

ing stored computer code which is used to program a computer to perform the disclosed function and process of the present invention. The computer-readable medium may include, but is not limited to, any type of conventional floppy disk, optical disk, CD-ROM, magnetic disk, hard disk drive, magneto-optical disk, ROM, RAM, EPROM, EEPROM, magnetic or optical card, or any other suitable media for storing electronic instructions. Further, it is understood that the specific order or hierarchy of steps in the methods disclosed are examples of exemplary approaches. Based upon design preferences, it is understood that the specific order or hierarchy of steps in the method can be rearranged while remaining within the disclosed subject matter. The accompanying method claims present elements of the various steps in a sample order, and are not necessarily meant to be limited to the specific order or hierarchy presented.

It is believed that the present disclosure and many of its attendant advantages will be understood by the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the components without departing from the disclosed subject matter or without sacrificing all of its material advantages. The form described is merely explanatory, and it is the intention of the following claims to encompass and include such changes.

What is claimed is:

1. A method for performing paired subtractive routing in a Serial Attached Small Computer System Interface (SAS) cascaded topology, comprising:

- assigning an input port to a SAS expander device;
- assigning an output port to the SAS expander device;
- defining the output port and the input port to be paired with each other as a primary subtractive port;
- programming only a SAS initiator address in the route table of the SAS expander device;
- adding a second input port and a second output port to the SAS expander device;
- defining the second input port and the second output port to be paired with each other as a secondary subtractive port;
- sending an OPEN command out the output port upon receiving the OPEN command into the input port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device;
- sending the OPEN command out the input port upon receiving the OPEN command into the output port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device;
- sending the OPEN command out the second output port upon receiving the OPEN command into the second input port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device;
- sending the OPEN command out the second input port upon receiving the OPEN command into the second output port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device; and
- specifying the subtractive ports of the SAS expander device via a modified routing attribute of a vendor unique SAS Management Protocol (SMP) function, wherein when the modified routing attribute exists for a port, a SAS initiator ignoring a SMP DISCOVER

response attribute for the port and instead using the modified routing attribute for the port, the secondary subtractive port operates for communication with the direct attached device of the SAS expander device.

2. The method of claim 1, wherein the OPEN command defaults to the primary subtractive port.

3. The method of claim 1, wherein the programming a SAS initiator address in the route table of the SAS expander further includes:

programming the route table for a self-configuration specified port, wherein the programming the route table for the port is performed by the SAS expander device.

4. A method for performing paired subtractive routing in a Serial Attached Small Computer System Interface (SAS) cascaded topology, comprising:

assigning an input port to a SAS expander device;

assigning an output port to the SAS expander device;

defining the output port and the input port to be paired with each other as a primary subtractive port;

programming only a SAS initiator address in the route table of the SAS expander device, wherein the programming the SAS initiator address in the route table of the SAS expander device further includes programming the SAS initiator address in the route table of the SAS expander device using each SAS initiator in a SAS routing topology, each SAS initiator programming only the SAS initiator address for that SAS initiator in the route table of the SAS expander device;

adding a second input port and a second output port to the SAS expander device;

defining the second input port and the second output port to be paired with each other as a secondary subtractive port;

sending an OPEN command out the output port upon receiving the OPEN command into the input port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device; and

sending the OPEN command out the input port upon receiving the OPEN command into the output port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device;

specifying the subtractive ports of the SAS expander device via a modified routing attribute of a vendor unique SAS Management Protocol (SMP) function, wherein when the modified routing attribute exists for a port, a SAS initiator ignoring a SMP DISCOVER response attribute for the port and instead using the modified routing attribute for the port, wherein each SAS initiator only programs the SAS initiator address for that SAS initiator in the route table of one type of modified routing attribute port of the SAS expander device, depending on the position of the SAS initiator in the SAS routing topology.

5. The method of claim 1, wherein the SAS initiator is located at a top or a bottom of the SAS routing topology.

6. A system, comprising:

means for assigning an input port to a SAS expander device;

means for assigning an output port to the SAS expander device;

means for defining the output port and the input port to be paired with each other as a primary subtractive port;

means for programming only a SAS initiator address in the route table of the SAS expander device;