

### Interfacing to the SHARP 15 Inch TFT Liquid Crystal Displays

#### OBJECTIVE

The purpose of this application note is to address the noise issues associated with interfacing SHARP's LQ150X1DG11, LQ150X1DG16 or LQ15X01W to single board computers that do not have a sufficient number of grounds.

#### BACKGROUND

In an effort to introduce a cost competitive version of our 15" Thin-Film-Transistor matrix Liquid Crystal Display (LCD), we have redesigned our LCD drive elec-

tronics. As a result of this redesign, the new displays have become more dependent on proper grounding. If the recommended grounding is not adhered to as specified in the official specification, then the display may exhibit noise. The display specification specifies that the controller electronics supply fifteen grounds directly to the display. In some cases this can be impractical or impossible to offer in the customer's design. With this in mind, I have designed an interface board (with the assistance of Quadrangle Products) that accommodates a minimal number of customer supplied grounds from the controller electronics.

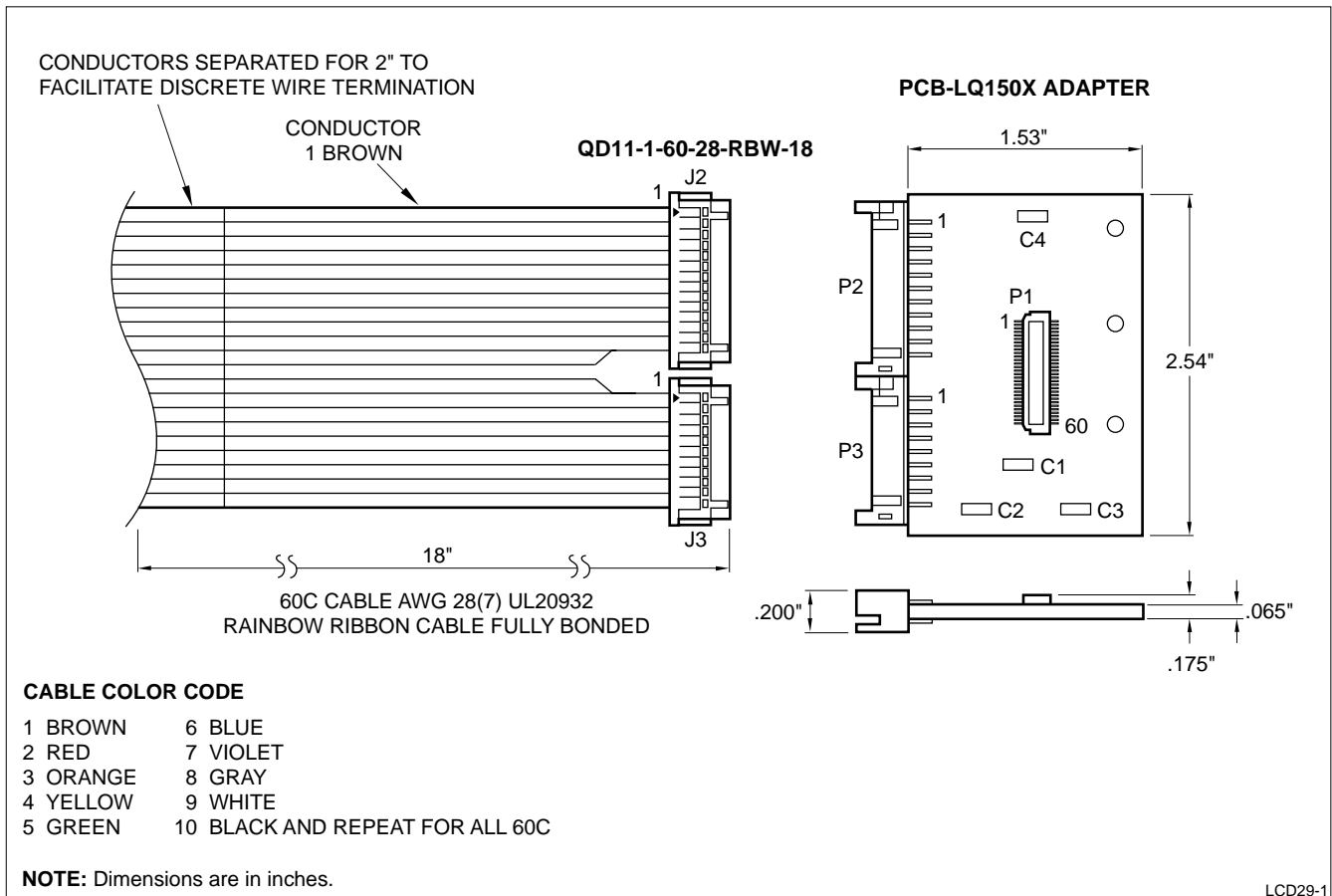


Figure 1. Interface Adapter Board and Necessary Cabling

Table 1. Wire Connection List for QD11-1-60-28-RBW-18

CN1	SIGNAL	P2
1	GND	1
2	RB0	2
3	RB1	3
4	RB2	4
5	RB3	5
6	RB4	6
7	RB5	7
8	GND	8
9	GB0	9
10	GB1	9
11	GB2	11
12	GB3	12
13	GB4	13
14	GB5	14
15	GND	15
16	BB0	16
17	BB1	17
18	BB2	18
19	BB3	19
20	BB4	20
21	BB5	21
22	GND	22
23	RA0	23
24	RA1	24
25	RA2	25
26	RA3	26
27	RA4	27
28	RA5	28
29	GND	29
30	GA0	30
31	GA1	31
32	GA2	32

CN1	SIGNAL	P3
33	GA3	1
34	GA4	2
35	GA5	3
36	GND	4
37	BA0	5
38	BA1	6
39	BA2	7
40	BA3	8
41	BA4	9
42	BA5	10
43	GND	11
44	GND	12
45	GND	13
46	V <sub>SYNC</sub>	14
47	H <sub>SYNC</sub>	15
48	ENAB	16
49	GND	17
50	GND	18
51	CKB	19
52	CKA	20
53	GND	21
54	GND	22
55	GND	23
56	MODE	24
57	V <sub>CC</sub>	24
58	V <sub>CC</sub>	26
59	V <sub>CC</sub>	27
60	V <sub>CC</sub>	28

