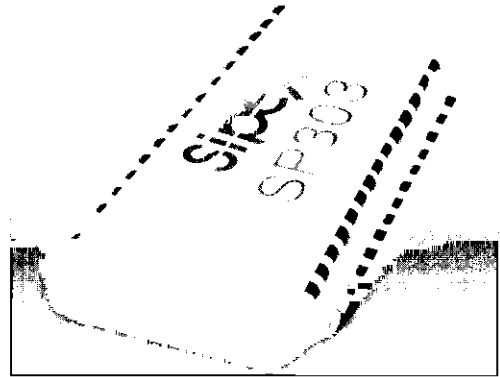**Sipex**
SIGNAL PROCESSING EXCELLENCE

SP303

RS232/AppleTalk™ Serial Transceiver

- Single chip serial transceiver supports AppleTalk™ or RS232 interface
- Programmable Selection of Interface
- 4 RS232 Drivers and 4 RS232 Receivers
- Provides Macintosh™ type interface
- ±30V Receiver Input Levels
- Surface Mount Packaging

DESCRIPTION...

The **SP303** is a single chip device that offers both RS232 and Apple–Talk interfaces. When configured for RS232 mode the **SP303** has 4 drivers and 4 receivers. When the part is programmed for Apple–Talk mode, the **SP303** supports Macintosh–type ports. All drivers and receivers can operate at data rates up to 1 Mbps. The differential driver used for transmitting data signals is equipped with a tri-state function. The **SP303** is available in a 28–pin SOIC package for operation over the commercial temperature range.

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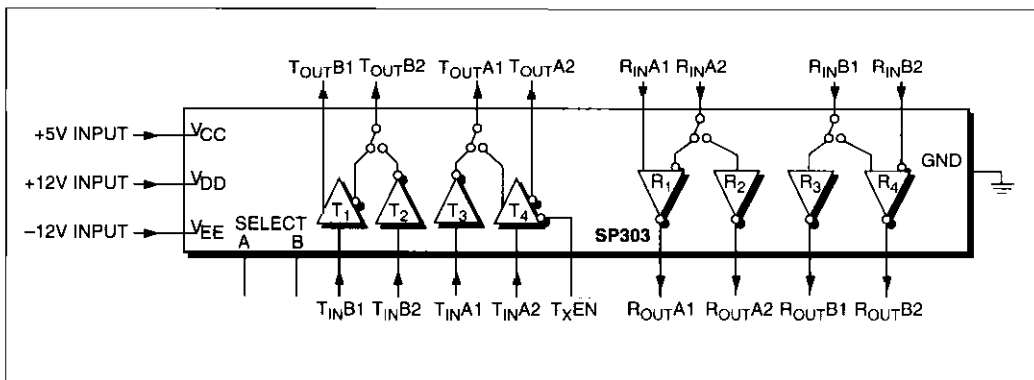
SPECIFICATIONS

$(T_{MIN} \leq T_A \leq T_{MAX}$ and nominal supply voltages unless otherwise noted)

| PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITIONS
RS232 DRIVER					Note 1
TTL Input Level					
V_{IL}	0		0.8	V	
V_{IH}	2.0			V	
High Level Output	+5.0			V	$R_L = 3K\Omega$, $V_{IN} = 0.8V$
Low Level Output			-5.0	V	$R_L = 3K\Omega$, $V_{IN} = 2.0V$
Short Circuit Current			±30	mA	$V_{OUT} = 0V$
Slew Rate			30	V/µs	$C_L = 50pF$, $R_L = 3k\Omega$; $T_A = 25°C$
Transition Time		3		µs	Note 2
Transmission Rate			200	Kbps	
RS232 RECEIVER					Note 1
Input Voltage Range	−15		+15	V	
Input High Threshold	+1.75		+2.5	V	Positive-going
Input Low Threshold	+0.75		+1.35	V	Negative-going
Input Impedance	3		7	KΩ	$C_L < 2,500pF$; $V_{SS} \leq V_{IN} \leq V_{DD}$
TTL Output Level					
V_{OL}			0.4	V	$V_{CC} = +4.75V$, $I_{OUT} = +1.6mA$
V_{OH}	2.4			V	$V_{CC} = +4.75V$, $I_{OUT} = -0.5mA$
Receiving Rate			200	Kbps	
DIFFERENTIAL DRIVER					Note 3
TTL Input Level					
V_{IL}	0		0.8	V	
V_{IH}	2.0			V	
High Level Output	+3.6	+6		V	$I_{OH} = 8mA$
Low Level Output	-3.6	-6		V	$I_{OL} = -8mA$
Differential Output	±3.6			V	$R_L = 450\Omega$
	$(V_{EE}+0.7V)$		$(V_{DD}-0.7V)$	V	$RL = \infty$
Short Circuit Current			40	mA	
Output Current			±500	µA	$-0.25V < V_O < 6V$; Power off
Leakage Current		0.05	±10	µA	$TxEN=V_{cc}$, $0 \leq TxDO \leq 6V$, Note 4
Transition Time		720		ns	$R_L=450\Omega$, $C_L=50pF$; Note 5
Transmission Rate			1000	Kbps	
DIFFERENTIAL RECEIVER					Note 3
Common Mode Range			±7	V	Note 6
Differential Input			±15	V	Note 6
Differential Input Threshold	−0.2		+0.2	V	$T_A=25°C$
Input Voltage Hysteresis	30			mV	$V_{CM}=0V$; $T_A=25°C$
Input Resistance	3			KΩ	$-7V<V_{CM}<+7V$
TTL Output Level					
V_{OL}			0.4	V	$V_{CC}=+4.75V$, $I_{OUT}=+1.6mA$
V_{OH}	2.4			V	$V_{CC}=+4.75V$, $I_{OUT}=-0.5mA$
Receiving Rate			1000	Kbps	
Short Circuit Output Current			±120	mA	$V_{OUT}=0V$
SINGLE−ENDED RECEIVER					Note 3
Input Threshold	−200		+200	mV	$T_A=25°C$
Input Voltage Hysteresis	30			mV	$V_{CM}=0V$; $T_A=25°C$
Input Impedance	3		7	KΩ	
TTL Output Level					
V_{OL}			0.4	V	$V_{CC}=+4.75$; $I_{OUT}=+1.6mA$
V_{OH}	2.4			V	$V_{CC}=+4.75$; $I_{OUT}=-0.5mA$
Transmission Rate			1000	Kbps	
POWER REQUIREMENTS					
$V_{DD} = +12V$, ±10%		7	15	mA	All Transmitter outputs $R_L=\infty$
$V_{CC} = +5V$, ±10%		5	7	mA	$T_A=25°C$
$V_{EE} = -12V$, ±10%		11	20	mA	

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SPECIFICATIONS

($T_{MIN} \leq T_A \leq T_{MAX}$ and nominal supply voltages unless otherwise noted)

PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITIONS
ENVIRONMENTAL AND MECHANICAL					
Operating Temperature	0		+70	°C	
Storage Temperature	−65		+150	°C	
Package		28–pin SOIC			

Note:
1. RS232 Mode, SELA = SELB = GND.
2. V_{OUT} from +3V to −3V or −3V to +3V.
3. Macintosh™ AppleTalk™ Mode, SELA = SELB = +5V.
4. Leakage current specification applies to both TxDO− and TxDO+; T_A=+25°C only.
5. From 10% to 90% of steady state.
6. This is an absolute maximum rating. Normal operating levels are $V_{IN} \leq 5V$.

