Long Distance Serial Bus (Rev. 1.0)

The Long Distance Serial Bus (LDSB) is designed to allow long cable lengths between nodes as well as good immunity to lightning. Two shielded twisted pairs are used, one for power, and one for data.

Power is between 10 and 30 Volts DC, with maximum current determined by wire sizes, lengths, and fusing. Nodes should be designed so they take less than 2 Watts peak, with average power kept as low as possible. For instance, motors and sensors should only be powered when taking a measurement. Power should be on Pin 1 and Ground on pin 2.

Data is differential and swings between 1/3 and 2/3 of the Power voltage. Pin 3 is designated as NET+ and idles (marking) at 1/3 of Power, swinging to 2/3 for a space. Likewise, Pin 4 is designated as NET- and idles at 2/3 of Power, swinging to 1/3 for a space.

LDSB operates using 1200 baud Asynchronous, nonreturn-to-zero (NRZ) format with 1 start bit, 8 data bits, and 1 stop bit. The low speed and relatively high driver output impedance avoids reflections in the cable. High cable capacitance results in phase shifting of the received data, but because of the low data rate and differential nature, data loss is avoided. Controller Network Protocol (www.certsoft.com/cnp11.pdf) is normally used on LDSB, but other protocols may be used.

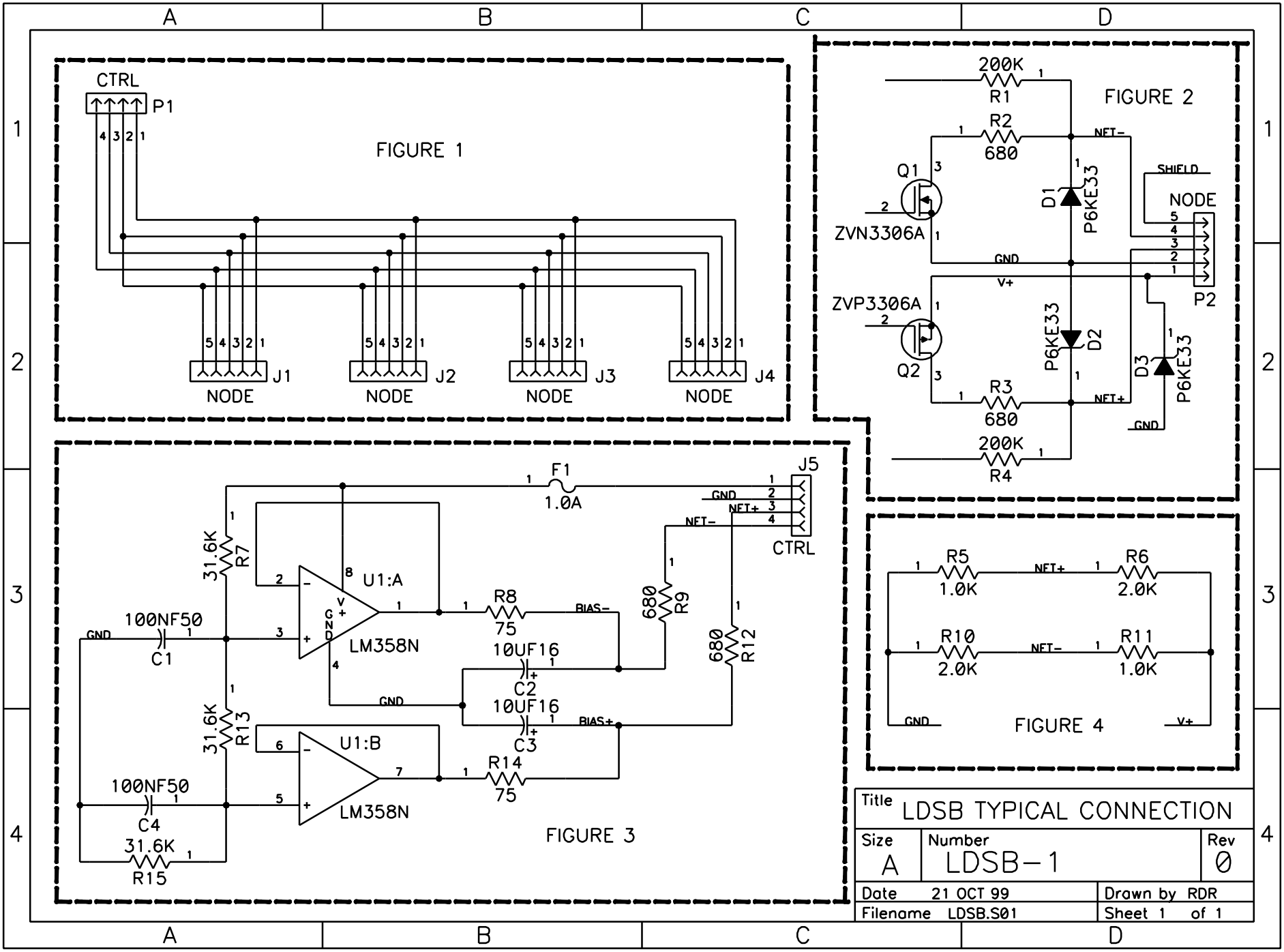
Figure 1 shows a typical cable connection. The network controller provides one or more 4 pin connectors that supply power and data. Each node uses at least a 5 pin connector, the 5th pin being the cable shield, which is connected to ground at the controller. This shield line may be left open, or used to prevent metal enclosures from floating. No current should be drawn from this shield line. AMP CPC Series 1 connectors are normally used, but other connectors are possible. The controller normally uses a 206430-1 jack, while individual nodes use a 206705-1 jack. Cabling between nodes may be daisy-chained, taking into account maximum current draw.

Figure 2 shows a typical node connector configuration. This output stage is also used by the controller. The receiver derives it's input from the two 200K resistors and must include a suitable amount of hysteresis.

Figure 3 shows one possible way to provide the normal 1/3 and 2/3 of Power idle voltage. A passive network can also be used, as shown in Figure 4, at the expense of increased idle current draw.

Transient protectors (such as P6KE33) must be used on all connector lines to ground. In addition, some kind of EMI filtering, such as ferrite beads, should be used on all connector lines.

Figures 1-4 on following page.


A
B
C
D
1
2
3
4
CTRL
P1
4 3 2 1
FIGURE 1
5 4 3 2 1
J1
J2
J3
J4
NODE
NODE
NODE
NODE
200K
R1
FIGURE 2
R2
680
NET-
Q1
ZVN3306A
D1
P6KE33
SHIELD
NODE
5 4 3 2 1
P2
GND
V+
ZVP3306A
Q2
D2
P6KE33
D3
P6KE33
R3
680
NET+
GND
200K
R4
F1
1.0A
J5
GND
NET+
NET-
CTRL
31.6K
R7
U1:A
LM358N
100NF50
C1
R8
75
BIAS-
680
R9
680
R12
10UF16
C2
10UF16
C3
BIAS+
31.6K
R13
U1:B
LM358N
R14
75
100NF50
C4
31.6K
R15
FIGURE 3
R5
1.0K
NET+
R6
2.0K
R10
2.0K
NET-
R11
1.0K
GND
V+
FIGURE 4
Title
LDSB TYPICAL CONNECTION
Size
A
Number
LDSB-1
Rev
0
Date
21 OCT 99
Drawn by RDR
Filename LDSB.S01
Sheet 1 of 1