

INSTRUCTIONS

BCX

**BEAM CONTROLLER
FOR X-RAY ANALYSIS**

JEOL

No. ISMBCX-4

 **JEOL LTD. / JEOL TECHNICS LTD.**

Tokyo Japan

CAUTION

Operation etc. for T330-BCX is identical to that for BCX.
 Refer to the instruction manual for BCX and following notes.

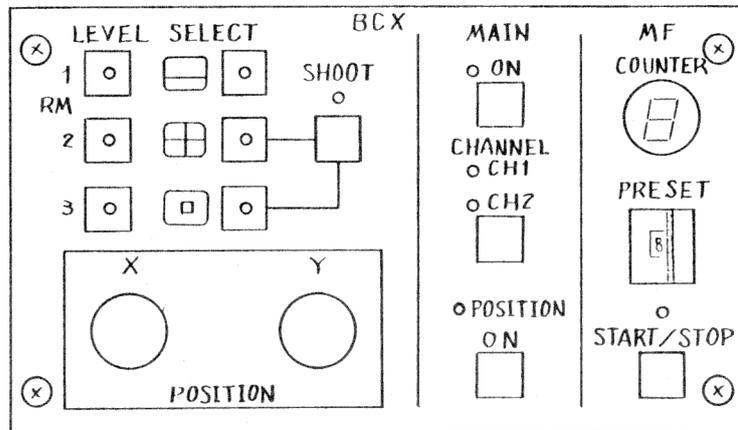
2 SPECIFICATIONS

- Beam positioning: X 120 mm, Y 80 mm
- RM input: 60 mm/+10V on CRT, 3 base levels
- Multi exposure: 1 to 9 frame(s) or endless
- Analysis mode: SPOT, LINE, AREA
- Averaged analysis: Selected Area Scan(SAS) mode ; 10 mm \square on CRT

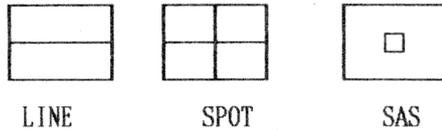
4 CIRCUIT DESCRIPTION

- On SPOT and Averaged analysis, beam scan is to be SPOT/SAS after SHOOT ON.
 Then no image is displayed. (Image is displayed on SHOOT OFF mode.)

5 PANEL DESCRIPTION



- 1 ON/OFF → MAIN
- 2 SPOT/OFF → SHOOT
- 3 POSITION/X-RAY → POSITION
- 4 SELECT

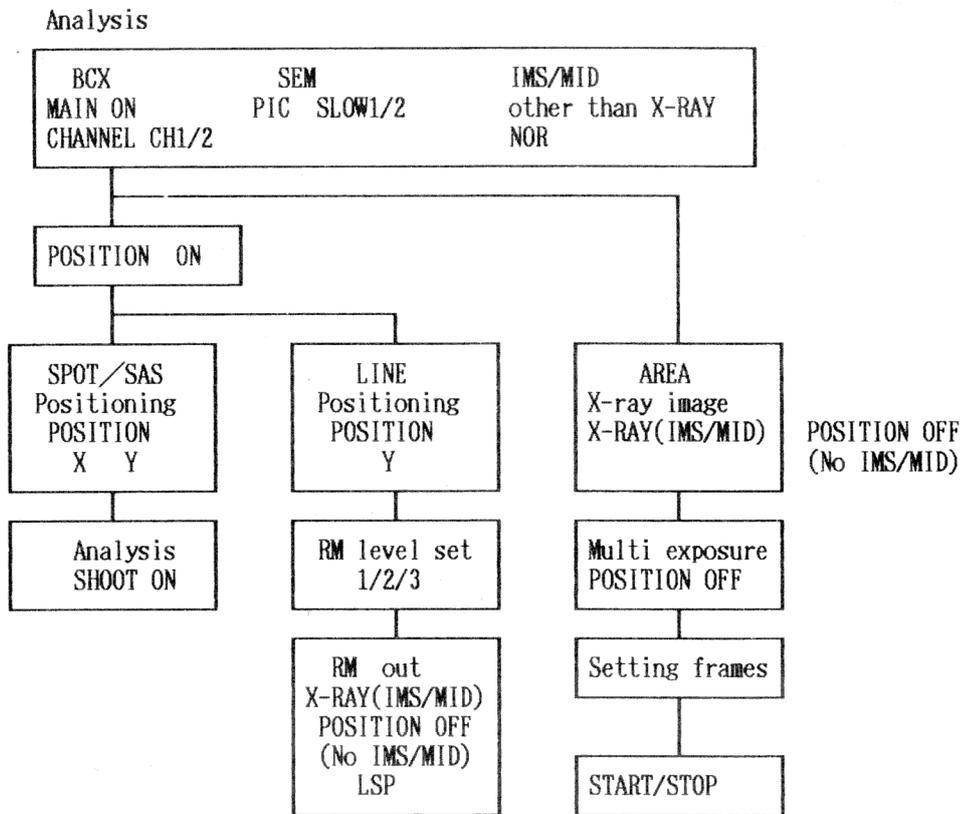


- 5 FRAME 0: endless (count-up) , 1~ 9 : numbered exposure(count-down)

6 OPERATION

Changed the **SIZE** to **SPEED** and **PHOTO** to **SLOW** .

- X-ray image and secondary electron image are not overlaped.
- Set the BCX MAIN to ON and select X-RAY for X-ray image display with IMS or MID. (No IMS/MID is installed, then set the POSITION to OFF.)
- MID allows SPLIT/DUAL mode for X-ray image display.
- For positioning, select IMS/MID to image other than X-RAY and set NOR mode on MID.



6.3 Line analysis

- RM levels
Level between zero and full is 60 mm .
Zero level(from bottom of view)
RM1 = 25 mm, RM2 = 20 mm, RM3 = 15 mm

Averaged analysis mode

- Analysis procedure is same as SPOT analysis.
- Select the SAS mode .
- Beam scan is changed in selected area only by SHOOT ON. (No image)

6.4 Photography

- 1 to 9 frame(s): Set frame number and push the START/STOP switch to start. The INDICATOR displays remaining frame(s).
- 0 (endless exposure): Push the START/STOP switch to start and push it again after desired exposure.

The INDICATOR displays lower 1 digit of number of exposed frame.

Note: To stop the exposure...

Frame end: Exposing frame is last frame.