## HARDWARE DESCRIPTION

The new adapter board, Quadrangle Products part number PCB-LQ150X, has added two new Printed Circuit Board (PCB) layers in order to introduce a ground and power plane. In addition, the board allows customers to add up to four capacitors (trim bypass) to further stabilize the GND and  $V_{CC}$  signals. Since most LCD Controller designs only offer one display clock, the PCB also internally connects the CLKA and CLKB signals. The board has mounting holes and comes with the necessary mounting screws in order to mount to the LQ150X1DG11, LQ150X1DG16, or LQ15X01W displays.

This system requires a fully bonded flat ribbon cable that is designed with a one-to-one interconnect at the LCD side of the cable. One such cable, Quadrangle Products part number QD11-1-60-28-RBW-18, offers this type of configuration as an engineering prototype solution. This cable allows (separated conductors 2" from the end of the cable) the customer to add the appropriate connector to the controller side of the cable to mate to the control electronics.

**NOTE:** The unused GND signals must be terminated at the LCD adapter board side and run the entire length of the cable up to the last 2" of cable where the conductors have been separated. This insures that the appropriate data and control signals are isolated by a sufficient ground signal.

Both the adapter board and the flat ribbon cable can be purchased as a kit from Quadrangle Products under part number RT-50A. Also note that Quadrangle can provide completed cables for 'plug and play' between the LQ150X1DG11, LQ150X1DG16, LQ15X01W and the customer's controller.

## TESTING AND QUALIFICATION

This design has been tested and qualified using Aaeon Electronics PCM-5894 and PCM5896 single board computers driving the LQ150X1DG11, LQ150X1DG16, and LQ15X01W displays. In each case, these computers (controller electronics) offer only four grounds to the displays and performed without noise.

## CONCLUSION

If your design constraints limit the number of available grounds, or if your LCD controller electronics supply a minimal number of ground signals, take the steps described to avoid noise issues and costly redesign in your TFT display system.

## REFERENCES

Quadrangle Products: (732) 970-1100  
[www.quadrangleproducts.com](http://www.quadrangleproducts.com)

Aaeon Electronics: (732) 203-9300  
[www.aaeon.com](http://www.aaeon.com)

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