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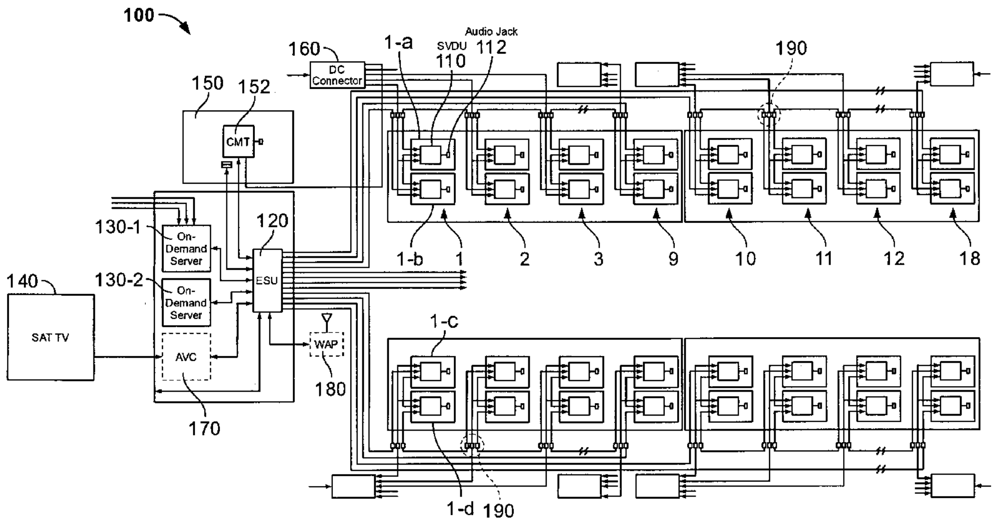
(54) **Title:** SYSTEM FOR PROVIDING IN-FLIGHT ENTERTAINMENT WITH DATA REDUNDANCY



(57) **Abstract:** A system for providing in-flight entertainment with data redundancy is described. In an embodiment of the invention, the system includes a first server and a second server disposed within an aircraft, each having stored thereon digital content. The system also includes a network switch that is communicatively linked to both the first and the second servers, and video display units, each being located proximate to a passenger seat within the aircraft, communicatively linked to the network switch, and having a user interface that permits a passenger to request digital content. Both the first and second servers are configured to transmit their respective stored digital content to the video display units via the network switch. Each of the plurality of video display units decodes and displays the video content upon receiving it.

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SYSTEM FOR PROVIDING IN-FLIGHT ENTERTAINMENT WITH DATA REDUNDANCY

[0001] This application claims priority to U.S. Provisional Patent Application Serial No. 60/625,476 filed on November 5, 2004, which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention relates generally to in-flight entertainment systems and, more particularly, to a full in-seat digital video system.

BACKGROUND

[0003] Current in-flight entertainment (IFE) systems are tailored to the needs of aircraft that carry more than 150 passengers. Such aircraft have spacious interiors as well as generous weight and power constraints, and the IFE system used therein have seat boxes mounted under the seat, large closets and monuments in which to store head-end equipment, and in-arm passenger control units to control the audio, video and cabin attendant functions. Additionally, many current IFE systems are not sufficiently robust enough to recover from the failure of any major component.

SUMMARY

[0004] In accordance with the foregoing, a system for providing in-flight entertainment with data redundancy is provided. In an embodiment of the invention, the system includes a first server and a second server disposed within an aircraft, each having stored thereon digital content. The system also includes a network switch that is communicatively linked to both the first and the second servers, and video display units, each being located proximate to a passenger seat within the aircraft, communicatively linked to the network switch, and having a user interface that permits a passenger to request digital content. Both the first and second servers are configured to transmit their respective stored digital content to the video display units via the network switch. Each of the plurality of video display units decodes and displays the video content upon receiving it.

[0005] In another embodiment of the invention, a system for providing in-flight entertainment is located on-board an aircraft and includes an on-demand server with stored digital content, first and second network switches communicatively linked to the on-demand server, and video display units. Each video display unit is located proximate to a passenger seat within the aircraft and is communicatively linked to both the first and second network switches. Each video display unit has a user interface that permits a passenger at the seat to request digital content. The on-demand server transmits its stored digital content to a subset of the plurality of video display units via either the first or second network switch. Both the first network switch and the second network switch are configured to route the digital content to a subset of the plurality of video display units, which then decode and display the digital content upon receiving it.

[0006] In yet another embodiment of the invention, a system for providing data redundancy on an in-flight entertainment network that is deployed on an aircraft includes a server having stored therein digital content, video display units distributed throughout the aircraft and linked together in a daisy chain. The units at the two respective ends of the daisy chain are linked to a primary communications path and a secondary communications path. The server transmits its stored digital content to the video display units via both the primary and secondary communications path. Upon receiving the content, each of the plurality of video display units decodes and displays it.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 illustrates the basic topology of an in-flight entertainment system in accordance with one embodiment of the present invention; and

[0008] FIGS. 2A, 2B and 3-5 illustrate various other embodiments of the in-flight entertainment (IFE) system.

DETAILED DESCRIPTION

[0009] An embodiment of the invention is illustrated in FIG. 1. In this embodiment, an IFE system 100 includes a communications network deployed on an aircraft. In this embodiment, the network is Ethernet-based, but may be based on any sort of networking standard. In the illustrated embodiment, the aircraft has several rows, and each row has four seats. Any seating arrangement is possible, however. Each seat has its own smart video display unit (SVDU) 110 having an integrated audio jack (AJ) 112. The SVDUs 110 are communicatively linked to the network. Power to the SVDUs 110 is provided by a number of DC-DC converters 160. The system 100 also includes an Ethernet switch unit (ESU) 120, which appropriately routes Ethernet frames carrying digital content to the SVDUs 110 on the network. The ESU 120 allows various Ethernet devices on the aircraft (e.g., on-demand servers, SVDUs, audio/video controller, SATCOM BGAN port, data loading ports) to communicate with one another. The ESU 120 accepts downloadable configuration tables based on known addresses to support aircraft reconfigurations. There are many possible implementations of the ESU 120. In one embodiment of the invention, for example, the ESU 120 has eight Ethernet ports for 74 seats. In another embodiment, the ESU provides 12 Ethernet ports for 104 seats. It is to be noted that a variety of network topologies are possible for the network, including token ring, and star.

