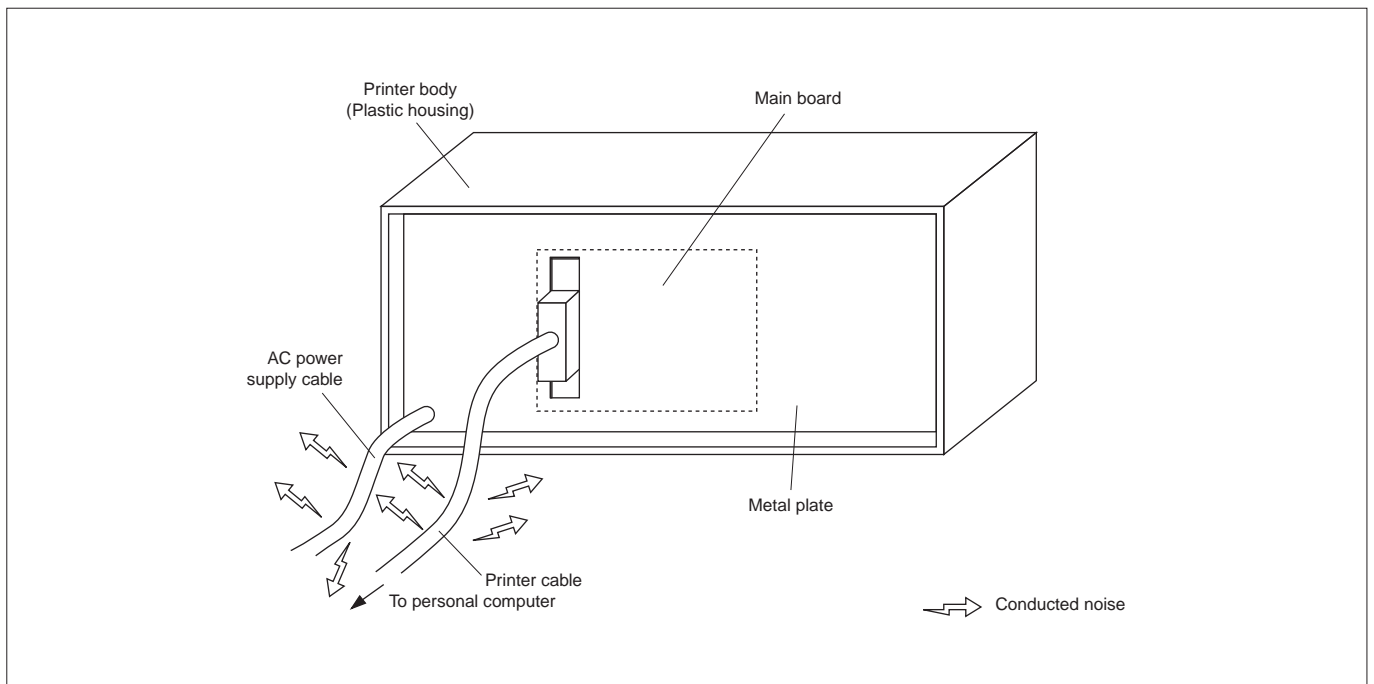


6 Example of Noise Suppression in Printers

Noise Emission Status :

Noise generated from the main printer board and from the drive motor are radiated from the printer cable.

In printers, noise generated from the main board is conducted to the printer cable and AC power supply cable, where they act as antennas. Noise generated while the motor is operating may sometimes cause a problem. In addition, friction between paper sheets generates static electricity, causing a malfunction.