• • Push the START/STOP switch.

Scan end: Stop exposure halfway • • Push SCANNING SPEED on SEM.

7 INTERCONNECTION DIAGRAM

Interconnection diagram is changed.

8 SIMULTANEOUS USE OF OTHER ATTACHMENTS

- For X-ray image display with IMS or MID, BCX is required.
- BCX is required for X-ray analysis with EDS or FCS.

- Every attachment other than the above can be installed simultaneously with BCX.

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1. GENERAL

The BCX controls the beam mode and position for spot analysis using an EDS (Energy Dispersive X-ray Spectrometer) in combination with the Scanning Microscope, and displays the spot position on the CRT screen. Further, this controller has a built-in interface circuit for the RM (Rate Meter) output signal for line analysis and PHA (Pulse Height Analyzer) output signal for area analysis, and a built-in multiple exposure control circuit for X-ray image recording.

2. SPECIFICATIONS

- Beam positioning:
 - X direction
Horizontally movable over 130 mm on CRT screen.
 - Y direction
Vertically movable over 100 mm on CRT screen.
- Input system:
 - CH1 (RM, X-RAY), CH2 (RM, X-RAY).
 - RM (Rate Meter) output ... RM.
 - PHA output ... X-RAY (X-ray image).
- RM input:
 - Input impedance ... 10 k Ω .
 - Input voltage ... 0 to +10 V.
 - In the LSP mode, the amplitude modulation rate is 70 mm/+10 V input on CRT.
- X-RAY input:
 - Input impedance ... TTL input.
 - Input voltage ... +3 to +5 V (TTL H level).
 - Intensity-modulated on CRT.
- Multiple exposure:
 - 1 to 100 frames.
- Dimensions:
 - Control unit
105 mm (W) \times 95 mm (H) \times 203 mm (D).

3. COMPOSITION

- Control unit complete with cables (built into ATT. BOX) 1.
- Connector unit complete with 4 BNC panel jacks and a connector panel (built into scanning microscope) 1.

4. CIRCUIT DESCRIPTION

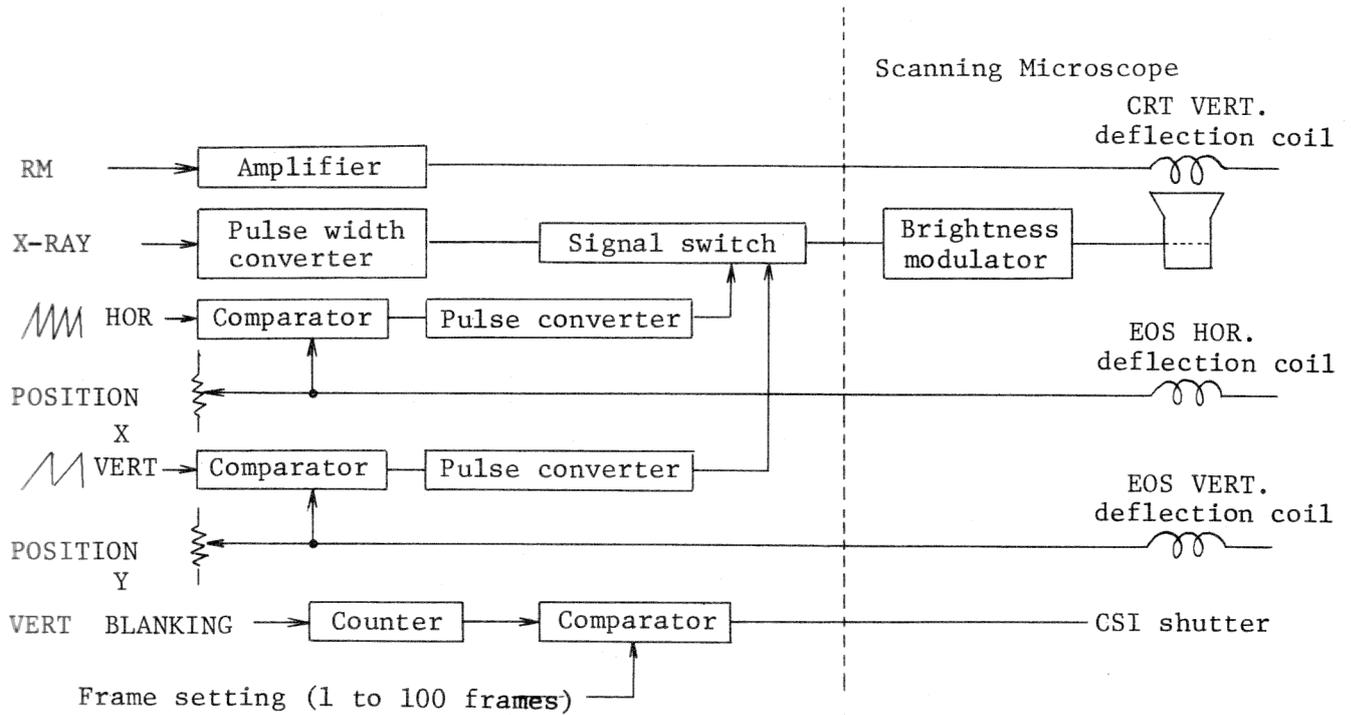
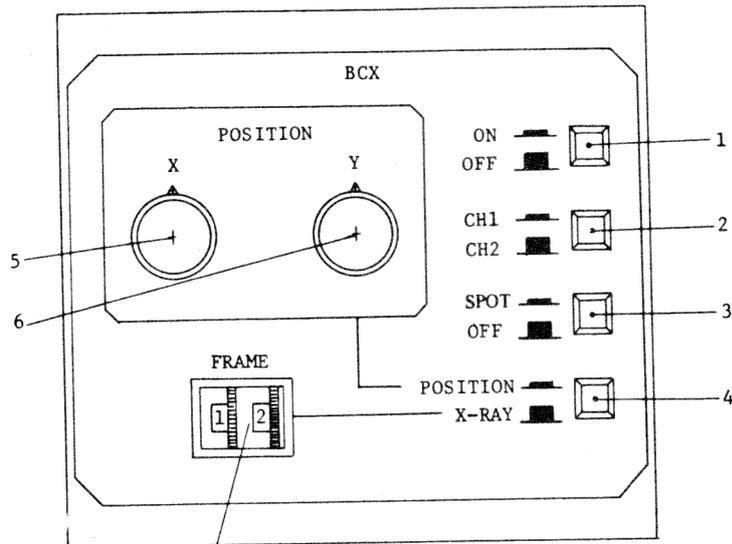


Fig. 1 Block schematic

- In the LSP mode, the RM (Rage Meter) signal is fed to the CRT VERT. deflection coil for line analysis.
- The PHA output signal is inputted through the X-RAY terminal. This signal is converted by the pulse width converter, and is fed to the brightness modulator via the signal switch, thus displaying the X-ray image on the CRT for area analysis.
- DC currents set by the POSITION X and POSITION Y knobs are fed to the EOS deflection coils, and their corresponding positional signals are fed to the brightness modulator in order to display the beam position on the CRT for spot analysis.
- In accordance with the frame setting signal and VERT. BLANKING signal, the number of frame exposures is set, and the resultant shutter signal is fed to the CSI shutter.

