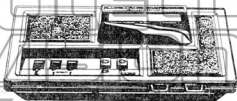


TITLE: ColecoVision Expansion Module #1 Model 2405



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1. Purpose

This specification establishes the performance specification and criteria for manufacturing the COLECOVISION Expansion Module #1 Model 2405 for American NTSC system.

2. Applicable Documents

#72019 Top Housing
#72020 Bottom Housing
#72029 Assembly
#91046 P.C. Board Assembly (Logic)
#91049 Schematic
#91657 Instruction Sheet
#92064 Final Test Cartridge
#92065 Color Test Cartridge
#92106 Colecovision Specification/Bill of Materials
FCC Part 15, Subpart J
QC 101 Coleco Toy and Game Standard
QC 102A Transportation Test Procedure
QC 108B Sampling Specifications
QC 109 Handling and Operating Procedures for MOS Circuits
QC 111 Label and Graphic Standards
QC 114 P.C. Board Workmanship Standard

3. Acceptance

3.1 AQL (Acceptance Quality Level) of the finish console shall be:

1.0% AQL MAJOR

4.0% AQL MINOR

4. Environmental Requirements

At the completion of tests for following requirement, unit shall pass performance specification item 7.

4.1 Operating Temperature Range: $+10^{\circ}\text{C}$ (50°F) to 40°C (104°F) at 70% RH.

4.2 Storage Temperature Range: -10°C (14°F) to 60°C (140°F) at 90% RH.

4.3 Thermal Shock: Shall withstand 10 cycles for one hour at each operating temperature extreme. Unit to stabilize for one hour at room temperature between temperature changes.

4.4 High Voltage Static Tests: At all switches, housing openings, painting line, any metal surfaces withstand 25 KV discharge from a 200 pF capacitor with 10K ohm limiting resistor.

4.5 Vibration: Shall comply with standard per QC 102A.

4.6 Drop Test: Console shall withstand (3) 30" drops per QC 101. Shall comply with QC 102A (packaged).

5. Applicable Standards

5.1 Coleco Toy and Game Standard

(QC 101 and EPSC).

5.2 Surface Coatings Standard, Label and Graphic Standards

(QC 111 and EPSC).

6. Life

6.1 1000 hours minimum, shall be tested as follows: At 25°C ambient with connection to ColecoVision Console powered by COLECO POWER SUPPLY MODELS #55416 or #74942 (power switch in ON position) and a game cartridge is inserted into the unit under test.

6.2 Cartridge door assembly #78016 minimum 5000 openings tested to 90° of travel.

- 6.3 Cartridge connector #75465 minimum 5000 insertions @400-600 insertions/hour with contact resistance 0.5 ohms maximum. Contact resistance shall be determined with a virgin cartridge PCB before or after insertion test. Insertion test cartridge PCB must be less than 0.5 ohms contact resistance measured on a virgin cartridge connector.
- 6.4 Controller "D" connector #75450 minimum 1000 insertions/withdrawals (with cable). Maximum insertion force = 12 pounds. Minimum withdrawal force: 5 pounds. Maximum contact resistance = 0.5 ohms. Insertion/withdrawal force, contact resistance shall be determined with a virgin "D" connector. Insertion test "D" connector must be less than 0.5 ohms contact resistance and within force specification measured on a virgin male PCB connector.
- 6.5 Game select and reset switch #74933 minimum 10,000 operations with contact resistance not to exceed 200 ohms. Switch assembly including cap actuation force at center of cap to be 7 ± 2 oz.
- 6.6 Slide switch #74934 minimum 1000 operations with contact resistance not to exceed 0.03 ohms. Switch assembly including knobs actuation force both directions to be 11 ± 4 oz.
- 6.7 Expansion port edge connector minimum 1000 insertions/withdrawals. Maximum insertion force = 25 pounds and minimum withdrawal force = 5 pounds. Maximum contact resistance = 0.1 ohms. Shall be tested with a virgin PCB male edge connector only. PCB male test connector must be less than 0.1 ohms contact resistance and within force specification measured on a virgin female connector.

7. Performance Specification

7.1 General Test Conditions

7.1.1 A ColecoVision Console (EPS #183) powered by supply (EPS #190) is required for performing any test in this specification.

7.1.2 Ambient environment shall be 25°C at 50% \pm 10% RH unless otherwise noted.

7.1.3 Module will be stabilized to ambient condition before testing.

7.1.4 Two hand-controllers (EPS #184), switch box (R-74608), are required as accessories for performing some portion of the tests.

7.1.5 ~~Test shall be performed only on color TV sets.~~

7.2 Power Supply Requirements

Three regulated DC voltages supplied by ColecoVision Console are required as below.

- a. 5V \pm 5%, -5% at 360 MA Max., 280 MA typical.
- b. -9V \pm 5% DC at 50 MA Max., 40 MA typical.
- c. 12V \pm 5% DC at 35 MA Max., 30 MA typical.