PINOUT
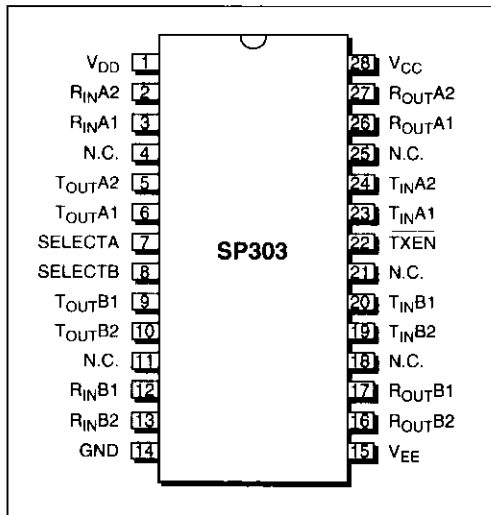
PIN ASSIGNMENTS – RS232 MODE

Pin 1 — V_{DD} — +12V Power Supply.

Pin 2 — $R_{IN}A2$ — DSR; RS232 input.

Pin 3 — $R_{IN}A1$ — RXD; RS232 input.

Pin 4 — N.C. — No Connection.

Pin 5 — $T_{OUT}A2$ — RTS; RS232 output.

Pin 6 — $T_{OUT}A1$ — TXD; RS232 output.

Pin 7 — SEL A — Select A; used with Select B (pin 8) to select operating mode. Logic "0" on both SEL A and SEL B selects RS232 mode; logic "1" on both SEL A and SEL B selects AppleTalk™ mode.

Pin 8 — SEL B — Select B; used with Select A (pin 7) to select operating mode. Logic "0" on both SEL A and SEL B selects RS232 mode; logic "1" on both SEL A and SEL B selects AppleTalk™ mode.

Pin 9 — $T_{OUT}B1$ — DTR; RS232 output.

Pin 10 — $T_{OUT}B2$ — RI; RS232 output.

Pin 11 — N.C. — No Connection.

Pin 12 — $R_{IN}B1$ — CTS; RS232 input.

Pin 13 — N.C. — No Connection.

Pin 14 — GND — Signal ground. Connected to logic and chasis ground.

Pin 15 — V_{EE} — −12V Power Supply.

Pin 16 — N.C. — No Connection.

Pin 17 — $R_{OUT}B1$ — CTS; TTL Output to UART.

Pin 18 — N.C. — No Connection.

Pin 19 — $T_{OUT}B2$ — RI; TTL input from UART.

Pin 20 — $T_{IN}B1$ — DTR; TTL input from UART.

Pin 21 — N.C. — No Connection.

Pin 22 — TxEN — Transmit Enable; Only functional in Mac Mode.

Pin 23 — $T_{IN}A1$ — TXD; TTL input from UART.

Pin 24 — N.C. — No Connection.

Pin 25 — N.C. — No Connection.

Pin 26 — $R_{OUT}A1$ — RXD; TTL output to UART.

Pin 27 — N.C. — No Connection.

Pin 28 — V_{CC} — +5V Power Supply.

PIN ASSIGNMENTS — MACINTOSH™ APPLETALK™ MODE

Pin 1 — V_{DD} — +12V Power Supply.

Pin 2 — $R_{IN}A2$ — Receive data; received at UART's RxD (non–inverted); $V_{IH} = 0.2V$; $V_{IL} = -0.2V$; $R_{IN} = 3KW$ minimum.

Pin 3 — $R_{IN}A1$ — Receive data; received at UART's RxD (inverted); $V_{IH} = 0.2V$; $V_{IL} = -0.2V$; $R_{IN} = 3K\Omega$ minimum.

Pin 4 — N.C. — No Connection.

Pin 5 — $T_{OUT}A2$ — Transmit data; driven from UART's TxD (non–inverted); tri–stated when UART's RTS is not asserted; $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$.

Pin 6 — $T_{OUT}A1$ — Transmit data; driven from UART's TxD (inverted); tri–stated when RTS is not asserted; $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$

Pin 7 — SEL A — Select A; used with Select B (pin 8) to select operating mode. Logic "0" on both SEL A and SEL B selects RS232 mode; logic "1" on both SEL A and SEL B selects AppleTalk™ mode.