5. PANEL DESCRIPTION



7 Fig. 2 Control unit

1 ON / OFF button

By setting this button to ON, the BCX is electrically connected to the Scanning Microscope, and by setting this button to OFF, the BCX is electrically disconnected from the Scanning Microscope.

2 CH1 / CH2 button

Is used to select CH1 or CH2. Through each channel, either RM or X-RAY signal is inputted.

3 SPOT / OFF button

By setting this button to SPOT, the electron probe scanning stops (spot state), and by setting this button to OFF, the probe recommences scanning.

4 POSITION / X-RAY button

By setting this button to POSITION, the spot position or line scan position is displayed on the CRT, and by setting this button to X-RAY, the input signal through CH1 or CH2 as selected is displayed on the CRT.

5 POSITION X knob

Is used to move the electron probe in the X direction (horizontal direction on the CRT).

6 POSITION Y knob

Is used to move the electron probe in the Y direction (vertical direction on the CRT).

Note: If the SPOT / OFF button is set at OFF, turning this knob causes the electron probe scan position on the CRT to be moved, but has no effect on the said position in the PIC mode. In the LSP mode, turning this knob also causes the electron probe scan position to be moved in the Y direction with the SPOT / OFF button at OFF.

7 FRAME setter

In case an X-ray image is to be photographed by multiple exposure, this setter is used to set the number of frame exposures. This setter is operative when the POSITION / X-RAY button is set at X-RAY.

6. OPERATION

6.1 Spot analysis

1. Prior to spot analysis, obtain a secondary electron image under the following conditions:

- MODE switch PIC
- SIZE switch EXP or PHOTO
- ACCELERATING VOLTAGE control 25 (20 for T20)
- MAGNIFICATION control arbitrary
- SPOT SIZE control 7 to 9 o'clock position

If the IMS is provided, depress its SEI button.

2. Set the controls on the BCX control unit panel as follows:

- POSITION X and POSITION Y knobs 12 o'clock position
- ON / OFF button ON
- CH1 / CH2 button CH1 (when signals are inputted through CH1)
- SPOT / OFF button OFF
- POSITION / X-RAY button POSITION
- FRAME setter 01

By the above setting, an image as shown in Fig. 3 is obtained.

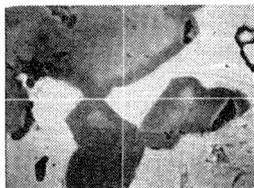


Fig. 3 Secondary electron image and spot position

Vertical line:

Shifts to the right when the POSITION X knob is turned clockwise, and to the left when the knob is turned counterclockwise.

Horizontal line:

Shifts upwards when the POSITION Y knob is turned clockwise, and downwards when the knob is turned counterclockwise.

The intersection of the vertical and horizontal lines indicates the spot position.

Manipulate the POSITION X and POSITION Y knobs so as to bring the point of intersection of both lines to the position of interest, and set the SPOT / OFF button to SPOT.

Notes: 1. When the SPOT / OFF button is set at SPOT, the image is not displayed on the CRT.

2. If the vertical line is considerably deviated from the screen by the knob manipulation, the horizontal line disappears.

6.2 Area analysis

1. Obtain a secondary electron image under the conditions described in Step 1, Sect. 6.1.
2. Set the controls on the BCX control unit panel as follows:

and knobs ... arbitrary (these knobs have no effect on this analysis)

/ button

/ button (when signals are inputted through CH1)

/ button

/ button

If the IMS is provided, depress its button.

In that case, however, the terminal should be idle. If the IMS is not provided, turn the scanning microscope control panel knob fully counterclockwise (otherwise, the secondary electron image will overlap the X-ray image).

By the above setting, an image as shown in Fig. 4 is obtained.

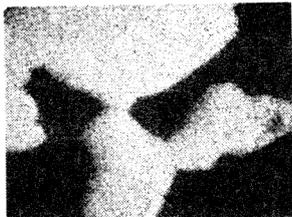


Fig. 4 X-ray image

When the IMS setting is returned to SEI , the secondary electron image overlaps the X-ray image. By setting the / button to , the X-ray image disappears, and the image on the CRT becomes as shown in Fig. 3. If the IMS button is depressed again, only the spot position is displayed on the CRT.

6.3 Line analysis

1. Obtain a secondary electron image under the conditions described in Step 1, Sect. 6.1.
2. Obtain an X-ray image by setting the BCX controls as indicated in Step 2, Sect. 6.2.
3. Set the BCX control unit / button to . The X-ray image now disappears, and only the spot position is displayed on the CRT. The knob may be at an arbitrary position. Manipulate the knob so as to bring the horizontal line to the desired position. This horizontal line indicates the LSP position on the specimen.

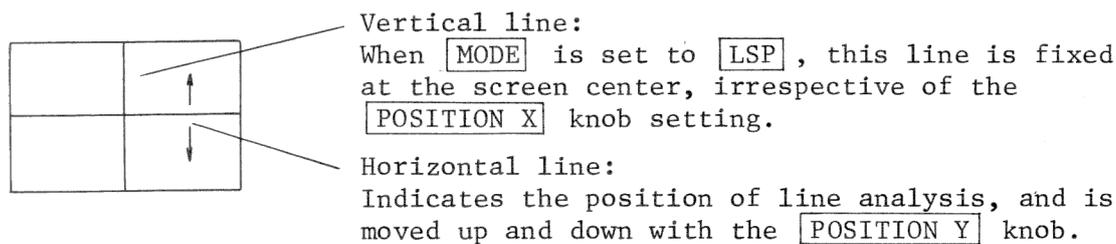


Fig. 5 Spot position display

4. After positioning the horizontal line, return the **POSITION** / **X-RAY** button setting to **X-RAY**.
5. Set the scanning microscope control panel **MODE** switch to **LSP**.
6. The signal from the RM (Rate Meter) is now displayed on the CRT.

