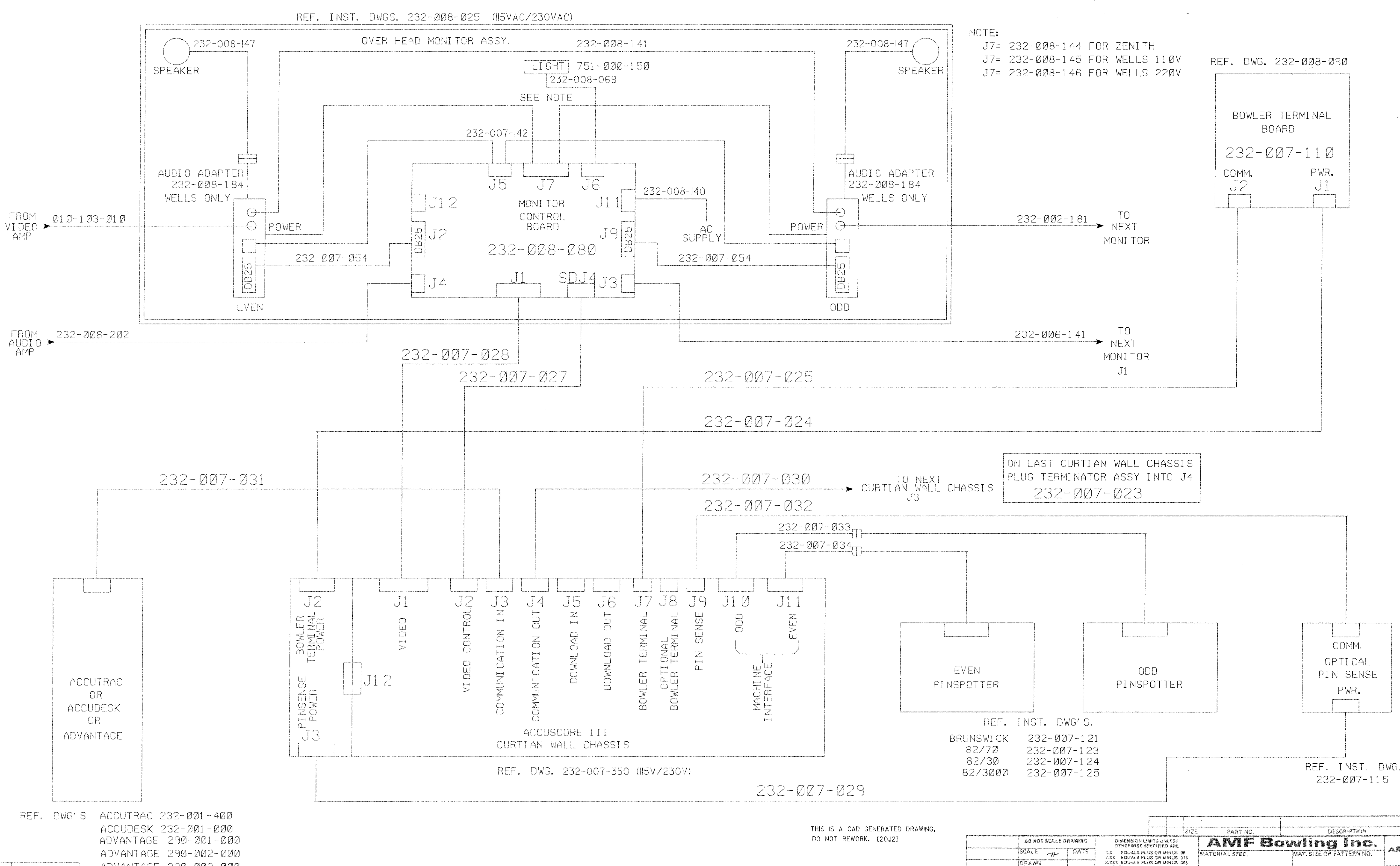
PART NAME C90 115V 50/60 HZ ADS CHANNEL INSTALLATION

CLASS 82 DIV 232 DWG SIZE C NUMBER 008-015

MILLIMETERS | INCHES

THIRD ANGLE PROJECTION

ENG. CHANGE NO.	REV	SUB	CHANGE	ZONE	BY	DATE
AS-00381	NEW		NEW DRAWING		TJZ	3-5-9[illegible]



THIS IS A CAD GENERATED DRAWING, DO NOT REWORK. [20,12]

DO NOT SCALE DRAWING	SCALE —/—	DATE	
DRAWN TJZ	3-5-91		
CHECKED	3-25-91		
APPROVED	3-26-91		
232-008-200 NEXT ASSEMBLY			

DIMENSION LIMITS UNLESS OTHERWISE SPECIFIED ARE: X.X EQUALS PLUS OR MINUS .06; X.XX EQUALS PLUS OR MINUS .015; X.XXX EQUALS PLUS OR MINUS .005; ANGLES; FRACTIONS

AMF Bowling Inc.

MATERIAL SPEC. — MAT. SIZE OR PATTERN NO.

PART NAME: BLOCK DIAGRAM, SYSTEM - ACCUSCORE III WITH OPTICAL PIN SENSE

CLASS 82 — DIV. 232 — DWG. SIZE D — NUMBER 008-203