Pin 8 — SEL B — Select B; used with Select A (pin 7) to select operating mode. Logic "0" on both SEL A and SEL B selects RS232 mode; logic "1" on both SEL A and SEL B selects AppleTalk™ mode.

Pin 9 — $T_{OUT}B1$ — Handshake output; driven from UART's DTR (inverted) ; $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$

Pin 10 — $T_{OUT}B2$ — Handshake output; driven from UART's DTR (non–inverted); $V_{OH} = 3.6V$ min; $V_{OL} = -3.6V$ min; $R_L = 450\Omega$

Pin 11 — N.C. — No Connection.

Pin 12 — $R_{IN}B1$ — Handshake input or external clock; received non–inverted at UART's CTS and TRxC; $V_{IH} = 0.2V$; $V_{IL} = -0.2V$; $R_{IN} = 3K\Omega$ minimum.

Pin 13 — N.C. — No Connection.

Pin 14 — GND — Signal ground. Connected to logic and chasis ground.

Pin 15 — V_{EE} — –12V Power Supply.

Pin 16 — N.C. — No Connection.

Pin 17 — $R_{OUT}B1$ — Receive handshake output; connects to UART's CTS and TRxC.

Pin 18 — N.C. — No Connection.

Pin 19 — $T_{OUT}B2$ — Not used in AppleTalk™ mode.

Pin 20 — $T_{IN}B1$ — Transmit handshake input; connects to UART's DTR output.

Pin 21 — N.C. — No Connection.

Pin 22 — $Tx\overline{EN}$ — Transmit data driver enable; connects to UART's RTS; transmit data driver is enabled when this pin is low.

Pin 23 — $T_{IN}A1$ — Transmit data input; connects to UART's TxD output.

Pin 24 — N.C. — No Connection.

Pin 25 — N.C. — No Connection.

Pin 26 — $R_{OUT}A1$ — Receive data output; connects to UART's RxD input.

Pin 27 — N.C. — No Connection.

Pin 28 — V_{CC} — +5V Power Supply.

FEATURES...

The **SP303** is a single chip device that offers both RS232 and Apple–Talk interfaces. When configured for RS232 mode the **SP303** provides 4 drivers and 4 receivers. When the part is programmed for Apple–Talk mode, the SP303 supports Macintosh–type ports. The mode can be changed at any time by bringing both the SEL A and the SEL B pins high for Mac mode, or low for RS232 mode.

The RS232 line driver circuits convert TTL–logic level inputs into inverted RS232 output signals. The RS232 receivers convert the EIA RS232 input signals to inverted TTL output logic levels. The receivers have voltage hysteresis, which helps eliminate spurious output transitions that might result from low–amplitude noise voltages during slower-speed signal transitions.

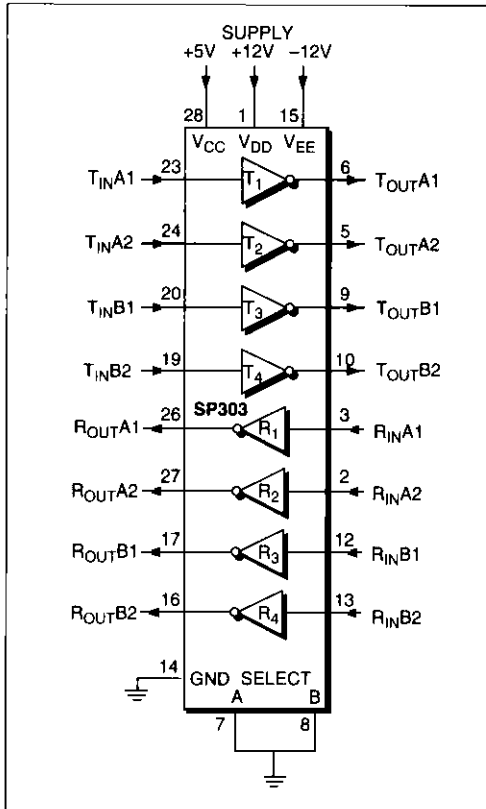When the **SP303** is programmed for Mac mode, the transmit data and receive data signals are

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Figure 1. RS232 Operating Mode

to offer more flexible interface capabilities without additional material costs.