~~All DC voltages shall have no more than 10mV p-p ripple.~~

7.3 Radiation interference limits, line conducted interference limits shall meet FCC Part 15 specification on TV interference device under test condition Item 7.1, shall include two hand controllers connected to the module.

7.4 Clock Frequency

7.41 System Clock

System clock is supplied by ColecoVision Console and requirements are:

Main clock frequency shall be $3.579545 \text{ MHz} \pm 125 \text{ Hz}$ at U3 pin 26.¹¹

Rise and fall time to be max. 28 ns between 0.4 to 3.2V.

Logic high to be 112 to 168 ns at 4.0V.

Logic low to be 112 to 168 ns at 0.4V.

7.5 Current Drain

The individual currents drawn by the three DC voltages must not exceed limits as indicated in the power supply requirement item 7.2.

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7.6 Composite Video Signal

7.6.1 The composite video signal shall meet American NTSC system and consist of following specification at Pin 33 of connector (Numbered per PCB layout) when using color test cartridge #92065.

Color	Chrominance AC Value (Volts)	Degree Related To Color Burst
White	—	—
Light Green	0.6	354
Medium Green	0.6	340
Dark Green	0.6	315
Light Blue	0.6	295
Medium Blue	0.6	270
Blue	0.6	237
Dark Blue	0.6	218
Light Purple	0.6	192
Purple	0.6	167
Light Red	0.6	147
Medium Red	0.6	115
Red	0.6	96
Dark Red	0.6	70
Light Brown	0.6	45
Green	0.6	25

Luminance
Level (7)

DC Value
(Volts)

Very High Luminance 0.77

High Luminance 0.65

Medium High Luminance 0.55

Medium Luminance 0.43

Medium Low Luminance 0.32

Low Luminance 0.21

Very Low Luminance 0.11

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7.62 Timing Requirement

PARAMETER		MIN	TYP	MAX	UNIT
tf1	Fall time, VBLACK to VSYNC		18		nS
tw(HS)	Pulse Width, Horizontal Sync		4.84		uS
tr1	Rise time, VSYNC to VBLACK		28		nS
tBS-CD	Delay time, Sync to Color Burst		372		nS
tw(CB)	Width, Color Burst		261		uS
tCB-LB	Delay time, Color Burst to left border		1.49		uS
tr2	Rise time, VBLACK to WHITE		60		nS
tw(LB)	Left Border Video Width		2.42		uS
tf2	Fall time, WHITE to VBLACK		118		nS
tw(AD)	Width of Active Display Area		47.68		uS
tw(RB)	Right Border Video Width		2.79		uS
trB-RS	Delay time, Right Border to Horizontal Sync		1.49		uS
tVFB	Vertical Front Blanking		191.1		uS
tVS	Vertical Sync		191.1		uS
VVBB	Vertical Back Blanking		828		uS
tABA	Active plus Border Area Time		18.8		nS
Number of color burst cycles			9		

7.63 Expansion Port (numbered per PCB layout) 60 pin total

Pin 1 Ground

Pin 2 Ground

Pin 11 Ground

Pin 13 Reset, Input - Table 7A, Timing Table 7B

Pin 31 Sound Output, Item 8.32

Pin 32 +12V

Pin 33 Composite video output, Item 7.61.

Pin 35 Ground

Pin 39 Ground

Pin 41 R/S Test Point

Pin 42 DS Clock Test Point

Pin 45 Clock Input 3.58MHz Item 7.41

Pin 57 +12V

Pin 59 +5V

Pin 59 +5V

Pin 60 -5V

Other pins are not used.

7.64 Cartridge Connector #1

Pin 1	A7 Output - Table 7A, Timing - Table 7B.
Pin 2	Ground
Pin 3	A5 Output - Table 7A, Timing - Table 7B.
Pin 4	VCC +5V, Item 7.2
Pin 5	A5 Output - Table 7A, Timing - Table 7B
Pin 6	A8 Output - Table 7A, Timing - Table 7B
Pin 7	A4 Output - Table 7A, Timing - Table 7B
Pin 8	A9 Output - Table 7A, Timing - Table 7B
Pin 9	A3 Output - Table 7A, Timing - Table 7B
Pin 10	A11 Output - Table 7A, Timing - Table 7B
Pin 11	A12 Output - Table 7A, Timing - Table 7B
Pin 12	A10 Output - Table 7A, Timing - Table 7B
Pin 13	A7 Output - Table 7A, Timing - Table 7B
Pin 14	C5 Output - Table 7A, Timing - Table 7B
Pin 15	A9 Output - Table 7A, Timing - Table 7B
Pin 16	D7 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 17	D6 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 18	D6 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 19	D1 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 20	D5 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 21	D2 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 22	D4 Tri-State I/O - Table 7A, Timing - Table 7B
Pin 23	Ground
Pin 24	D3 Tri-State - I/O - Table 7A, Timing - Table 7B

Note = 1) X - Denotes active high

2) X - Denotes active low.

3) Also refer to 6507 and 6532 data specification.