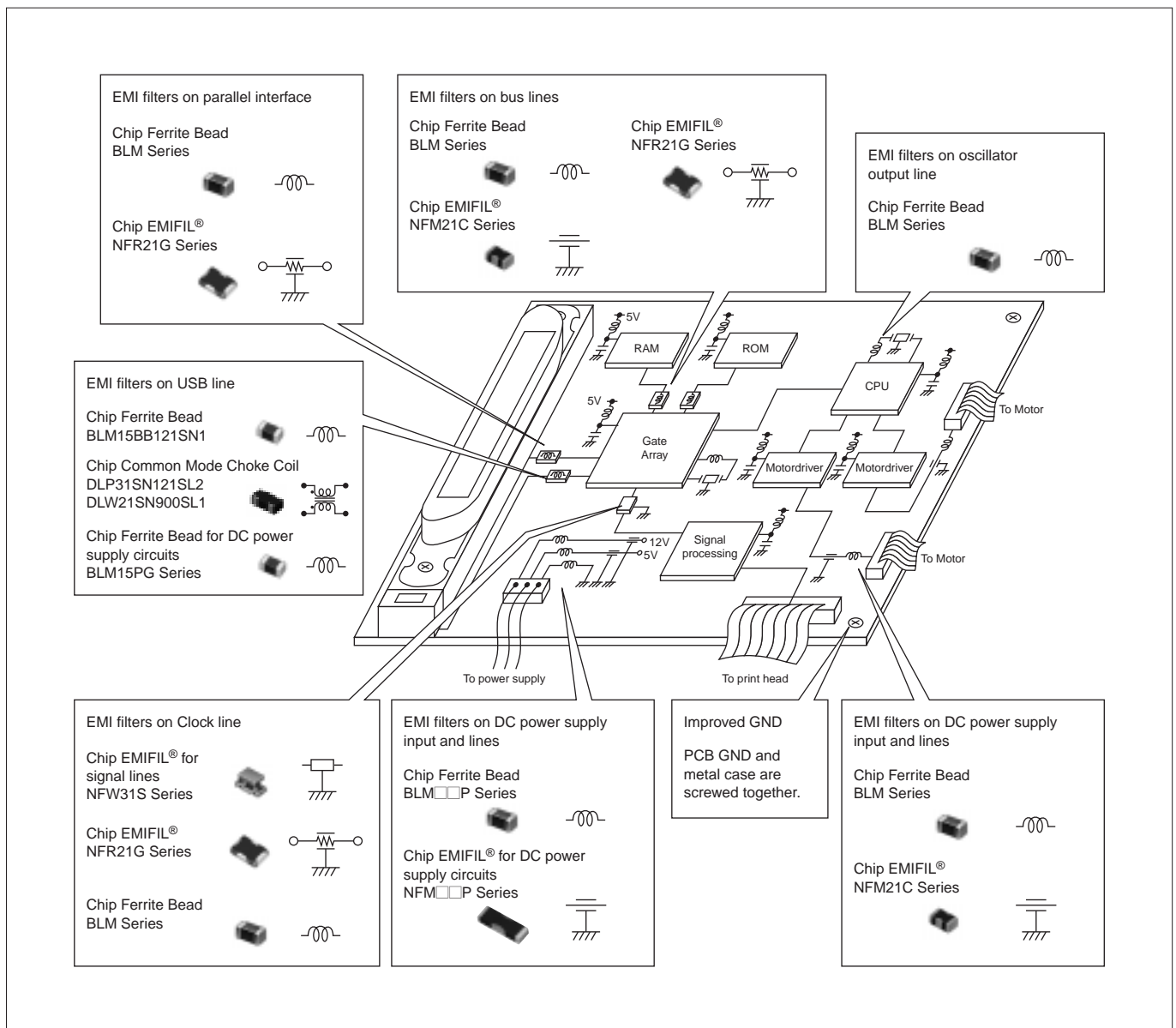
Example of Noise Suppression in Printers 6

Noise Suppression Content in Printers

In printers, the GND is improved to suppress noise from the main board and prevent static electricity from causing a malfunction. A GND plate (metal plate) is installed onto the rear face of the main board and connected to the main board GND.

To suppress noise conduction from the main board to the printer cable, EMI filters are installed on the printer cable port (parallel interface). To suppress noise

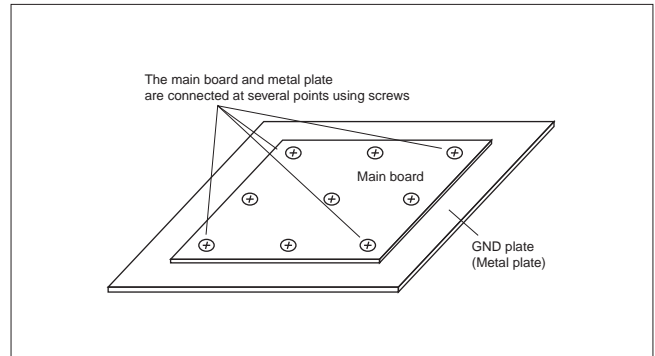
conduction to the AC power supply cable, EMI filters are installed on the DC power supply input and DC power supply line. To suppress noise caused by the motor, EMI filters are installed on the motor control signal lines. When noise radiated from the board itself is combined with noise from the surrounding cables, ferrite beads are installed on the clock and bus lines.