[0010] The system 100 also includes a cabin management terminal 152 that is communicatively linked to the network and that permits the flight crew to control and configure aspects of the system. In the illustrated embodiment, the cabin management terminal (CMT) 152 is physically located in a cabin attendant shelter 150 on the aircraft. The system further includes a first on demand server 130-1 and a second on-demand server 130-2, which provide pre-stored digital content to the network. Digital content may also be provided from a variety of other sources including a satellite TV and radio (SAT TV) subsystem 140 that receives real-time TV and radio signals. The SAT TV subsystem 140 is interfaced to the ESU 120 through an audio-video controller (AVC) 170. In the illustrated embodiment, the on-demand servers 130-1 and 130-2 are physically located in a utility cabinet 172.

[0011] The hardware components of the IFE system 100 may be physically arranged in any suitable manner. In one embodiment, the ESU 120, on-demand servers 130-1 and 130-2, and the AVC unit 170 are installed in the cargo or electronics bay, including the rack provisions, cooling, and power, with the CMT 150 and dual RJ-45 data loading ports being installed in the main cabin. The CMT 150 may also be located in a forward facing closet, or located in the “hat-rack” or shelf inside the closet area. RJ-45 jacks and DC power jacks may be mounted along the sidewall for each group of seats, thereby providing both a data connection and a power connection for the parts of the IFE system 100 located near that group of seats.

[0012] The system may also include at least one wireless access point (WAP) 180 that may, in some situations, be used by passengers with laptop computers or other wireless devices. The WAP 180 provides wireless LAN network connectivity for airborne applications. The WAP 180 is connected to the IFE system 100 via the ESU 120 and allows passenger wireless devices (e.g., laptops) to connect to the on-board cache Web content and entertainment services, as well as off-aircraft connectivity services. The WAP 180 is ARINC 763 (Network Service System) compliant, and is based on the IEEE 802.11b standard. It employs DSSS (Direct Sequence Spread Spectrum) and operates in the 2.4 GHz radio frequency band. Each WAP 180 has a range of at least 300 feet (or at least 100 meters), and transfers data effectively at rates of at least 11 Mbps. Moreover, additional WAPs can be daisy-chained together. Furthermore, some or all of the network of the IFE system 100 may be wireless, using the WAP 180 to access the network.

[0013] In the system illustrated in FIG. 1, the data stored on the on-demand servers 130-1 and 130-2 includes digital content such as movies, images, audio recordings, news broadcasts, and music. This content is streamed on-demand from the on-demand servers 130-1 and 130-2, through the ESU 120, and to those SVDUs 110 that request the content. At the each recipient SVDU 110, the content is decoded and processed. Each of the on-demand servers 130-1 and 130-2, in this regard, is capable of providing content simultaneously to multiple (e.g., 75 or more) passengers. Also, more on-demand servers can be included in the system to increase the number of passengers that are simultaneously serviceable. Having multiple (*i.e.*, two or more) on-demand servers also provides redundancy. Thus, in the event that one of the servers experiences a fault and is unavailable to deliver content, or in the event that connectivity between one of the on-demand servers and the network is lost, another on-demand server is able to assume the extra load. For example, assume one of the SVDUs 110 ordinarily receives digital content from the first on-demand server 130-1. If the first on-demand server 130-1 becomes unavailable, the SVDU 110 will stop receiving data from it (*e.g.*, the SVDU 110 transmits a Hypertext Transport Protocol (HTTP) GET command to the first on-demand server 130-1 and receives a "not found" error 404). The SVDU 110 will then request the digital content from the second on-demand server 130-2. After a period of time, the SVDU 110 may check the status of the first on-demand server 130-1 and, it that server has come back up, resume requesting data from it.

[0014] In general, the system and method described herein uses a layering approach that combines a large, many port switch at a head-end of a network with a small, localized switch close to the seats. While the actual configuration of the switches is flexible, the basic concept is that each SVDU is connected to one or more head-end servers through a flat, layer 2, Ethernet switch matrix. In this regard, FIG. 1 illustrates an embodiment in which a head-end switch (the ESU 120) feeds columns of seat junction boxes (SJBs) 190 located along the walls of the aircraft. The SJBs can be installed in fixed locations along the aircraft walls. A cable is then run from the SJB to the SVDU 110. This architecture facilitates maintenance activity that requires the seats to be removed by providing a wall disconnect point for the seat electronics.

[0015] In an embodiment of the invention, each SVDU 110 can be any suitable monitor for in-seat on-demand content and multicast digital broadcast video and audio viewing in-seat video. The SVDU may include an 8.9" touch screen liquid crystal display (LCD) monitor that features a 16:9 widescreen aspect ratio and is designed to fit in the limited space of a jet seat (*e.g.*, a regional jet Economy Class seat). For example, the SVDUs 110 may be designed to be installed in seat arms, seat backs, consoles, and/or wall mounted. Moreover, the SVDUs can include a decorative shroud. The SVDU 110 may be approximately 2-3 pounds and require approximately 10-15 watts of power. Users may interact with the SVDU via the touch screen monitor.

[0016] According to an embodiment of the invention, each SVDU 110 executes a high-speed, high-performance Web browser processor that enables applications and Web menu pages to load. The SVDUs are also capable of providing advanced features, such as displaying video program while simultaneously displaying a Web page or graphic from another source (similar to Picture-in-Picture). The SVDUs have a large amount of memory storage that allows some applications, such as games, to be resident within the SVDU. When a passenger selects a local game to play, all of the loading and interaction is within the SVDU. This not only speeds up the loading of the game, it also ensures that games are available even if there is a failure of the IFE network. Web page technology is used for easy passenger Graphical User Interface (GUI) design and modification. A generic GUI is standard with the IFE system 100, and customizations of all menus and applications may be performed to meet each airline's unique requirements.

[0017] Each SVDU 110 can also include: (1) integrated hardware MPEG decoders; (2) local games storage and processing; (3) one or more USB ports for passenger peripherals (such as remote keyboard, game controllers, etc.); (4) a privacy filter; and (5) an integral credit card reader for financial transactions. Additionally, the SVDU may have an external audio jack instead of an integrated audio jack, and may have a separate passenger control device for the passenger to use as a data entry and navigation aid.

