

# Household Electric Appliance Training System

(Color TV, B/W TV, Double-Card & Double-Track Recorder & Reproducer, VCD, DVD, AM/FM Radio, Dolby Decoder Power Amplifier, Karaoke)

## HEAT-BX-1



### Introduction

HEAT-BX-1 Household Electric Appliance Training System integrate color TV ( Toshiba 2-chip & Sanyo single-chip), B/W TV ( $\mu$ PC 3-chip, Toshiba 2-chip, dual in-line), double-card & double-track recorder & reproducer, VCD, DVD, AM/FM radio, Dolby decoder power amplifier, Karaoke, and it is composed of modules, table, and units, has central control table to control power supply and TV signals on student's table, can fulfill most experiments, inspection, debugging, and maintenance of the units above (set faults to faults array). It is widely used in all kinds of secondary vocational & technical schools, as well as professional skills appraisal departments of household electric appliance maintenance.

### Features

- 1) Adopts the most updated typical circuits in our country, so it is very universal.
- 2) Have leakage, short circuit, overload protection, power supply of color TV has cold bottom board and insulated transformer as dual protection, in addition, the equipment has internal line output transformer to avoid high-voltage electric shock, as well as line voltage and line current display.
- 3) There are circuit diagrams, test points, adjustment points on the experiment board. The whole set can be divided into 3 big parts and 3 small parts according to functions. It has perfect layout, convenient connection.
- 4) The color TV fault switches (altogether: 63), besides 1 set on the table, there is another set of hidden fault points under the board for teachers to test students.
- 5) Has AF & VF socket, AV I/O interface, remote control circuit adopts M50436-560P IC, adopts TA7680AP IC for audio signals processing, adopts TA7698AP IC for color decoding the branch oscillation of Y amplification frame oscillation. The structure is clear, tuning circuit also has manual regulation function.
- 6) Adopts FM/AM radio with Sony CXA1191M single-chip IC for reliability and convenience.
- 7) The experiments from discrete components to modular B/W TV are helpful to learn color TV.
- 8) Use instruments for regulation, definition, sensibility, and stability are higher than general ones.

## Technical Indexes:

### Central control table:

- (1) Input voltage: AC 220V±22V
- (2) Insulation resistance: ≥10MΩ
- (3) Antistatic strength: 1500V/60s
- (4) Current of leakage protection: ≤30mA

### Experimental Table:

- (1) Input voltage: AC 240V, 50Hz
- (2) Insulation resistance: ≥10MΩ
- (3) Antistatic strength: 1500V/60min
- (4) Current of leakage protection: ≤30mA, ≤0.1S
- (5) AC output:
  1. Constant-voltage: rated voltage: 220V, rated current: 6A
  2. Adjustable voltage: voltage range: 0~250V, rated current: 1A
- (6) DC output:
  1. 0~36V, 0~2A, stepless adjustable
  2. Constant-voltage DC: 54V±1V
  3. Constant-voltage DC: 108V±2V
  4. Constant-voltage DC: 180V±4V
- (7) Low frequency signals source:
  1. Frequency range: 21Hz~18kHz, ±2%
  2. Output voltage: 0~5Vp-p
- (8) High frequency signal source:
  1. Output frequency range: 350kHz~2MHz
  2. Output voltage: 0~5Vp-p adjustable
  3. Has AM function
- (9) Signal generator of TV:
  1. Output signal frequency range: NO.11 channel
  2. Output signal mode:
    - a. RF output: ≥300μVp-p
    - b. VF output: ≥1 Vp-p
    - c. AF output: ≥0.3 Vp-p
  3. TV signal format: 16 kinds: round, dot, lattice, B/W lattice, color, B/W etc
- (10) Level indication range: 0~100dB
- (11) AC voltmeter indication range: 0~300V
- (12) AC ammeter indication range: 0~5A

## Circuits Boards:

### (1) The unit board of NO.1 and NO.2 color TV:

1. Rule of TV set: PAL-DK.
2. Channel division:
  - a. VHF band: 1~5 channel;
  - b. VHF band: 6~12 channel;
  - c. U band: 13~57 channel;
3. Image mid-frequency: 38MHz
4. Audio mid-frequency: NO.1: 31.5MHz; NO.2: 6.5MHz
5. Color subcarrier: 4.43MHz

### (2) NO.3 integrated AM/FM radio circuit unit board:

1. Medium wave frequency range: 525kHz~1605kHz
2. FM frequency range: 87~108MHz
3. Mid-frequency: Medium wave: 465kHz, FM: 10.7MHz
4. Selectivity: >15dB
5. Sensitivity:
  - a. FM: >10μV;