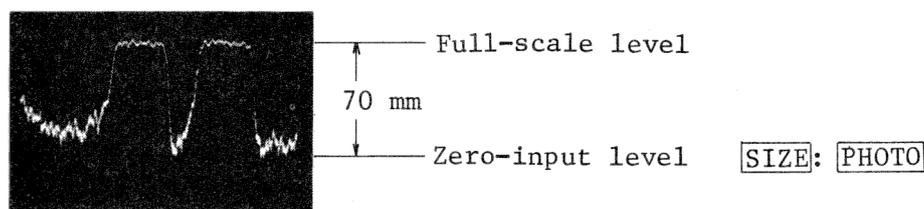


Fig. 6 LSP of RM signal

7. For secondary electron or backscattered electron line analysis, set the **POSITION** / **X-RAY** button to **POSITION**, and depress the **SEI** or **BEI** button of the IMS if it is provided. Then, set the scanning microscope control panel **MODE** switch to **PIC**, manipulate the **POSITION Y** knob so as to bring the horizontal line to the desired position, and set the **MODE** switch to **LSP** again.

*Note: In this case, the LSP on the CRT will be brightness-modulated. This can be avoided by turning the **POSITION X** knob fully clockwise or fully counterclockwise. In the LSP mode, the **POSITION X** knob has no effect on the beam scan on the specimen. If this knob is fully turned in this mode, however, the spot position display on the CRT will disappear when the **MODE** is changed from **LSP** to **PIC**.*

6.4 Photography

By setting the number of frames on the **FRAME** setter, the X-ray image can be photographed with multiple exposure. The BCX panel setting for this multiple exposure is the same as that given in Step 2, Sect. 6.2. Set the **FRAME** setter to **05**, for instance, and push the CSI shutter button. The shutter now opens and then closes after the five-frame exposure.

FRAME setter reading	Number of frames
01	1 frame
02	2 frames
⋮	
99	99 frames
00	100 frames

Multiple exposure is also possible for photographing the LSP waveform of the RM (Rate Meter) signal, but in usual cases, this is photographed with a one-frame exposure.

7. INTERCONNECTION DIAGRAM

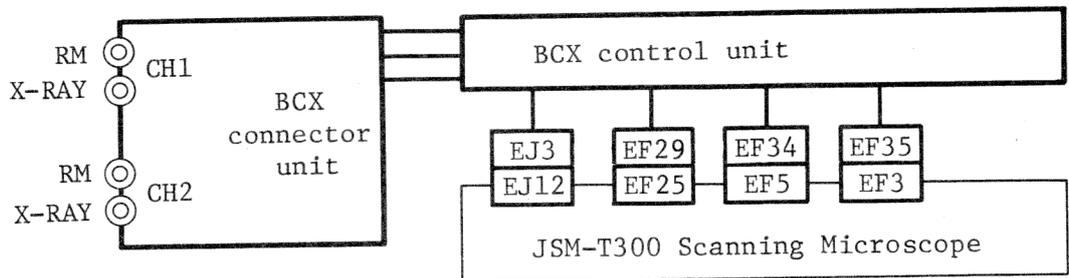


Fig. 7 Interconnection with JSM-T300

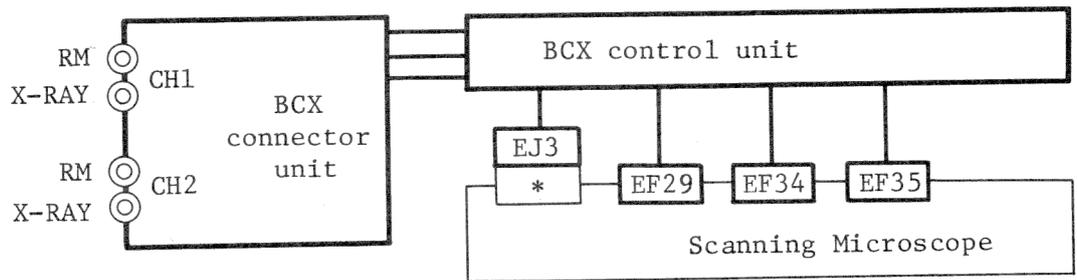


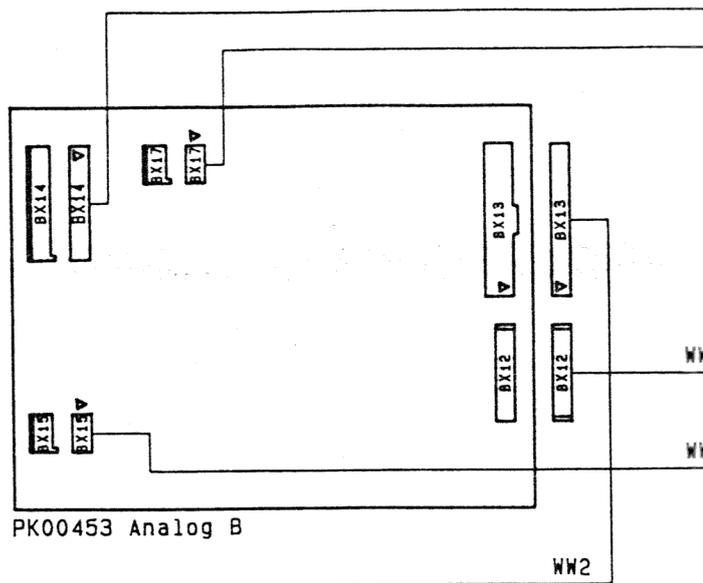
Fig. 8 Interconnection with JSM-T100/T200/T20

* : EJ3 for T200, EF47 for T20/T100.

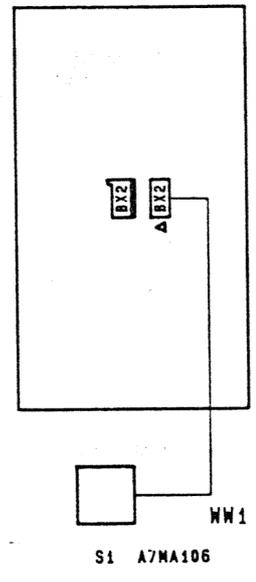
8. SIMULTANEOUS USE OF OTHER ATTACHMENTS

For T300, XIU cannot be simultaneously installed with BCX.