[0018] Referring still to FIG. 1, the CMT 150 acts as the primary crew interface to the IFE system 100 for control, operation, and maintenance of the IFE system. The CMT 150 executes a computer operating system and has a display with a touch screen that serves as an interface for the cabin attendants and maintenance personnel. It is suitable, in this regard, for the CMT to be implemented using the same device as the SVDU 110 discussed above. The CMT 150 also executes a Web browser client that is used to access control web pages from the IFE system. The CMT 150 provides control and visibility of the IFE system 100 via HTML-based Web pages, including video preview, and maintenance controls such as software upload, configuration management and built-in test equipment. Additionally, because the CMT 150 operates via a Web browser, the crew Graphical User Interface (GUI) may be easily customized to meet the unique requirements of different airlines. The CMT 150 also provides the following functions and controls: (1) power control for the IFE system; (2) manual launch of the safety demo video; (3) initialization of the flight information (flight destination, departure time, arrival time); (4) management of the entertainment system; (5) crew checking of the fault status report; and (6) enable/disable interactive features and airline specific applications.

[0019] The CMT 150 receives DC power from the DC power converter 160 and network connectivity via the ESU 120. The front panel of CMT 150 can include a power switch, brightness control, and Universal Serial Bus (USB) ports for carry-on external peripherals (e.g., CD/DVD-ROMs, floppy disc drives, USB thumb drives and keyboards). Crew operation of CMT 150 may also be via a portable USB-type keyboard.

[0020] The AVC 170 provides at least 24 channels of encoding of analog video and audio sources such as tape decks, DVD players, and satellite audio and video signals. The AVC 170 encodes in real time the external analog signals and provides MPEG-1 multicast digital streams to the IFE system 100.

[0021] The SAT TV 140 may include: an Antenna Control Unit (ACU), a radome assembly, a System Signal Processor (SSP), and a Receiver Decoder Unit (RDU). The ACU is a full range Ku-band antenna operating over the entire Direct Broadcasting Satellite (DBS) range of 10.7 to 12.75 GHz. The ACU provides fully automated acquisition and tracking of the designated satellite. The radome assembly is designed with a blunt aerodynamic approach providing a low drag solution and yielding a negligible impact on fuel burn. The radome passes the full range of DBS frequencies with minimal loss and features a single centerline diverter strip to protect against lightning strikes. Moreover, the radome features blow-out panels for pressurization and incorporates drainage paths to account for water condensation. The SSP processes the aircraft navigation data received from the ARINC 429 interface, and the SSP shares satellite information with the RDU through a RS-485 data bus. The SSP also controls the ACU acquisition through an RS-422 interface. The RDU provides eight channels of DBS signal programming.

[0022] Various features and embodiments of the present invention will now be described with reference to FIGS. 2A and 2B, and FIGS. 3-5. In the embodiment illustrated in FIGS. 2A and 2B, the IFE system is deployed on an aircraft having multiples rows of passenger seats, with four seats per row, with two seats on each side of an aisle. The seats are organized into three groups – a first group 62-1, a second group 62-2, and a third group 62-3. The system also includes many of the components illustrated in, and described in conjunction with FIG. 1. These components will be referred to using the same primary reference numbers used in FIG. 1, although secondary reference numbers are appended to indicate multiple instances of each component. The functionality of like-numbered components is assumed to be the same. In the embodiment of FIGS. 2A and 2B, a first, a second and a third DC Power Converter 160-1, 160-2, and 160-3, are each arranged as a power bus along the wall of the aircraft, such that one power converter serves each of the first, second and third groups 62-1, 62-2, and 62-3 of seats. The system also includes a first ESU 120-1 and a second ESU 120-2. Each of the ESUs has the same basic functionality as the ESU 120 described in conjunction with FIG. 1. In one embodiment, each ESU 120 has 48 ports, has auto-detect capability, and supports 10/100 Base-T Ethernet. In the embodiment of FIGS. 2A and 2B, having a second ESU provides redundancy in the event that one of the ESUs goes down or loses connectivity. In the embodiment of FIGS. 2A and 2B, the first group 62-1 of seats is wired to the first power converter 160-1, the second group 62-2 of seats is wired to the second power converter 160-2, and the third group 62-3 of seats is wired to the third power converter 160-3. Furthermore, the first group 62-1 of seats and half of the second group 62-2 of seats are linked via Ethernet cable to the first ESU 160-1. The third group 62-3 of seats, as well as the other half of the second group 62-2 of seats is linked via Ethernet cable to the second ESU 160-2.

[0023] Referring to FIG. 3, in an embodiment of the invention, the IFE system includes seat junction boxes 190 distributed throughout the aircraft. Each seat junction box 190 provides data and power to nearby SVDUs 110. In particular, the DC Power Converters 160 supply power to seat junction boxes 190, which, in turn, supply power to SVDUs 110. Similarly, the ESU 120 is communicatively linked via Ethernet cable to each of the seat junction boxes 190. The seat junction boxes are, in turn, communicatively linked via Ethernet cable to the individual SVDUs 110.

[0024] Referring to FIG. 4, another embodiment of the invention will now be described. In this embodiment, the IFE system has many of the same components as the previously described embodiments, as indicated by similar labels and reference numbers. In the embodiment of FIG. 4, the IFE system includes a first on-demand server 130-1, a second on-demand server 130-2, and a third on-demand server 130-3. The ESU 120 includes two complete and independent 24-port managed Ethernet switches, labeled A and B respectively. In the embodiment of FIG. 4, the duplication of on-demand servers and Ethernet switches provides for data redundancy. Thus, for example, if the first on-demand server 130-1 becomes disabled, then the ESU 120 can automatically reroute the on-demand video requests that were originally intended for the first on-demand server 130-1 to the second on-demand server 130-2. Thus, the SVDUs 110 that were being served by the first on-demand server 130-1 will now be served by the second on-demand server 130-2. Similarly, if one of the Ethernet switches in the ESU 120 becomes disabled, then the on-demand server or servers that relied upon that Ethernet switch can send all of their data traffic to the other Ethernet switch. For example, the Ethernet switch A normally routes the Ethernet frames of the first on-demand server 130-1, but becomes disabled, then the first on-demand server 130-1 will send its Ethernet frames to switch B. Switch A and switch B may maintain duplicate copies of each others routing tables for this purpose.

[0025] Referring still to FIG. 4, the SVDUs 110 are daisy-chained together via Ethernet cables. This configuration provides yet another data redundancy feature. For example, if there is a break in the Ethernet connectivity at point I in FIG. 4, all of the SVDUs on either side of the break will still be connected to the network by receiving data traffic from the opposite side. This aspect of the invention will be described further with reference to FIG. 5.