The **SP303** is available in a 28–pin SOIC package for operation over the commercial temperature range.

APPLICATION EXAMPLE
RS232 MODE SERIAL INTERFACE

Figure 3 shows the **SP303CT** used in a dual serial port application which allows both RS232 and Macintosh™ AppleTalk™ Mode interfaces. With SEL A and SEL B low, the port can be configured for RS232. In this mode, the SP303CT is set up for 4 drivers and 4 receivers. The transmitter enable pin (pin22) has no effect in this mode.

The RFI filters shown are optional depending upon the FCC requirements of the system. The **SP303CT** has internal slew rate limiting, which keeps the RS232 slew rate <30V/µS. Since the
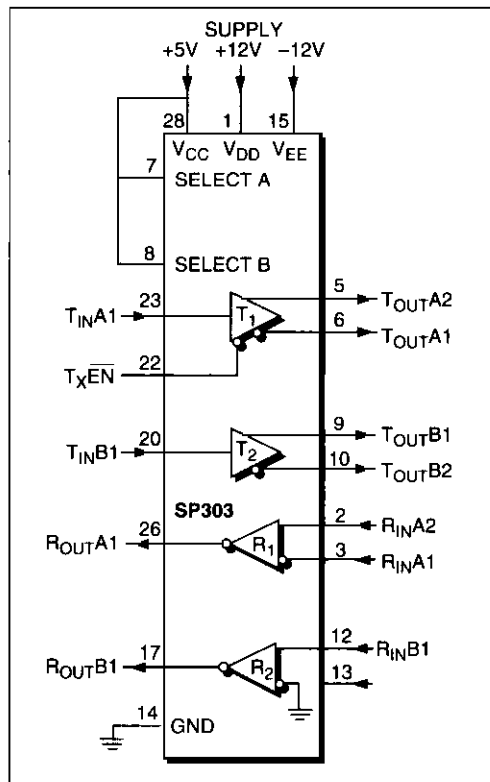
differential, while the handshake out and handshake in signals are single–ended. The **SP303** does not have the extra GPI (general purpose input). All drivers and receivers can operate at data rates up to 1 Mbps. The differential driver used for transmitting data signals is equipped with a tri-state function. When the TxEN pin is brought low the differential driver is enabled; when it is high, the driver outputs are tri–stated. The tri–state function does not affect any other driver in either mode of operation.

One **SP303** can significantly reduce the board space necessary for a similar discrete solution offering both RS232 and Apple–Talk interfaces. Due to the space savings, the **SP303** can provide multi-mode interfacing to equipment such as printers or modems without sacrificing additional board space, or cost. This allows the OEM

Figure 2. Macintosh™ AppleTalk™ Operating Mode

SP303CT is usually connected to the outside world, it is suggested that the user place transient voltage suppression devices on each of the I/O lines to ensure up to ±25KV ESD protection.

While the part is programmed for RS232 mode, the drivers and receivers can operate up to 200Kbps. The RS232 receiver inputs are capable of receiving signals up to ±30V. The Macintosh™ AppleTalk™ mode inputs and outputs are protected to guard against the situation where an RS232 cable is connected to the port while it is configured for Macintosh™ AppleTalk™ mode.

APPLICATION EXAMPLE
MACINTOSH™ APPLETALK™ SERIAL INTERFACE

The schematic below (*Figure 4*) shows the **SP303CT** programmed for Macintosh™ AppleTalk™ operating mode. In this mode the **SP303CT** offers one differential driver used for transmitting data, one differential receiver used for receiving data, one single–ended, non–inverting receiver used to receive a handshake signal, and one single–ended inverting driver used to transmit a handshake signal.