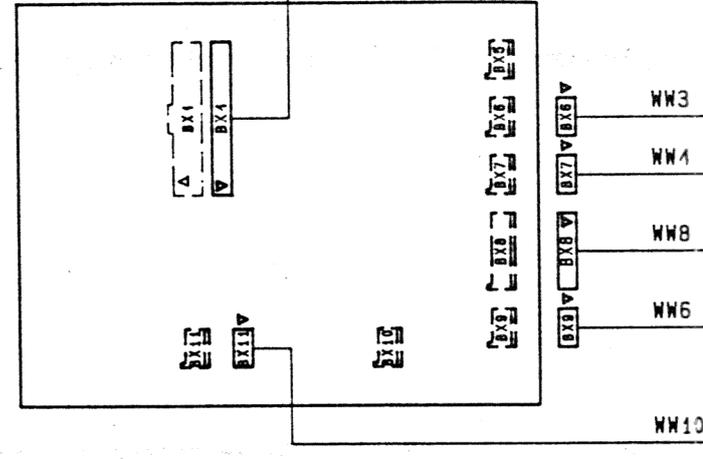
The BCX can be installed simultaneously with all other attachments.

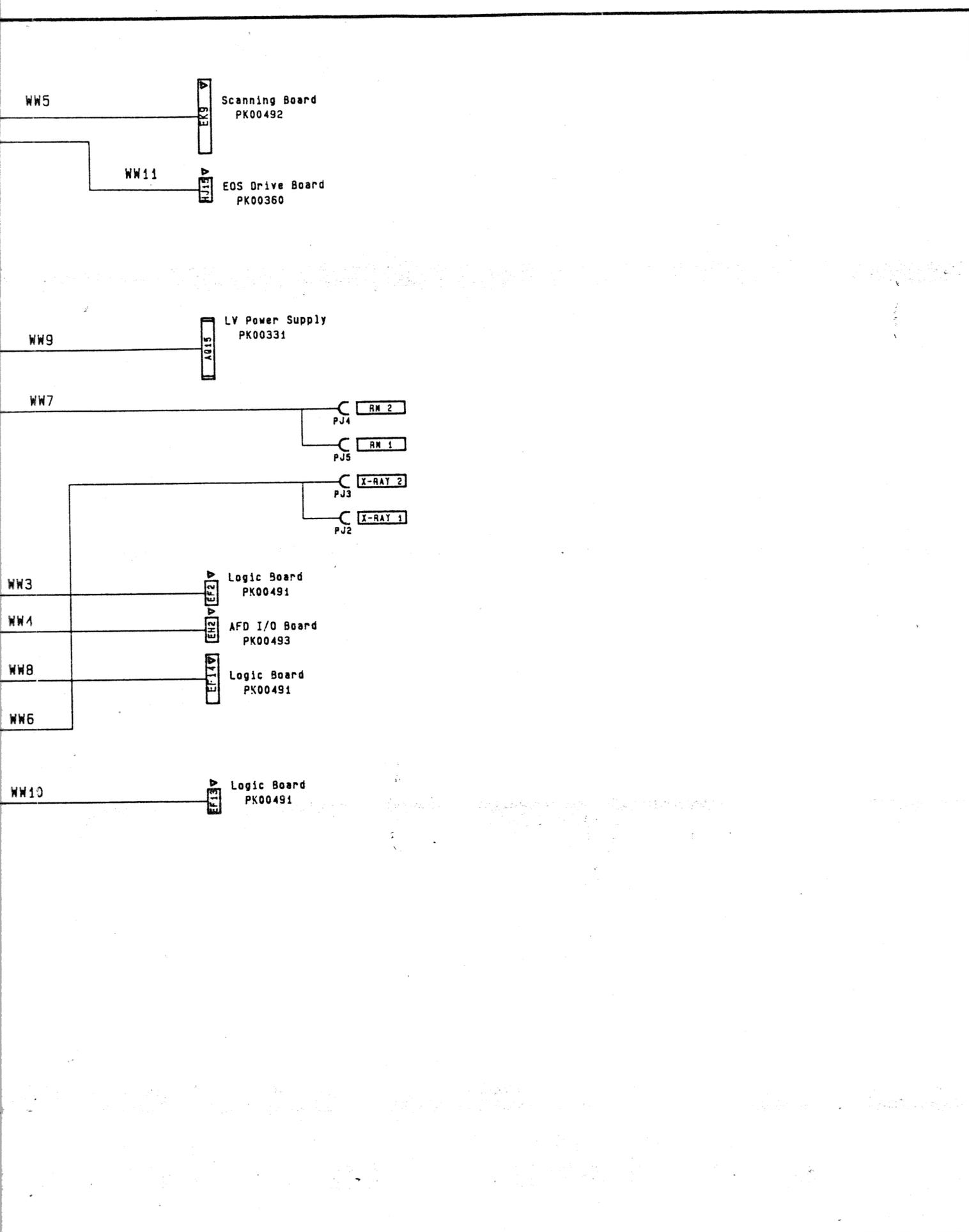


PK00451 BCX SW B

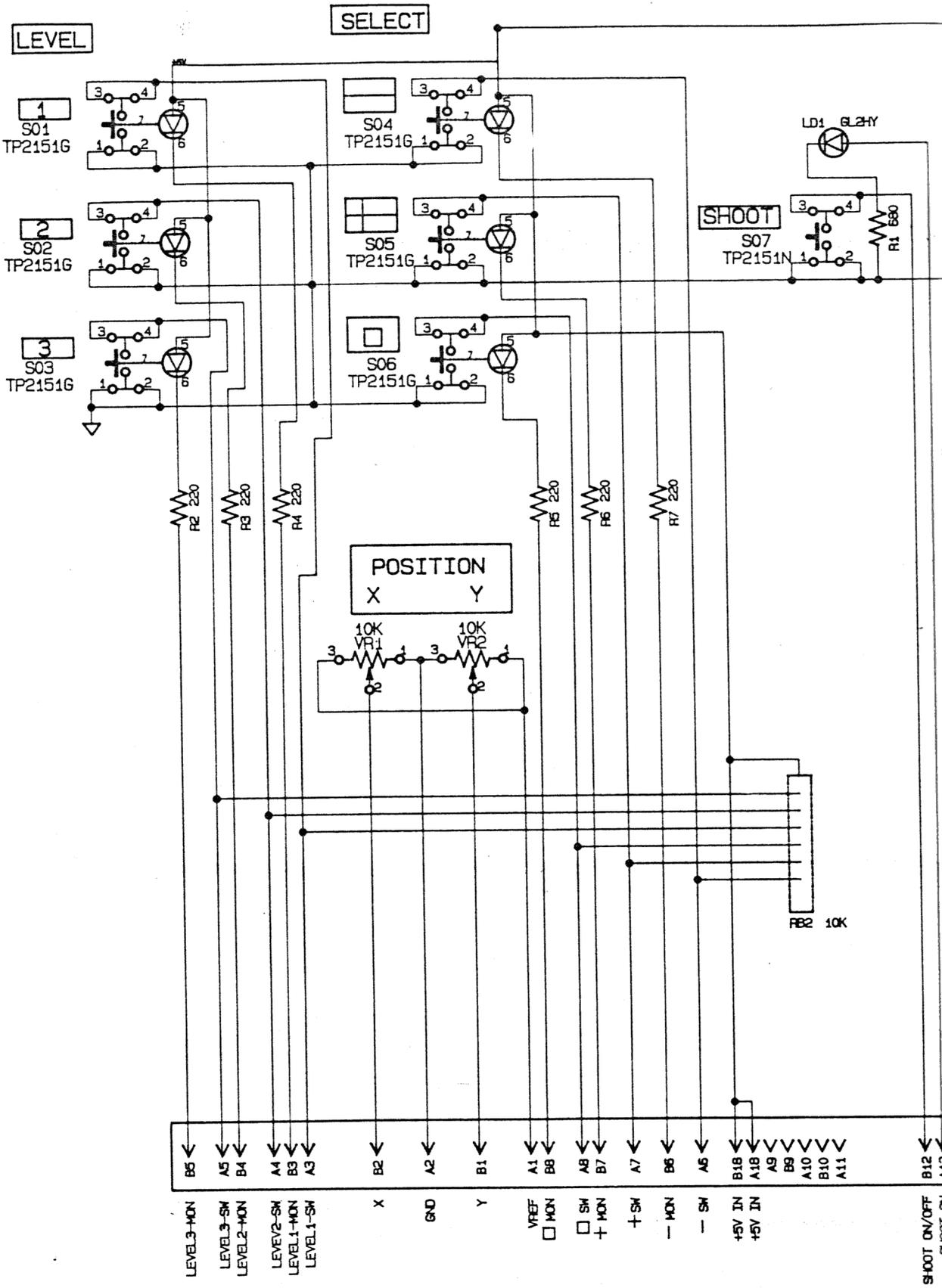