[0026] Referring to FIG. 5, yet another embodiment of the invention will now be described. In this embodiment, redundant network architecture is provided by running two or more Ethernet lines (each originating from a different physical port) from the ESU to each column of seats. In this embodiment, the first Ethernet line will be referred to as the primary network feed, and feeds the first seat group of that column at a Primary Network Feed Site 90, which then feeds in a daisy-chain manner to the remaining seats in that column. The second Ethernet line will be referred to as the back-up or redundant network feed, and runs from the ESU to the last seat group of that same column at a Back-Up (Redundant) Network Feed Site 92. If, for example, a problem or break occurs at Site II, then the SVDUs will seek an alternate connection via the second Ethernet link to the servers. So, in this example, the SVDU in one of the seats in Row 3 and the SVDUs in the seats in Row 9 will receive data from the back-up network feed.

[0027] Referring still to FIG. 5, the IFE system can also include hand-out terminals 200. The hand-out terminals are integrated (in terms of their functionality) with the SVDUs 110, and can be connected thereto. All SVDUs may have the port to allow the hand-out terminals to be connected, but only those passengers provided with the hand-out passenger terminal can connect to and use the system. Although the connection between the SVDU and the hand-out terminal may be standard, such USB 2.0, the SVDU will only recognize and use the specific hand-out terminals provided with the system. By connected the hand-out terminal to the SVDU, the passenger may gain access to the on-demand servers, and thus to a large library (*e.g.*, potentially more than 500 hours of audio and video material) of entertainment material. The hand-held unit 200 is powered over the cable connector thereby eliminating any need for batteries and their maintenance. Since the hand-out terminal has no storage for content, there is no concern (or airline liability) for content loss. Airlines will easily obtain permission to present early-release movies as the potential for carry-off theft is eliminated. Hand-out passenger terminals 200 can also include: a 100 BT Connection Plug, Audio on Demand (AOD) MP-3 player, Video on Demand (VOD) MPEG 1,2 player; Web Access functionality; Games; Anti-Theft Device; Keyboard; Mouse; and/or Credit Card Reader.

[0028] In an embodiment of the invention, the IFE system is able to load flight information automatically according to the flight phase. In particular, for example, flight information can be input via the ARINC 429 interface connections to the flight guidance computer and the air data computer. Moreover, content can be scripted and automatically broadcasted from the server to the IFE system. In this regard, many different scripts can be stored on the aircraft and triggered by various parameters such as flight phase and routing. This allows route specific programming with little or no flight attendant intervention. Scripting can be provided to manage the in-seat IFE access as needed. The cabin crew has the possibility to override the automated functionality via the CMT 150. Furthermore, the

IFE system includes loader ports 175 (FIG. 5) through which entertainment content and switching tables may be loaded into the system.

[0029] Although only a few exemplary embodiments of the present invention have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the following claims.

WHAT IS CLAIMED IS:

1. A system for providing in-flight entertainment, the system comprising:

a first server disposed within an aircraft, the first server having stored thereon digital content;

a second server disposed within the aircraft, the second server having stored thereon digital content;

a network switch disposed within the aircraft, wherein the network switch is communicatively linked to both the first and the second servers; and

a plurality of video display units, each of the plurality being located proximate to a passenger seat within the aircraft, each of the plurality being communicatively linked to the network switch, each comprising a user interface that permits a passenger to request digital content,

wherein both the first and second servers are configured to transmit their respective stored digital content to the plurality of video display units via the network switch, and

wherein each of the plurality of video display units decodes and displays the video content upon receiving it.

2. The system of claim 1, wherein each of the first and second servers is normally assigned to provide its digital content to a different group of the plurality of display units, wherein when the first server becomes unable to transmit its digital content to the group of display units to which it is assigned, the second server transmits its digital content to the group of display units to which the first server is normally assigned.

3. The system of claim 1, wherein the network switch is an Ethernet switch that routes Ethernet frames containing the digital content to the plurality of video display units.

4. The system of claim 1, wherein the digital content is transmitted to the plurality of video display units as streaming video, wherein each of the plurality of video display units comprises a decoder for decoding the streaming video.

5. The system of claim 1, wherein each of the plurality of video display units has a touch screen user interface.

6. The system of claim 1, wherein the digital content stored on each of the servers comprises in-flight movies.

7. The system of claim 1, further comprising a wireless access point communicatively linked to the network switch.

8. The system of claim 7, wherein the network is a wireless network, and the plurality video display units access the network via the wireless access point.

9. The system of claim 1, wherein the network switch is a first network switch, the system further comprising a second network switch communicatively linked to the first and second servers.

10. A system for providing in-flight entertainment, the system being located on-board an aircraft, the system comprising:

an on-demand server having stored thereon digital content;

a first network switch communicatively linked to the on-demand server;

a second network switch communicatively linked to the on-demand server;

a plurality of video display units, each of the plurality being located proximate to a passenger seat within the aircraft, each of the plurality being communicatively linked to both the first and second network switches, each of the plurality comprising a user interface that permits a passenger at the seat to request the digital content,

wherein the on-demand server transmits its stored digital content to a subset of the plurality of video display units via either the first or second network switch,

wherein both the first network switch and the second network switch are configured to route the digital content to the subset of the plurality of video display units, and

wherein each of the subset of the plurality of video display units decodes and displays the digital content to a passenger upon receiving it.

11. The system of claim 10, wherein each of the first and second network switches is normally assigned to a different group of the plurality of display units, wherein when the first network switch becomes unable to communicate with the group of display units to which it is assigned, the second network switch communicates with the group of display units to which the first network switch is normally assigned.

12. The system of claim 10, wherein the first and second network switches are Ethernet switches that route Ethernet frames containing the digital content to the plurality of video display units.

13. The system of claim 10, wherein the digital content is transmitted to the plurality of video display units as streaming video, wherein each of the plurality of video display units comprises a decoder for decoding the streaming video.

14. The system of claim 10, wherein the user interface of each of the plurality of video display units is a touch screen interface.

15. The system of claim 10, wherein the network is a wireless network, and the plurality video display units access the network via a wireless access point.