The differential driver used for transmitting data can be put into tri–state mode by bringing the TxEN line high; a low on this pin will enable
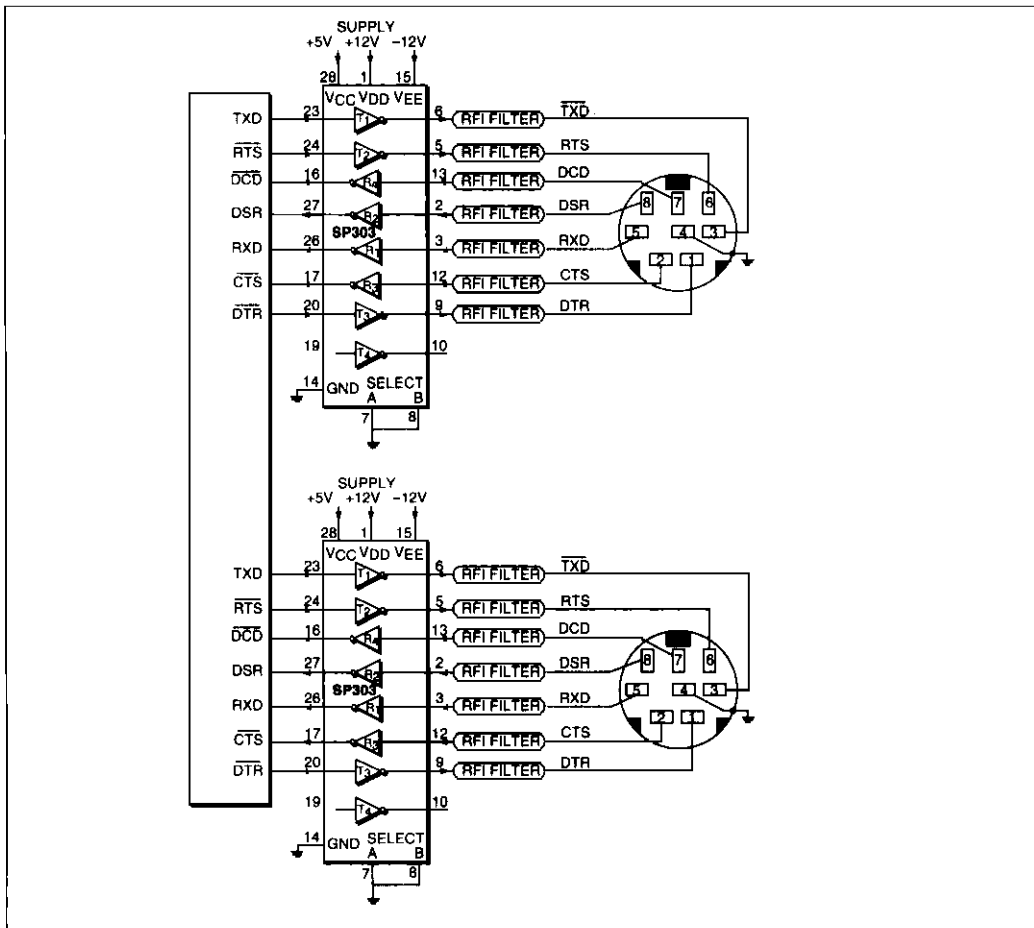

Figure 3. RS232 Interface.

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the driver output. This function only applies to the transmit data driver in ApppleTalk™ mode. Both differential drivers have output signals on each pin that typically swing ±6V. The peak to peak differential voltage swing is typically ±12V.

The second driver is used for transmitting the handshake output signal and can be used as either a differential driver or single ended. This particular application required a single–ended inverting signal for the handshake output signal.

Some Macintosh equipment requires an extra single–ended inverting receiver which is called a general purpose input. The GPI receiver is normally connected to pin 7 on the external 8 pin connector. This receiver is not available on the SP303CT.