6 Example of Noise Suppression in Printers

Improving the GND

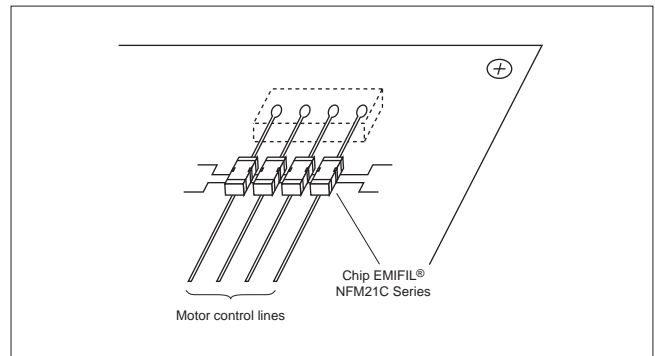
To reduce the level of noise from the main board, a GND plate (metal plate) is installed onto the rear face of the main board to improve the GND. The main board GND and GND plate are connected at several points. However, if the connection points are inappropriate, the noise level may increase. Therefore, great care must be given when selecting the connection points. Connections should not be made at points where the noise level is especially strong, such as the oscillator circuit GND. Improving the GND is also intended to prevent static electricity from causing a malfunction. Improving the GND suppresses any potential difference between the GND generated when current from static electricity flows into the board.



Installing EMI filters on Motor Control Lines

Noise generated by the motor is conducted to the main board and other cables via the motor cable and radiated. EMI filters are installed near the motor to suppress the noise.

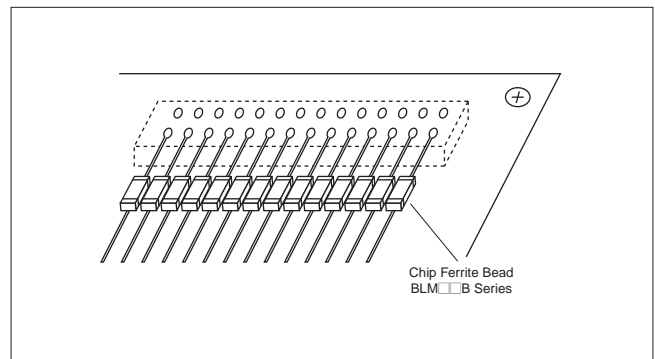
In case that EMI filters cannot be installed near the motor, NFM21C series (Chip EMIFIL®) are installed on cable connections to the motor. However, the noise suppression effect may not be as much as that obtained by installing EMI filters near the motor.



Installing EMI filters on the Parallel Interface

If noise is conducted to the printer cable, high levels of noise are radiated. Therefore, EMI filters are installed on the cable port (parallel interface) to suppress noise. Note that installing a filter with a large impedance value may sometimes hinder communication between the printer and personal computer.

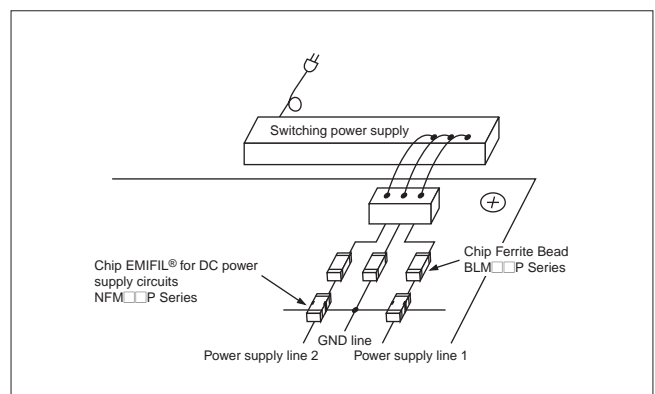
Using a BLA31 series (Array type) decreases the mounting surface area.



Installing EMI filters on the DC Power Supply Input and Lines

Noise is conducted from the DC power supply and GND lines to the switching power supply and radiated from the AC power supply cable. To suppress the noise, the BLM□□P series (Chip Ferrite Bead) is inserted onto each power supply line (including the GND line).

If the noise level is high, the NFM□□P series (Chip Solid EMIFIL® for DC power supply circuits) is installed in addition to the chip ferrite bead to achieve more noise suppression effect.