- b.  $W: > 3\text{mv/m}$
- 6. Undistorted power:  $\geq 0.5\text{W}$
- 7. Power supply power consumption:  $\leq 3\text{W}$
- (3) NO.4 double-card & double-track record/reproduce circuit unit board:
  - 1. Speed:  $4.76\text{ cm/s} \pm 3\%$
  - 2. Fast forward, rewind time: 140s (C-60)
  - 3. The left & right sound track output AF power:  $\geq 0.5\text{W}$
- (4) NO.5, NO.6, NO.7 B/W TV:
  - 1. Receive range: VHF 1~12 channel, UHF 13~57 channel
  - 2. Image mid-frequency: 38MHz
  - 3. NO.1 mid-frequency of audio signals: 31.5MHz
  - 4. NO.2 mid-frequency of audio signals: 6.5MHz
- (5) Technical indexes of B/W TV:
  - 1. Image channel noise limit sensitivity:
    - a.  $\text{VHF} \leq 250\mu\text{V}$
    - b.  $\text{UHF} \leq 300\mu\text{V}$
  - 2. Audio channel noise limit sensitivity:
    - a.  $\text{VHF} \leq 83\mu\text{V}$
    - b.  $\text{UHF} \leq 100\mu\text{V}$
  - 3. Horizontal definition of image center:  $\geq 200$  lines
  - 4. Audio channel max effective output power:  $\geq 0.5\text{W}$
  - 5. Image recurring ratio: Horizontal:  $\geq 80\%$ , Vertical:  $\geq 85\%$
  - 6. Scanning non-linear distortion:
    - a. Horizontal:  $\leq 18\%$ ;
    - b. Vertical:  $\leq 13\%$
  - 7. Image geometry distortion:  $\leq 6\%$
- (6) Technical indexes of color TV:
  - 1. Image channel noise limited sensitivity:
    - a.  $\text{VHF}: \leq 350\mu\text{V}$
    - b.  $\text{UHF}: \leq 400\mu\text{V}$
  - 2. Audio channel noise limited sensitivity:
    - a.  $\text{VHF} \leq 100\mu\text{V}$
    - b.  $\text{UHF} \leq 133\mu\text{V}$
  - 3. Color sensibility:  $\leq 90\mu\text{V}$ , when input resistance is  $75\Omega$
  - 4. Horizontal definition of image center:  $\geq 200$  lines
  - 5. Audio channel max effective output power:  $\geq 0.5\text{W}$
  - 6. Image recurring ratio:
    - a. Horizontal:  $\geq 80\%$
    - b. Vertical:  $\geq 85\%$
  - 7. Image geometry distortion:  $\leq 6\%$
  - 8. Power supply consumption:  $\leq 60\text{W}$ (14" color kinescope)
  - 9. Scanning non-linear distortion:
    - a. Horizontal:  $\leq 15\%$
    - b. Vertical:  $\leq 12\%$
- (7) NO.8 kind: VCD unit board:
  - 1. AF frequency response:  $(20\text{Hz} \sim 20\text{kHz}) \pm 1\text{dB}$
  - 2. VF output amplitude:  $1\text{V} \pm 0.2\text{V}_{\text{p-p}}$
  - 3. VF output rule: PAL/NTBC double rules.
  - 4. Horizontal definition:  $\geq 250$  lines
  - 5. Rated power consumption: 25W

School must provides digital multimeter, oscilloscope, frequency sweeper, AC milli-voltmeter, set of common tools for household electric appliances by itself;

- (8) NO.9 DVD unit board
- (9) NO.10 power amplifier unit board

## Configuration:

1) Teacher's demonstration control table (specification: 1600×900×1200mm): 1 demonstration table, 1 multifunction household electric appliance integrated experiment table, power supply control case for students' table.

2) Student's table (specification: 1600×900×1200mm): 1 table with 2 seats.

3) Experiment equipment includes:

Chassis and screen (composed of color and B/W two 14"Kinescopes), with stereo speaker case, AC, DC, high-frequency voltage collection signals receive & transmission etc devices inside.

27 unit circuit components (include color TV, remote controller of VCD), made of imported high-grade epoxy board with principle drawing, all elements and faults switches and testing points.

