



Kongto Technology Co., Ltd.

CNC Machine CRT-to-LCD Complete Retrofit Guide

Fault Diagnosis | Model Matching | Installation Pitfalls | One-Stop Expert Reference

Covering: FANUC, Mitsubishi, Siemens, Mazak, Heidenhain, GSK, KND - Full Series

Keywords: CRT to LCD retrofit | CNC machine display replacement | FANUC LCD kit | industrial LCD monitor upgrade | CRT display conversion

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Introduction: Why Tens of Thousands of CNC Machines Need CRT-to-LCD Retrofits Every Year

Across China's manufacturing sector, a vast number of imported and domestically produced CNC machines commissioned from the late 1980s through approximately 2010 remain in active service at small-to-medium machining shops. Systems from FANUC, Mitsubishi, Siemens, Mazak, Heidenhain, GSK (Guangshu), and KND (Kaindi) are widely deployed in hardware, mold-making, injection molding, wire-cutting, and precision parts machining operations.

The CRT (cathode-ray tube) displays standard on these older machines are increasingly failing due to natural aging of vacuum tube components, contamination from shop-floor oil and dust, voltage fluctuations, and high-temperature/high-humidity operating conditions. Common symptoms include dead screens, noisy displays, brightness deterioration, and high-voltage noise. Original-equipment CRT tubes have been entirely discontinued; used/salvage tubes are scarce, expensive, and carry no service-life guarantee.

SEO Keywords: CNC machine CRT display repair, FANUC A61L-0001-0093 LCD replacement, Mitsubishi MDT962B retrofit solution, CRT to industrial LCD panel, legacy CNC monitor upgrade

Industry Tip: All data in this guide is sourced from Kongto Technology's real-world retrofit installations over the past two years, covering more than 3,000 machines across China's Pearl River Delta, Yangtze River Delta, North China, and Southwest regions.



Chapter 1: CNC Machine CRT Display Fault Classification & Retrofit Justification

1.1 Common CRT Failure Modes and Diagnosis Guide

Based on nationwide retrofit consultation data, CRT failures cluster into six well-defined categories:

Fault 1: Dead Screen + High-Voltage Whine (Most Frequent)

- o Symptom: Buzzing sound on power-up, blank screen, possible burning smell near flyback transformer
- o Root cause: Failed flyback transformer - irreversible hardware fault
- o High-frequency models: FANUC A61L series 9" and 14" CRTs, Mitsubishi MDT962B
- o Recommendation: Repair cost exceeds replacement value; LCD retrofit is the only economical path

Fault 2: Dim, Blurry Image + Extended Warm-Up Time

- o Symptom: Requires 10-30 minutes to show a stable image; progressive brightness loss
- o Root cause: Cathode filament aging, cathode poisoning - most common in amber and green monochrome screens
- o Recommendation: Post-repair recurrence is near-certain; one-time LCD retrofit eliminates the cycle

Fault 3: Screen Flicker / Jitter / Intermittent Blackout

- o Symptom: Rolling image, random blackouts correlated with power fluctuations
- o Root cause: Aged, bulging capacitors on the CRT power board
- o Recommendation: Capacitor replacement provides short-term relief; underlying tube degradation continues

Fault 4: Color Loss / Distortion / Scan Lines

- o Symptom: Missing RGB channels, visible horizontal or vertical interference lines
- o Root cause: Failed RGB driver circuit on the CRT neck board; all OEM replacement parts are discontinued



- o Recommendation: Cannot be repaired; display must be replaced

Fault 5: Yellowing / Soft Characters / Barrel Distortion

- o Symptom: Phosphor coating degradation causing yellow tint and edge distortion
- o Root cause: Irreversible phosphor aging - no repair value

Fault 6: Smoke / Exploded High-Voltage Capacitor

- o Symptom: Complete hardware failure with safety risk
- o Recommendation: Write off the CRT immediately; install industrial LCD

Industry Tip: Most factories initially attempt CRT repair by replacing capacitors, flyback transformers, and sourcing used tubes. However, the nearly universal outcome is repeated failure within months, causing production downtime that far exceeds the cost of a one-time LCD retrofit.

1.2 CRT Repair vs. LCD Retrofit: Full Cost Comparison

The following data table, derived from 3,000+ actual retrofit cases, delivers a clear answer to the perennial question: Is it more cost-effective to replace the CRT or retrofit with an LCD?