16. A system for providing data redundancy on an in-flight entertainment network that is deployed on an aircraft, the system comprising:

a server having stored therein digital content;

a plurality of video display units distributed throughout the aircraft, the plurality being communicatively linked together in a daisy chain, wherein a first display unit of the plurality and a second display unit of the plurality are disposed at each of the two respective ends of the daisy chain;

a primary communications path defined between the first display unit and the server; and

a secondary communications path defined between the second display unit and the server;

wherein the server transmits its stored digital content to the plurality of video display units via both the primary and secondary communications path, and

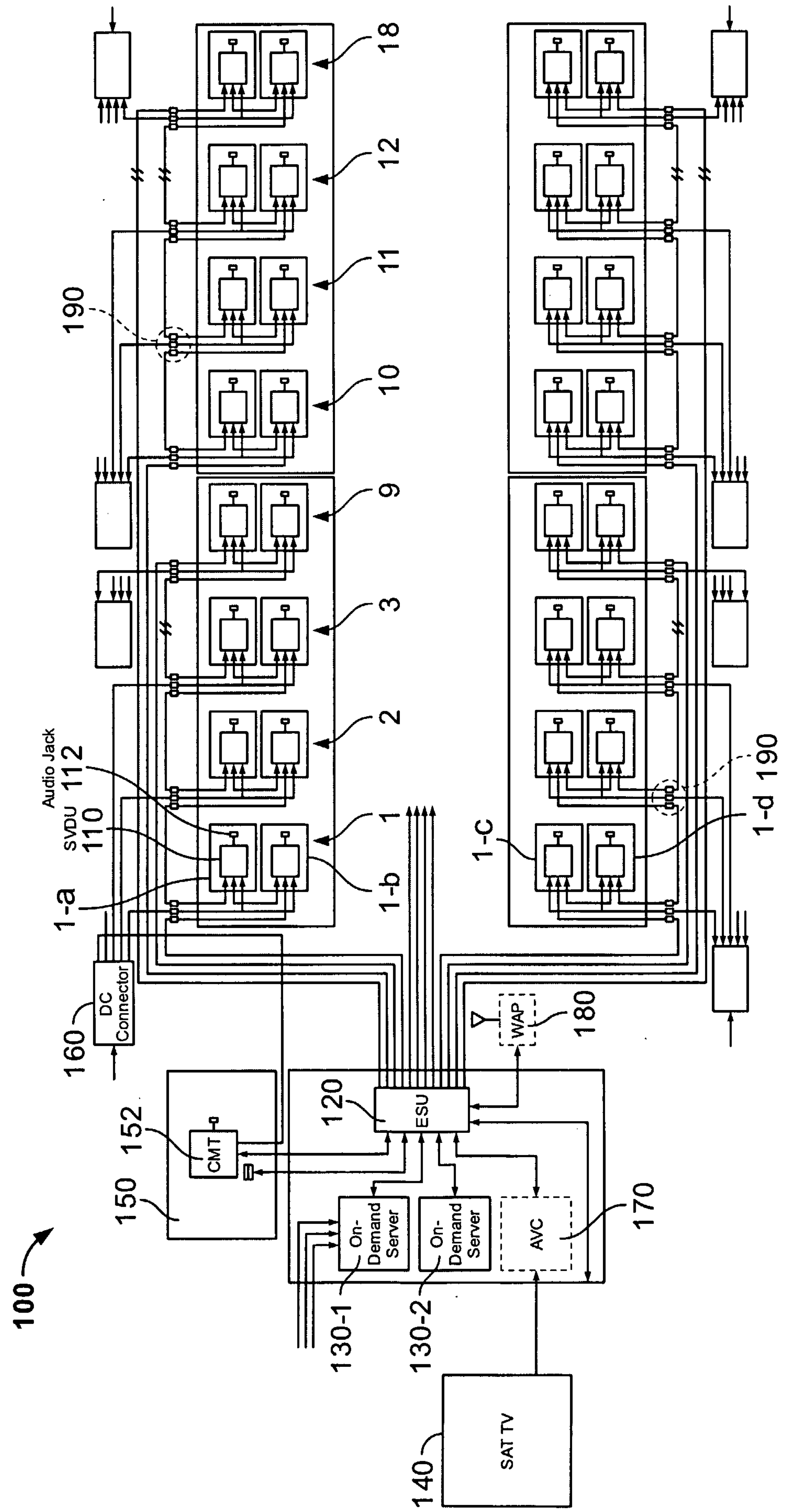
wherein each of the plurality of video display units decodes and displays the digital content upon receiving it.

17. The system of claim 16, wherein a break occurs such that at least some of the plurality of video display units can no longer receive data via the primary communications path but still continue to receive data via the secondary communications path.

18. The system of claim 16, further comprising a network switch communicatively linked to both the server and the plurality of video display units such that all communications from the server along the primary and secondary communications paths are routed through the network switch.

19. The system of claim 16, wherein the digital content is transmitted to the plurality of video display units as streaming video, and wherein each of the plurality of video display units comprises a decoder for decoding the streaming video.

20. The system of claim 19, wherein the digital content comprises in-flight movies.


100
18
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11
10
9
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2
1
190
Audio Jack
112
SVDU
110
1-a
1-b
1-c
1-d 190
160
DC Connector
120
ESU
180
WAP
152
CMT
150
On-Demand Server
On-Demand Server
AVC
170
130-1
130-2
140
SAT TV