## Circuit Board Configuration sheet:

| No                        | Name             |   | Unit | Qua. | Spec    | Remark                       |
|---------------------------|------------------|---|------|------|---------|------------------------------|
| 1                         | Experiment desk  |   |      | 1    |         | Aluminium & wood structure   |
| 2                         | Experiment table |   |      | 1    |         |                              |
| 3                         | Stools           |   |      | 2    | Plastic |                              |
| 4                         | Color TV Board   | Remote control, mid-frequency amplification, audio, power amplification unit  | Set  | 1    |         | 1.Toshiba 2-chip type        |
|                           |                  | Color decoding, $\gamma$ amplification, frame oscillation circuit   | Set  | 1    |         |                              |
|                           |                  | Power supply circuit unit   | Set  | 1    |         |                              |
|                           |                  | Line output circuit unit  | Set  | 1    |         |                              |
|                           |                  | Frame output circuit unit   | Set  | 1    |         |                              |
|                           |                  | Color TV final video amplification unit   | Set  | 1    |         |                              |
|                           |                  | Single chip LA7688 color TV circuit unit  | Set  | 1    |         | 2.Sanyo single-chip          |
|                           |                  | Power supply circuit unit   | Set  | 1    |         |                              |
|                           |                  | Line output circuit unit  | Set  | 1    |         |                              |
|                           |                  | Frame output circuit unit   | Set  | 1    |         |                              |
|                           |                  | Color TV final video amplification unit   | Set  | 1    |         |                              |
|                           |                  | Intelligent faults switch interface unit  | Set  | 1    |         | 3.Intelligent Toshiba 2-chip |
|                           |                  | Remote control, mid-frequency amplification, audio, power amplification unit  | Set  | 1    |         |                              |
|                           |                  | Color decoding, $\gamma$ amplification, frame oscillation circuit   | Set  | 1    |         |                              |
|                           |                  | Power supply circuit unit   | Set  | 1    |         |                              |
|                           |                  | Line output circuit unit  | Set  | 1    |         |                              |
|                           |                  | Frame output circuit unit   | Set  | 1    |         |                              |
|                           |                  | Color TV final video amplification unit   | Set  | 1    |         |                              |
|                           |                  | Remote control unit   | Set  | 1    |         | 4. I <sup>2</sup> C color TV |
|                           |                  | mid-frequency amplification, audio, power amplification, color decoding, $\gamma$ amplification, frame oscillation circuit unit | Set  | 1    |         |                              |
| Power supply circuit unit | Set              | 1   |      |      |         |                              |
| Line output circuit unit  | Set              | 1   |      |      |         |                              |
| Frame output circuit unit | Set              | 1   |      |      |         |                              |

|    |              |   |      |   |  |  |
|----|--------------|---|------|---|--|--|
|    |              | Color TV final video amplification unit   | Set  | 1 |  |  |
|    |              | Intelligent faults switch interface unit  | Set  | 1 |  | 5. Intelligent I <sup>2</sup> C color TV |
|    |              | Remote control unit   | Set  | 1 |  |  |
|    |              | mid-frequency amplification, audio, power amplification, color decoding, $\gamma$ amplification, frame oscillation circuit unit | Set  | 1 |  |  |
|    |              | Power supply circuit unit   | Set  | 1 |  |  |
|    |              | Line output circuit unit  | Set  | 1 |  |  |
|    |              | Frame output circuit unit   | Set  | 1 |  |  |
|    |              | Color TV final video amplification unit   | Set  | 1 |  |  |
|    |              | Color TV final video amplification unit   | Set  | 1 |  |  |
| 5  | B/W TV Board | B/W TV power supply, line scanning, final video amplification circuit   | Set  | 1 |  | 1. UPC 3-chip                            |
|    |              | UPC integrated audio power amplification circuit  | Set  | 1 |  | 2. Toshiba 2-chip                        |
|    |              | UPC integrated frame output circuit   | Set  | 1 |  |  |
|    |              | Dual in-line audio mid-frequency discrimination circuit   | Set  | 1 |  |  |
|    |              | TA76 AP mid-frequency amplification circuit   | Set  | 1 |  | 3. Dual in-line type                     |
|    |              | Integrated audio mid-frequency amplification discrimination circuit   | Set  | 1 |  |  |
|    |              | Integrated 3-chip mid-frequency amplification circuit   | Set  | 1 |  |  |
| 6  |              | Record/reproduce board  | Set  | 1 |  |  |
| 7  |              | AM/FM radio board   | Set  | 1 |  |  |
| 8  |              | VCD board   | Set  | 1 |  |  |
| 9  |              | Karaoke unit  | Set  | 1 |  |  |
| 10 |              | Power amplifier board   | Set  | 1 |  |  |
| 11 | Tools        | Multimeter  |      | 1 |  |  |
|    |              | Acute pliers  | Pair | 1 |  |  |
|    |              | Wire-cutter   | Pair | 1 |  |  |
|    |              | Diagonal pliers   | Pair | 1 |  |  |
|    |              | Wire-peel pliers  | Pair | 1 |  |  |
|    |              | Wrench  | Pair | 1 |  |  |
|    |              | Combination screwdriver   | Set  | 1 |  |  |
|    |              | Electric iron   |      | 2 |  |  |
|    |              | Electric iron bracket   |      | 2 |  |  |
| 11 |              | User's manual (Experiment guide)  |      | 1 |  |  |