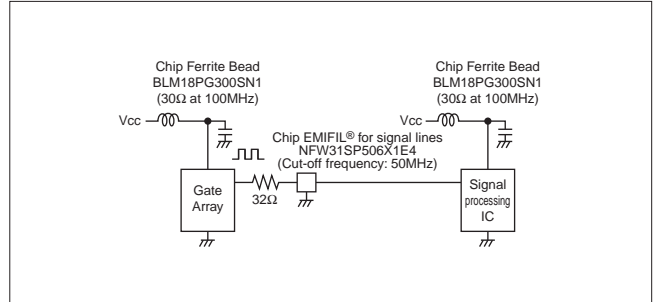


Example of Noise Suppression in Printers 6

Installing EMI filters on the Clock Line

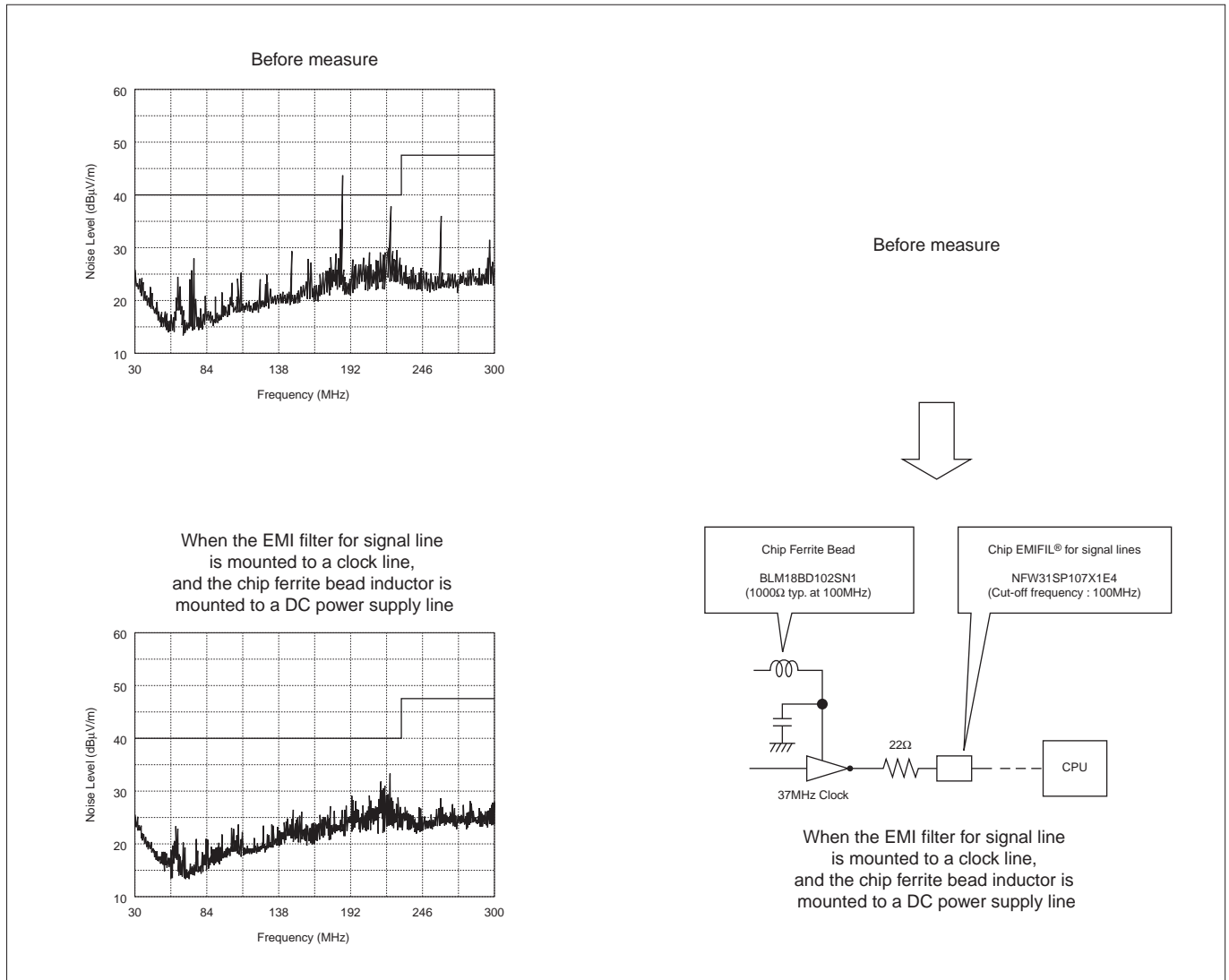
Clock signals generate high frequency noise. Noise and signal frequencies may be close to each other. Therefore, an EMI filter with high and steep attenuation is used, such as the NFW31S series (Chip EMIFIL® for signal lines) or the BLM□□B series (Chip Ferrite Bead For high-speed signal lines).

Noise caused by transient currents is also generated on the power supply line. Therefore, a chip ferrite bead is installed, as well as a by-pass capacitor, to suppress noise on the power supply line.



Example of effects produced when installing EMI filters on the Clock lines

Noise suppression effects produced when installing the EMI filter on the data clock lines.



6 Example of Noise Suppression in Printers

Installing EMI filters on Bus Lines

Bus lines contain many lines that switch on and off simultaneously. This causes instantaneous large currents to flow into the GND and power supply lines through the data and address. Therefore, it is necessary to suppress the current flow on the signal lines. The BLM series (Chip Ferrite Bead) is generally used for this purpose. On the control bus line, especially at high operating speeds, the BLM□□B series (Chip Ferrite Bead for high-speed signal lines that features a steep impedance rising) is used. On bus lines with high-level noise, the NFM21G series (Chip EMIFIL[®]) is sometimes used.

The radiation spectrum of noise generated from bus lines resembles that of noise generated from the motor. It is important to check which of the motor or bus lines is the source of the noise and then install EMI filters.