FIG. 1

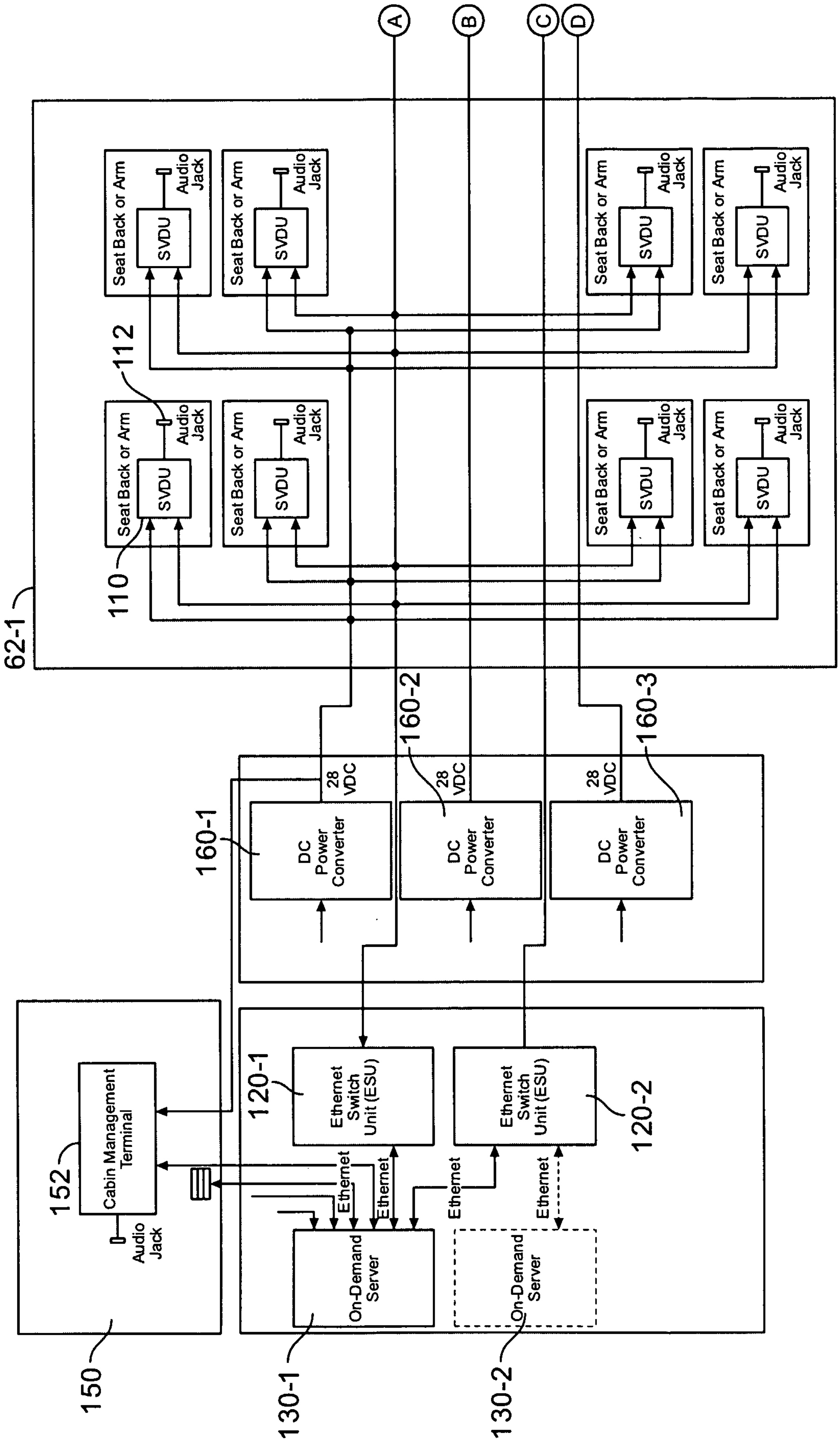
A
B
C
D
62-1
110
112
Seat Back or Arm
SVDU
Audio Jack
160-1
160-2
160-3
28 VDC
DC Power Converter
120-1
120-2
Ethernet Switch Unit (ESU)
Ethernet
152
Cabin Management Terminal
Audio Jack
150
On-Demand Server
130-1
130-2