Comparison Item	CRT Repair	Used CRT Replace	LCD Retrofit	Winner
9" Unit Cost	\$85-165 USD	\$110-210 USD	\$65-95 USD	LCD Wins
14" Unit Cost	\$110-250 USD	\$250-420 USD	\$95-170 USD	LCD Wins
Service Life	3-12 months post-repair	6-24 months (used)	50,000 hrs (8-10 years)	LCD Wins
Power Consumption	80-150W	80-150W	15-30W	LCD 80% Less
Downtime Risk	High (recurring)	Medium (unknown life)	Very Low	LCD Wins
Dust/Oil Protection	None	None	IP65 Industrial Grade	LCD Exclusive

Table 1: CRT Repair vs. LCD Retrofit - Full Cost Comparison (Source: Kongto Technology 2022-2024 case data)



Conclusion: Industrial LCD retrofit delivers the lowest total cost, longest service life, highest IP protection rating, and lowest downtime risk - the definitive CNC display upgrade solution.

1.3 Full Range of Compatible Equipment

LCD retrofits are not limited to CNC lathes and machining centers. All of the following can be upgraded:

- o Injection molding machine CRT displays (Nissei, Haitian, Ningbo, etc.)
- o EDM (Electrical Discharge Machine) CRT displays (Sodick, FANUC, etc.)
- o Wire EDM machine CRT displays (slow-wire and fast-wire)
- o Legacy industrial PCs and PLC control console CRTs

Any machine using RGBS, RGBHV, or CGA standard industrial video signals is compatible with our non-destructive LCD replacement kits.

Chapter 2: Model Identification & Precision Selection Guide for Major CNC Systems

90% of retrofit failures - wrong fit, wrong parts, non-illuminating displays - stem from model or connector mismatch. This chapter covers the full spectrum of common, high-frequency, and niche CRT models to ensure correct matching for all legacy CNC equipment types.

2.1 FANUC Full-Series Retrofit Model Reference Table

FANUC is the largest installed base in China with the highest retrofit demand. The following table covers all high-frequency retrofit models:

CRT Model Number	Connector Type	Signal Protocol	Compatible CNC System
A61L-0001-0093	20-pin Honda	RGBS	Series 0 / 0M / 0T / 0i (old)
A61L-0001-0074	20-pin Honda	RGBS	0M / 0T / 16i / 18i
A61L-0001-0094	20-pin Honda	RGBS	21i / OM-D (legacy)
A61L-0001-0086	20-pin Honda	RGBS	16i / 18i / 21i Series
D9MM-11A	20-pin Honda	RGBS	Legacy Series 0



D9CM-01A	Proprietary ribbon	RGBHV	Machining Center Dedicated
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Table 2: FANUC CRT Model Compatibility Reference Chart

FANUC A61L-0001-0093 | 9-inch amber monochrome CRT | Highest retrofit volume nationwide | Drop-in direct replacement | Zero rewiring, zero parameter changes

The A61L-0001-0093 9-inch amber monochrome CRT is the highest-volume retrofit model in China. It uses a 20-pin Honda connector with RGBS signal and supports true plug-and-play drop-in replacement - no rewiring, no sheet-metal modification, no CNC parameter changes required.

Industry Tip: Technical principle: The LCD conversion kit handles only the display signal. It has zero interaction with the CNC controller board, memory modules, or servo system. No parameters are changed and no programs are lost.

2.2 Mitsubishi Full-Series CRT Model Reference Table

Mitsubishi system high-frequency retrofit models covering M64, M50, and M500 full series:

- o MDT962B / MDT962B-4A - 9 inch, M64/E60/M50, M500/M520/M3 systems
- o BM09DF - 9 inch green monochrome, M310/M3 series
- o FCUA-CT100 - 10.4 inch, M50/M500 series
- o MDT947 / MDT947B - 9 inch, multiple M-series variants
- o MDT1283B - 12 inch large screen, C64/M520 machines

Mitsubishi legacy CRTs predominantly use 10-pin proprietary ribbon connectors. Generic universal conversion kits frequently produce flicker, color shift, or no image. Dedicated protocol-matched driver boards are mandatory for correct operation.

Industry Tip: 12-inch MDT1283B units must use native 4:3 aspect ratio industrial panels. 16:9 widescreen panels will stretch coordinates and cause critical display errors.

2.3 Mazak Legacy System Retrofit Notes

Mazak core retrofit models: CD1472-D1M, Totoku 12-inch CRT, compatible with M32, M35, and Mazatrol legacy control systems.

- o Mazak 14-inch CRTs feature non-standard factory cutouts - standard LCD bezels leave gaps that allow contamination



- o Widened aluminum alloy bezel frames are required for gap-free, flush mounting
- o No secondary sheet-metal work needed; installation completed within 30 minutes

2.4 Siemens Industrial CRT Retrofit Details

Siemens 810, 820, 810D, and 820M systems use 8.4-inch legacy CRTs with CGA signaling. Heavy installed base in milling machines across North China.