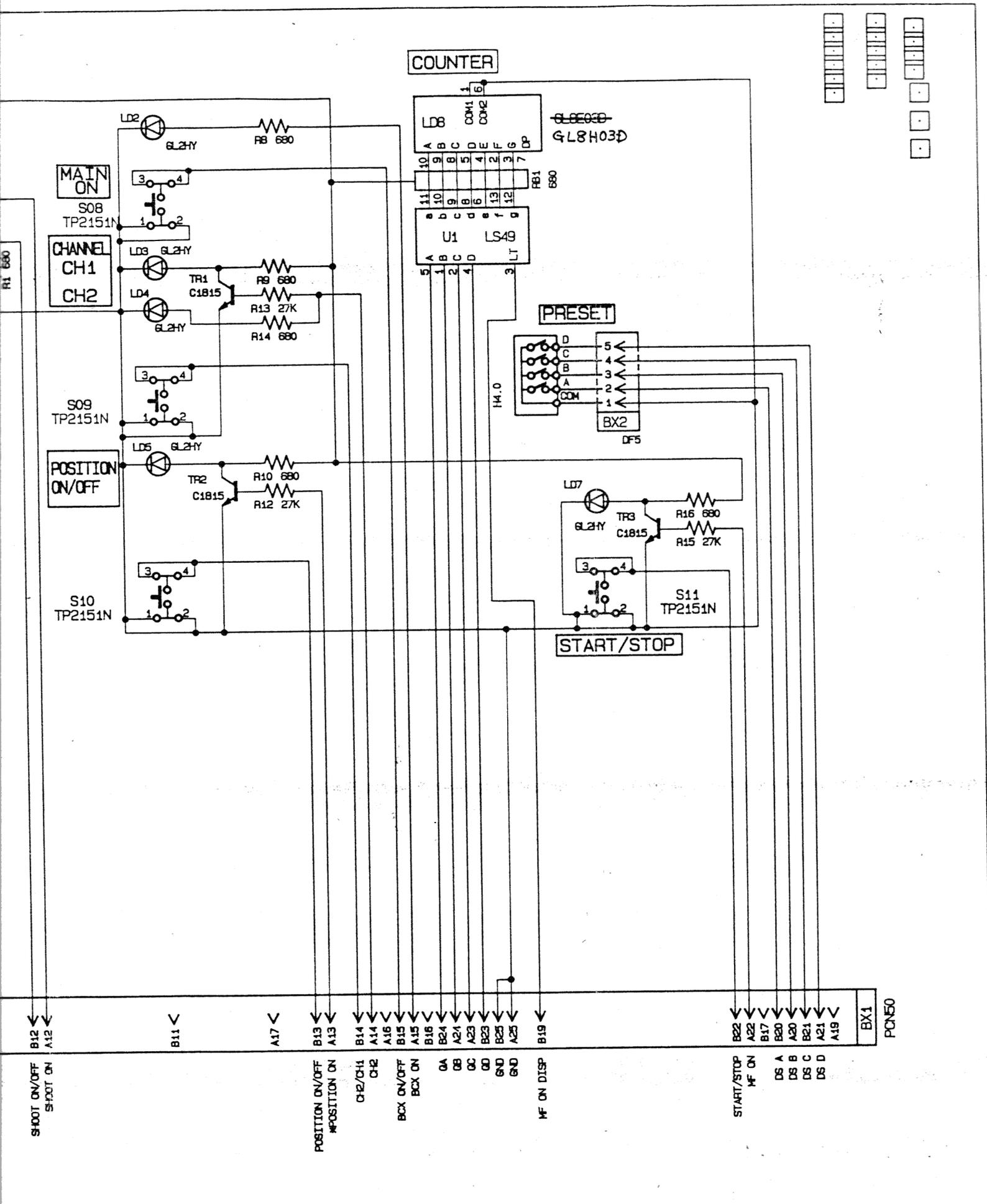
PK00452 BCX Logic B





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	DWG. DATE	MARK	DWG. NO	PAGE
	86/04/21	BX	PK00450	1/1