FIG. 2A

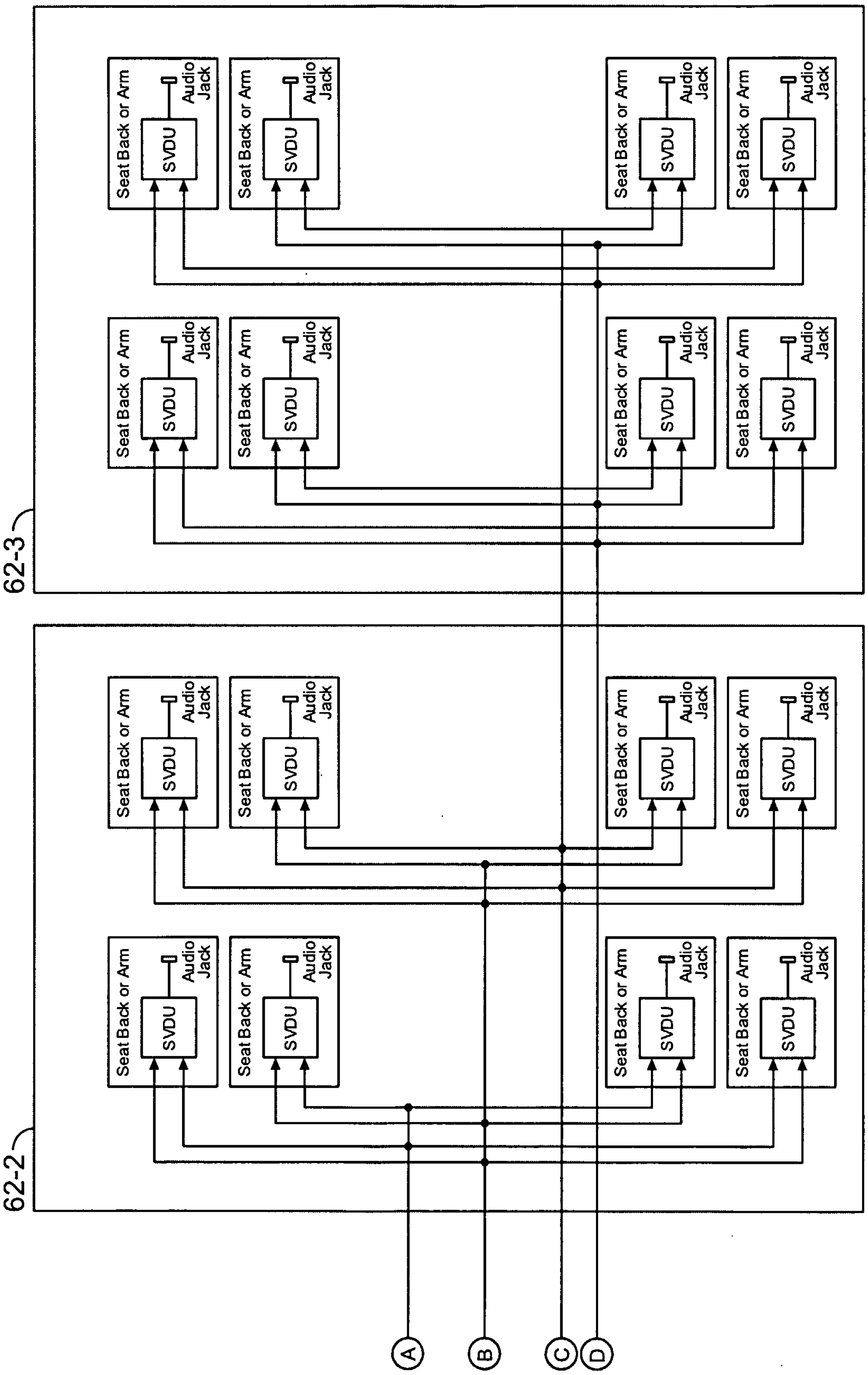

FIG. 2B

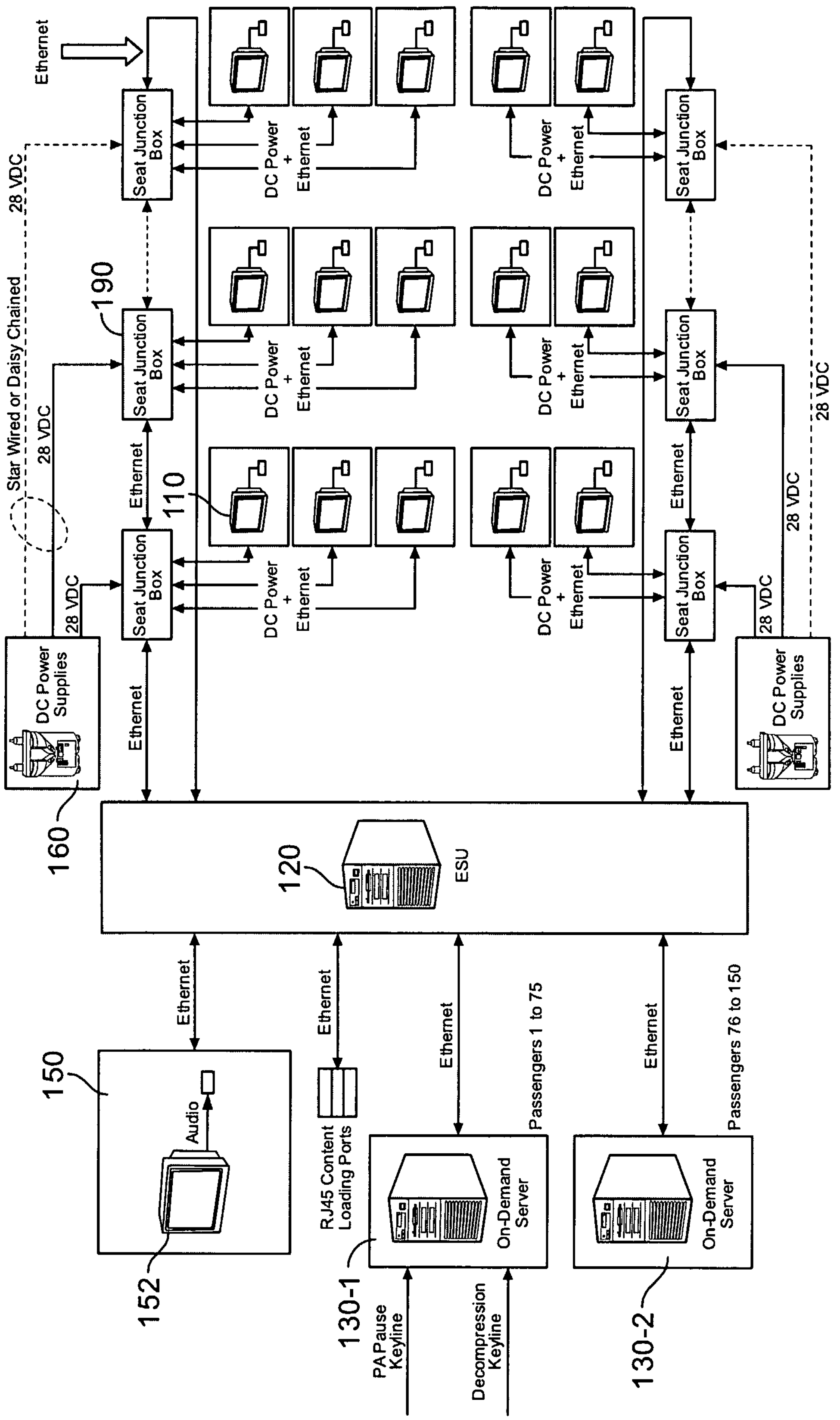
Ethernet
Seat Junction Box
28 VDC
Star Wired or Daisy Chained
190
110
DC Power + Ethernet
DC Power Supplies
160
120
ESU
150
Audio
152
RJ45 Content Loading Ports
Passengers 1 to 75
Passengers 76 to 150
On-Demand Server
130-1
130-2
PA Pause Keyline
Decompression Keyline