- o Pre-installation check: Confirm power supply type - DC 24V direct supply or external adapter
- o CGA signals require a dedicated CGA-compatible driver board; standard RGSB boards will not work
- o Kongto Technology maintains dedicated inventory for North and Northeast China demand

2.5 Domestic CNC System Retrofit Compatibility (GSK / Huaxing / Bosch Rexroth)

GSK legacy CRT displays, Huaxing CNC monitors, Barong (Baoyuan) legacy displays, and Cosay EDM monitors in 9-inch, 10.4-inch, 12.1-inch, and 14-inch formats use FANUC or Mitsubishi-compatible signals and can be replaced 1:1 with equivalent model kits.

Industry Tip: Non-standard ribbon connector variants require pin-definition verification. Kongto Technology provides a free wiring diagram service for all such models.

2.6 Niche and Long-Tail Machine Retrofit Solutions

The following uncommon models have no generic plug-and-play kit on the market:

- o Brother machining center CRT
- o Fadal CNC CRT display
- o Hitachi CNC monitor
- o Toshiba industrial CRT
- o Heidenhain legacy CRT

These can be resolved via dedicated signal conversion driver boards or custom bezel panel solutions, permanently eliminating the broken-and-irreparable problem for rare equipment.



Chapter 3: Three Retrofit Approaches - Full Comparison

Retrofit requests from nationwide customers fall uniformly into three categories. Each suits different factory staffing, operational conditions, and budgets:

Retrofit Method	Best For	Total Cost	Key Features
On-site Full Service	Shops without technicians / Single-unit jobs	Highest (includes labor)	Full turnkey installation; PRD area rapid dispatch; nationwide scheduling available
Complete LCD Kit - DIY RECOMMENDED	Shops with maintenance staff / Batch upgrades	Lowest (Best ROI)	Plug-and-play drop-in; 30-90 min install; no rewiring; nationwide shipping
Converter Box + Consumer Monitor	Temporary emergency use only	Medium (hidden high cost)	No dust/heat protection; no mounting frame; consumer monitor unsuitable for factory floor long-term

Table 3: Three CRT-to-LCD Retrofit Methods Compared (RECOMMENDED: Complete LCD Kit - DIY)

3.1 On-Site Full-Service Installation

Best for small shops without dedicated maintenance staff or single-unit retrofits. A Kongto technician travels to your site for disassembly, installation, wiring, commissioning, and test runs - no factory involvement required. Same-day service available across Shenzhen, Dongguan, and Foshan; nationwide scheduling available.

3.2 Complete LCD Kit - DIY Installation (Recommended: Best Value)

Complete industrial LCD kits deliver true plug-and-play drop-in replacement, pre-configured with dedicated driver board, aluminum alloy bezel frame, ribbon cable, and all hardware:

- o No rewiring or sheet-metal modification required
- o Any in-house maintenance technician can complete the job
- o Installation time: 30-90 minutes per unit
- o Ships nationwide; ideal for batch upgrades across multiple machines



3.3 Converter Box + Consumer Monitor (Not Recommended for Production Equipment)

Purchase an RGBS/RGBHV/CGA-to-VGA converter (e.g., GBS8219) and use a spare consumer monitor as a temporary stand-in. Consumer monitors offer no dust or heat protection, no secure mounting, and are not rated for industrial environments. Acceptable only for short-term emergency use.

3.4 Power Supply Options

- o Standard: DC 24V directly from machine tool power supply - clean, stable wiring
- o Alternative: External power adapter for non-standard machines
- o Both options provide stable operation with no impact on the CNC system

Chapter 4: LCD Selection Parameters and Procurement Pitfalls to Avoid

4.1 The Three Signal Protocol Match (Critical Selection Factor)

Signal protocol matching is the core of any CRT retrofit. A protocol mismatch causes no image, flickering, color failure, or complete display failure:

Signal Protocol	Primary Brands	Interface Feature	Matching Notes
RGBS	FANUC	4-wire composite sync	Most common protocol for monochrome amber/green CRTs; 20-pin Honda connector
RGBHV	Mitsubishi / Siemens	5-wire differential	Standard for large-screen models; requires dedicated driver board - generic boards incompatible
CGA	European / Legacy Domestic	15KHz low frequency	Siemens 810/820, old domestic CNC systems; requires CGA-specific driver board

Table 4: Industrial Signal Protocol Comparison and Driver Board Matching Guide



4.2 Always Specify New, Original Industrial LCD Panels

The market contains refurbished and salvage panels sold at deceptively low prices. Industrial reliability requires new panels from reputable manufacturers:

- o New original industrial LCD panel - never refurbished or salvage
- o Operating temperature: -20 degrees C to +60 degrees C, rated for harsh machining environments
- o Dust and oil protection: IP65 or higher industrial protection rating
- o Service life: 50,000 hours - 8-10 years of normal operation without failure

4.3 Monochrome Emulation Mode

For legacy amber and green monochrome CRT machines, the driver board's OSD menu can toggle between monochrome and color display modes, preserving the visual interface familiar to long-term operators while delivering full LCD image quality.