SHOOT ON/OFF
SHOOT ON

POSITION ON/OFF
POSITION ON

CH1/CH2
CH2

BCX ON/OFF
BCX ON

MF ON DISP

START/STOP
MF ON

DS A
DS B
DS C
DS D

NOTES
1. TS671300
2. TS671301 86/10/22

DRAWING
T. SATOH

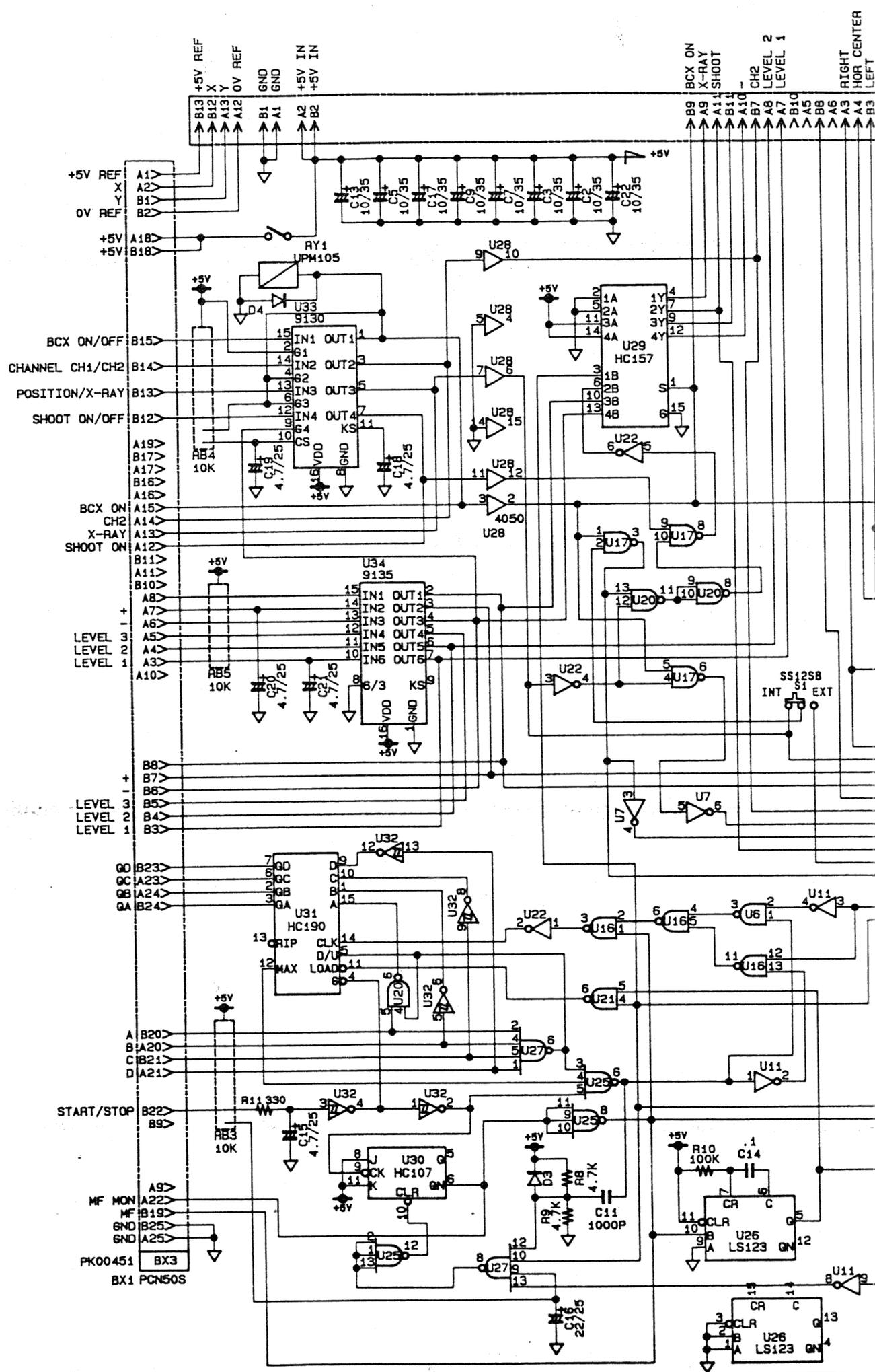
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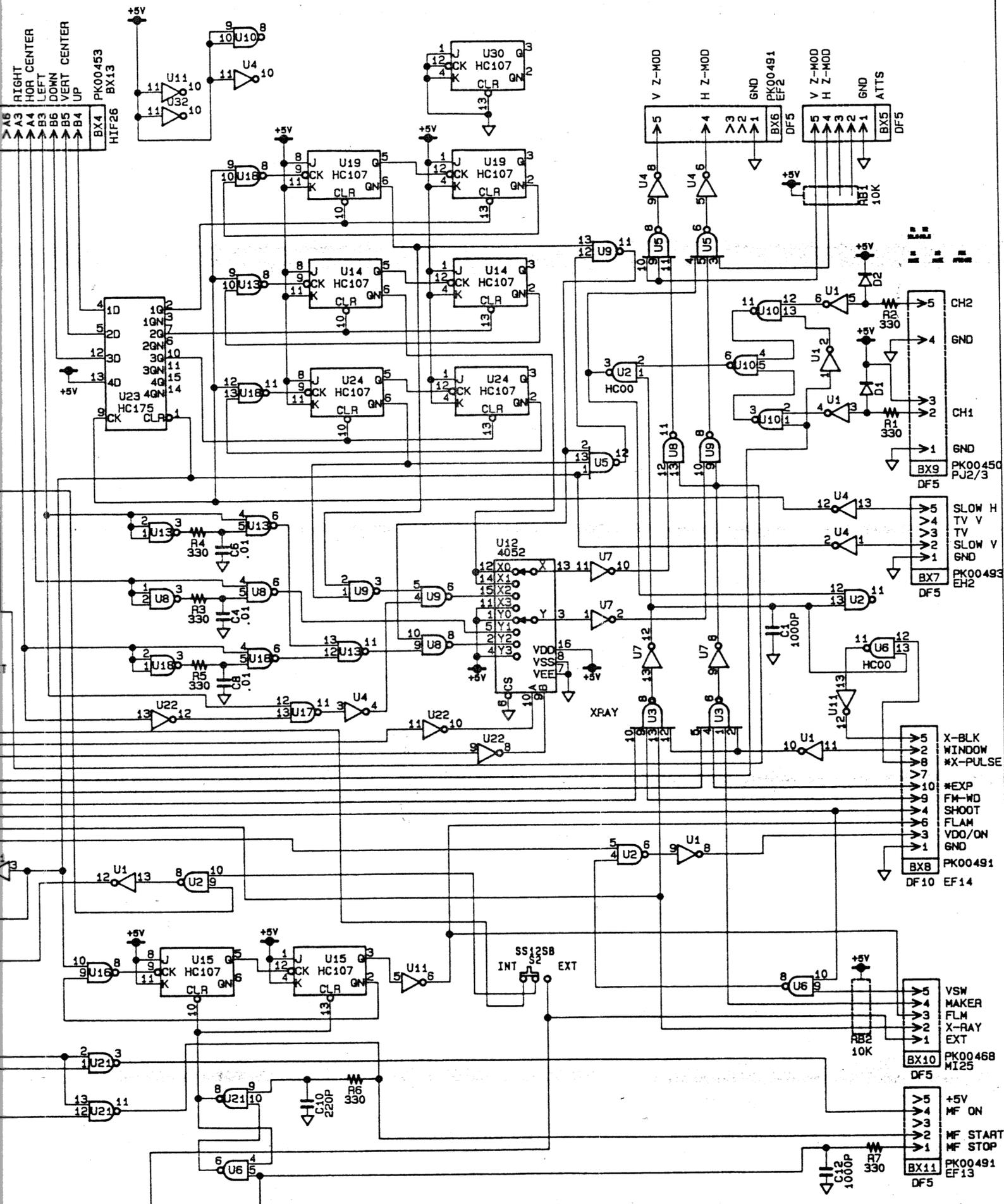
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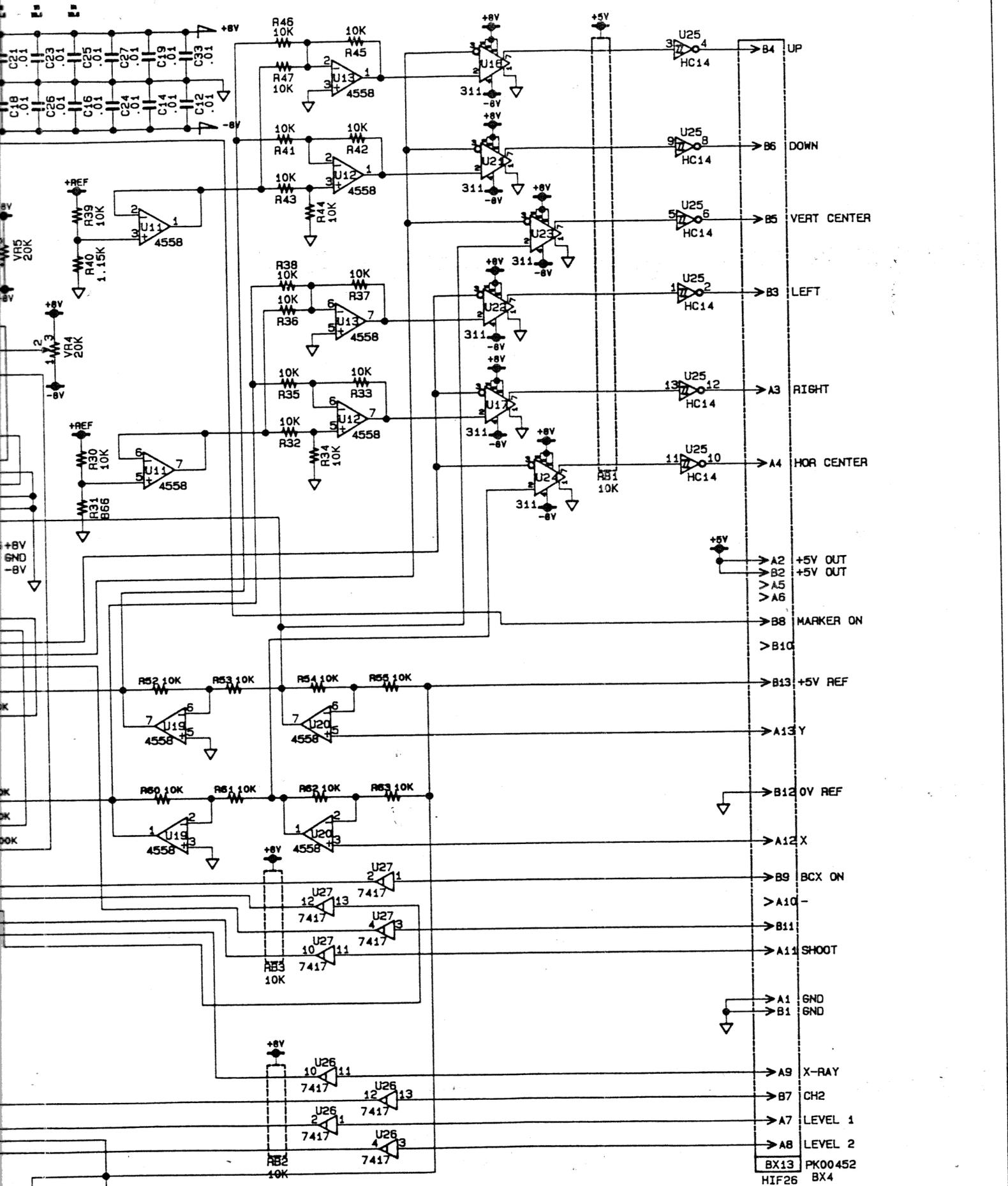
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NOTES
 1. TS671300-
 2. TS671301 86/10/22

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NOTES
 1. TS671300
 2. TS671301 86/10/22

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 T.SATOH
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TITLE
 BCX Analog Board

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