FIG. 3

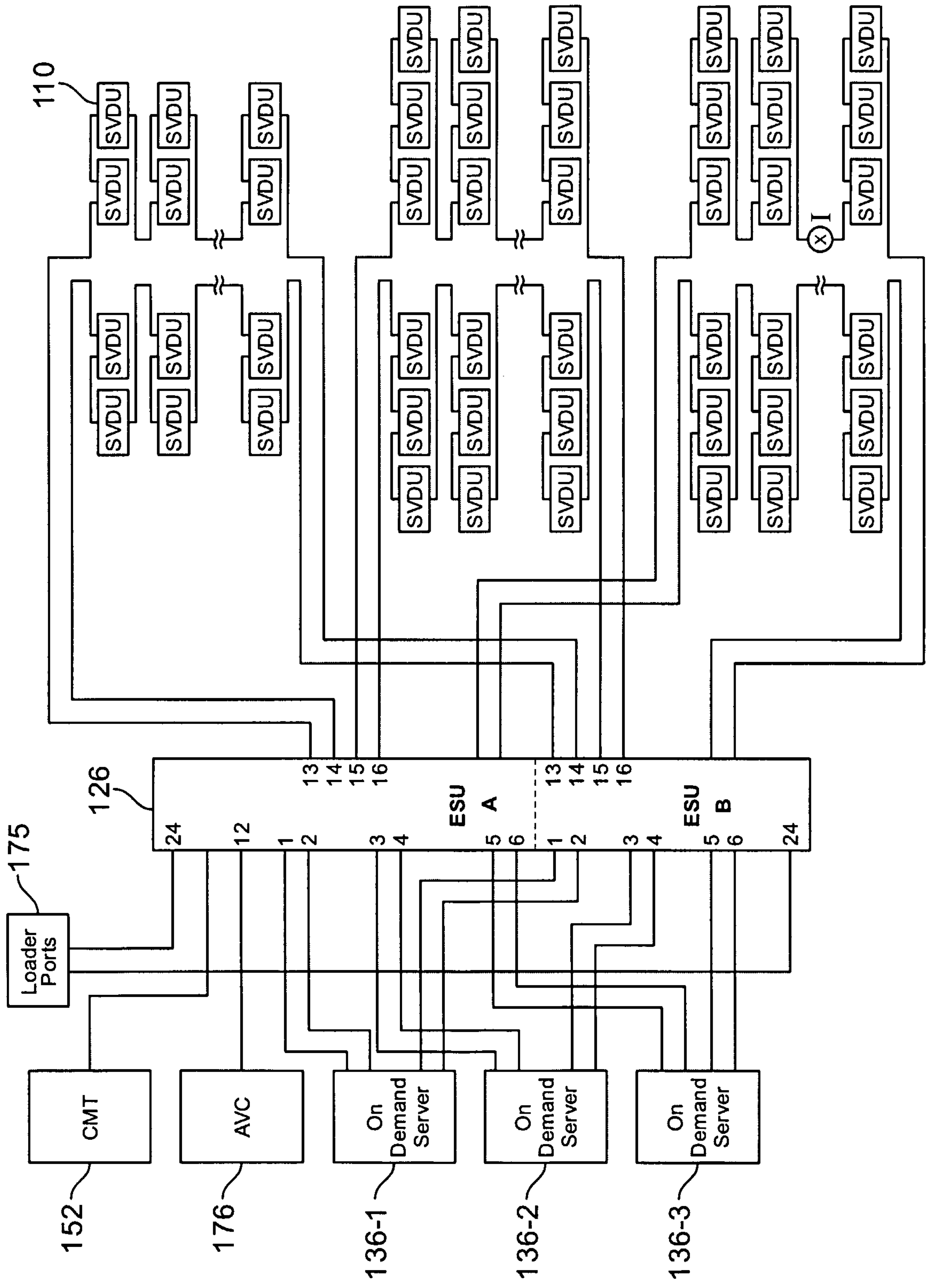
110
SVDU
126
ESU
A
ESU
B
13
14
15
16
24
12
1
2
3
4
5
6
175
Loader Ports
CMT
AVC
On Demand Server
152
176
136-1
136-2
136-3
I

FIG. 4

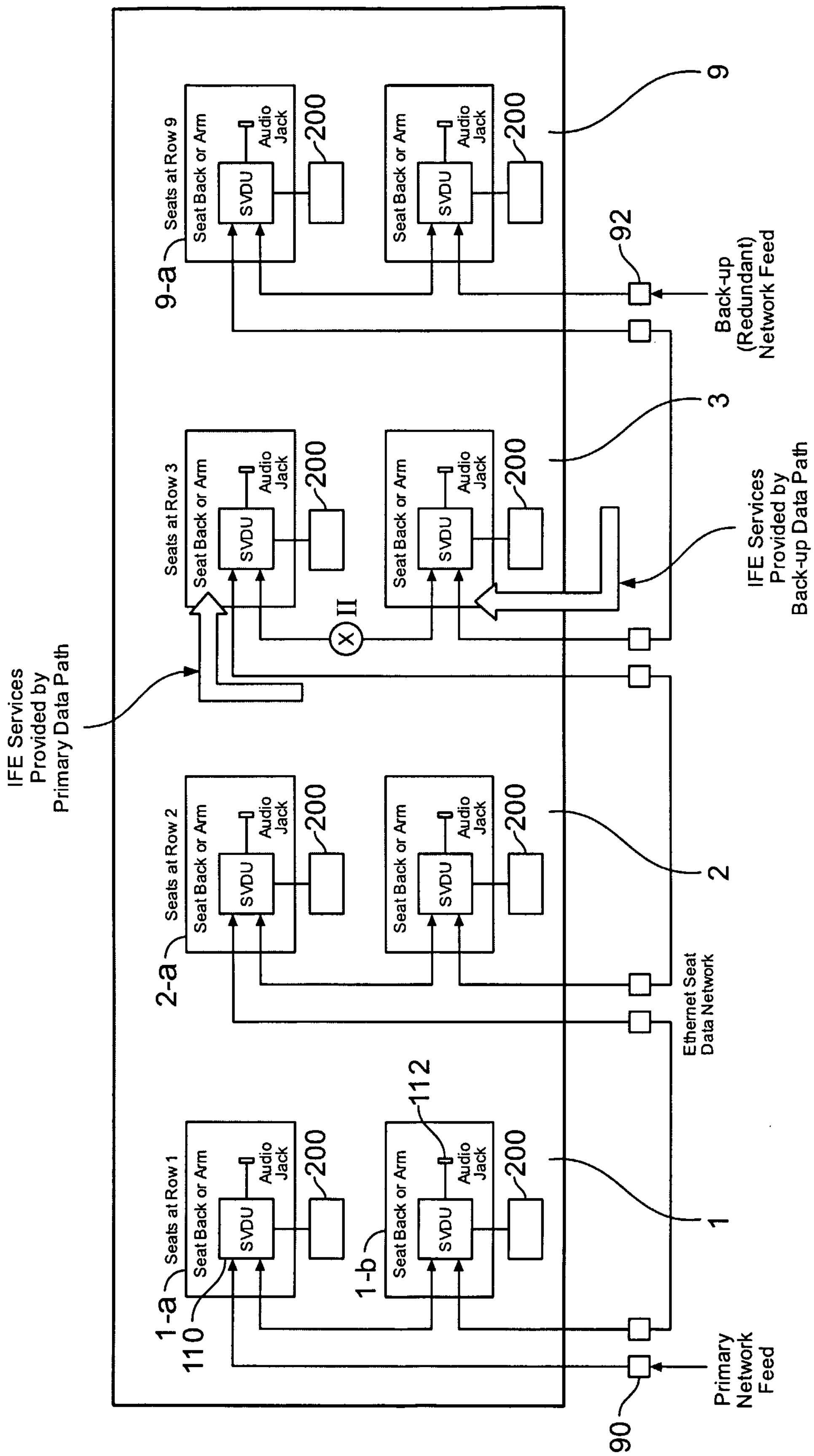
Seats at Row 1
Seat Back or Arm
SVDU
Audio Jack
200
1-a
110
1-b
112
1
Seats at Row 2
2-a
2
Seats at Row 3
3
Seats at Row 9
9-a
9
IFE Services Provided by Primary Data Path
IFE Services Provided by Back-up Data Path
Ethernet Seat Data Network
Primary Network Feed
90
Back-up (Redundant) Network Feed
92

FIG. 5