4.4 OSD Image Calibration

Professional industrial driver boards include a full OSD calibration menu. Image position offset, overscan, and black border issues can all be corrected via the OSD without touching any machine wiring or CNC parameters.

Chapter 5: Standard Installation Procedure and Industry Pitfalls

5.1 Pre-Installation Four-Step Self-Checklist

1. Measure the machine panel opening: 8.4" / 9" / 10.4" / 12" / 14"
2. Photograph the rear connector ribbon cable: 10-pin or 20-pin
3. Verify the machine supplies DC 24V power
4. Record the CNC system model number and CRT nameplate part number for exact kit matching



5.2 Standard Installation Procedure

5. Power down the entire machine; wait 3-5 minutes to allow capacitors to discharge
6. Remove the old CRT unit (observe high-voltage cap safety procedure)
7. Mount the new LCD aluminum alloy bezel frame in the original opening
8. Connect the original ribbon cable directly to the driver board (20-pin or 10-pin direct plug)
9. Connect the DC 24V power supply feed
10. Power on and use the OSD menu to fine-tune image position and size
11. Run machine unloaded for 30 minutes with no anomalies; then return to production

5.3 Top 4 Industry Installation Mistakes

Mistake #1: Using a Consumer Monitor to Save Cost

Consumer monitors are rated 0-40 degrees C and offer zero industrial protection. Factory floor conditions will damage them rapidly, and the rework cost far exceeds the premium for a proper industrial unit.

Mistake #2: Mixing Signal Protocols When Selecting a Driver Board

RGBS, RGBHV, and CGA are mutually incompatible protocols. Selecting the wrong driver board results in a dark screen, image distortion, or no sync - wasted procurement budget and machine downtime.

Mistake #3: Improvised Rewiring on Non-Standard Connector Models

Improvised wiring on non-standard ribbon connectors risks reverse polarity or short circuit, potentially damaging the CNC main board. Correct approach: verify the full pin definition and use a purpose-built signal conversion board.

Mistake #4: Installing a Widescreen (16:9) Panel

CNC controller outputs are always 4:3 video signals. A 16:9 widescreen panel will stretch the image horizontally, distorting coordinate values and making the display unusable. Always specify a 4:3 ratio industrial panel.

Chapter 6: Warranty Policy and Regional Installation Coverage



All Kongto Technology industrial LCD kits include a long-term warranty. Non-human-damage, non-unauthorized-modification failures are covered under the warranty policy, providing long-term production protection for your facility.

6.1 Regional Retrofit Demand Distribution

- o South China (Shenzhen, Dongguan, Foshan): Dense machine upgrade demand; on-site service available same day
- o East China (Jiangsu, Zhejiang, Anhui): Primarily DIY kit installations; nationwide shipping preferred
- o North China (Shandong, Hebei, Henan): Large installed base of legacy Siemens and Mazak equipment
- o Southwest (Sichuan, Chongqing, Guangxi, Yunnan): Kit-by-mail with local technician installation model
- o Fujian: Strong demand from injection molding and wire-EDM sectors

6.2 Kongto Technology Service Commitments

- o Free nationwide shipping; dispatch within 48 hours
- o Professional wiring diagrams and installation video tutorials included
- o Long-term warranty: free replacement for non-human damage
- o Remote technical support via phone or video call during installation
- o Volume pricing and on-site service contracts available for batch upgrades

Conclusion: Give Your Old Equipment a New Life - Reduce Maintenance Costs with Technology

Retrofitting legacy CNC machine CRT displays with industrial LCD panels is the most cost-effective machine life-extension solution in today's manufacturing sector. At minimal cost, it permanently resolves the industry pain points of discontinued CRT tubes, repeated repair cycles, and unplanned production stops.

Kongto Technology has been deeply engaged in CNC display retrofitting for many years. Our mission is technical precision, exact model matching, non-destructive installation, and long-term



stability. We focus exclusively on solving LCD upgrade challenges across all brands, all control systems, and both mainstream and niche CRT models - providing Chinese manufacturers with high-compatibility, high-reliability, cost-effective complete retrofit solutions.

This guide consolidates two months of nationwide customer consultation data, covering all high-frequency questions, mainstream model numbers, long-tail niche models, retrofit options, technical pitfalls, and field-proven installation procedures - a complete reference for anyone upgrading legacy CNC displays.

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