Since the SP303CT is usually connected to the outside world, it is suggested that the user place transient voltage suppression devices on each of the 1/0 lines to ensure up to ±25KV ESD protection.

POWER SUPPLY SEQUENCING

There are two requirements for power supply sequencing for the **SP303**. The first is that V_{DD} is always greater than V_{CC}. The second is that when the part is powered up, V_{DD} must be applied 20ms before V_{CC}.
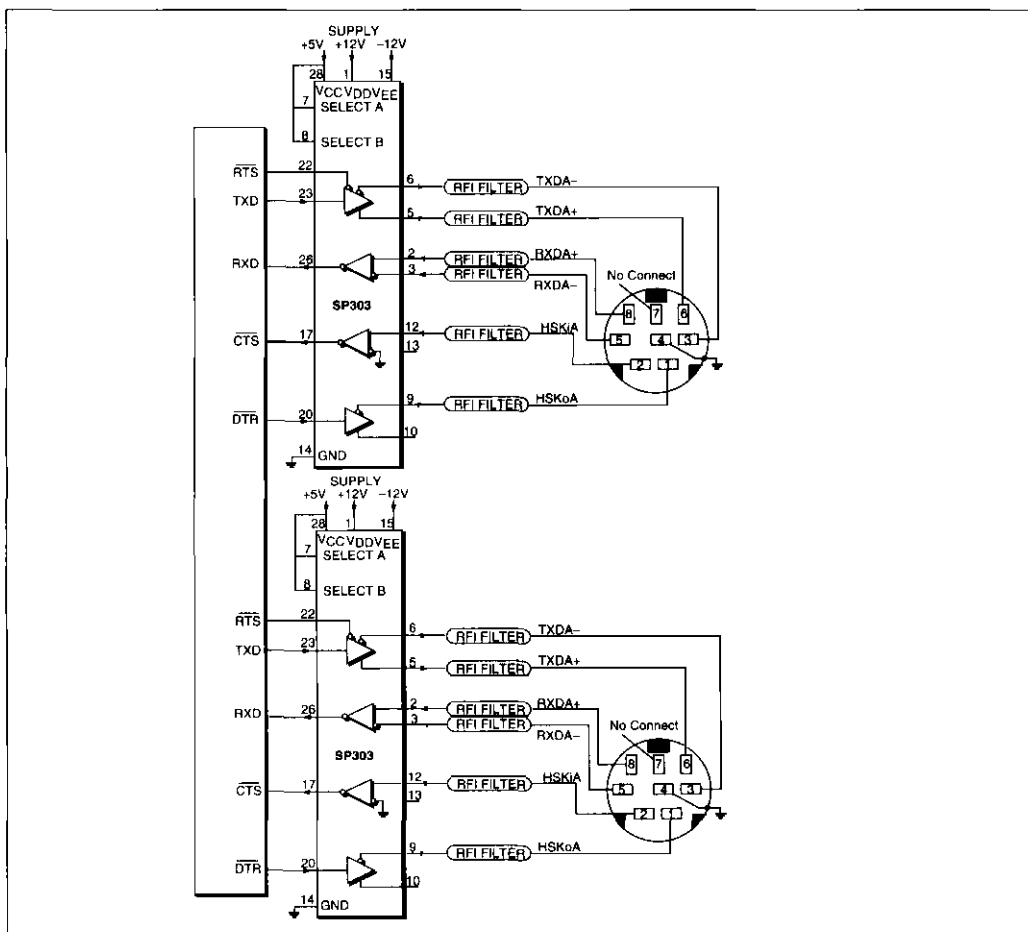

Figure 4. Macintosh™ AppleTalk™ Interface.

ORDERING INFORMATION

Model	Temperature Range	Package
SP303CT	0°C to +70°C	28–pin SOIC
SP303CT/TR	0°C to +70°C	28–pin SOIC/Tape–on–reel

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