To: **SPI-3 Protocol Study Group**
From: **Mike Kosco (MKosco@corp.adaptec.com)**
Subject: **Quick Arbitrate & Select (QAS) Proposal**
Date: **Monday, December 08, 1997**

1. Background

This proposal is for Quick Arbitrate and Select (QAS). It reduces overhead associated with parallel SCSI arbitration during re-selection by allowing targets to pass the bus to other devices on the bus. Initiator preemption allows the host regain control of the bus. The fairness algorythm defined in SPI-2 is used to guarantee bus bandwidth. The proposed protocol improvement is to be compatible and interoperable with the existing parallel SCSI protocol defined in SPI-2.

2. Terminology

QAS - Quick Arbitrate and Select

QAS Enabled Device - a SCSI device that supports QAS and has negotiated its use with the initiator.

QAS Capable Device - a SCSI device that is supports the QAS protocol

QAS Participating Device - a SCSI device that is participating in the current QAS protocol

QAS message code – 0x55

INFORMATION UNIT TRANSFER REQUEST (IUTR) message (see T10/97-230)

3. Quick Arbitrate and Select (QAS) Protocol

The Quick Arbitrate and Select (QAS) protocol allows the current QAS enabled target to transfer control of the bus to another QAS enabled device that is ready to use it. The QAS capability is reported in the INQUIRY data. A QAS capable initiator negotiates the use of QAS with each QAS capable target for each power-on cycle using the IUTR message.

QAS protocol begins when the QAS enabled devices on the bus detect, an 0x04 0x55 message sequence, or an 0x00 0x55 message sequence, or a transition from an IU phase to an 0x55 single-byte message. The REQ signal shall be asserted for a minimum of 8 ns during the message in phase to ensure that all QAS enabled devices see the messages.

The QAS message may occur following a DISCONNECT or COMMAND COMPLETE message, or following an INFORMATION UNIT phase.

When the QAS protocol begins all QAS enabled devices ready to use the bus, subject to the fairness algorythm place their SCSI ID's on the bus, assert BSY and wait for the MSG signal to negate.

If QAS protocol begins and there are no devices ready to use bus, no SCSI ID's are asserted and the current QAS enabled target transitions to the BUS FREE phase. The subsequent arbitration is a normal arbitration.

The current QAS enabled target, after sending the QAS message, negates the MSG signal and releases the bus.

When the MSG signal is detected negated the QAS particpating devices release the bus, with the current QAS enabled target asserting the winning SCSI ID.

After removing their IDs, the QAS participating devices sample the bus to see if their SCSI ID is still asserted on the bus to determine if they have won. The winning QAS particpating device asserts the SEL signal along with it's SCSI ID and the SCSI ID of the device it is re-selecting. When the current QAS enabled target detects the SEL signal asserted, it releases BSY and the SCSI ID it was driving. The winning QAS particpating device now owns the bus.

Figure 1 is an example of the QAS protocol following a DISCONNECT message.

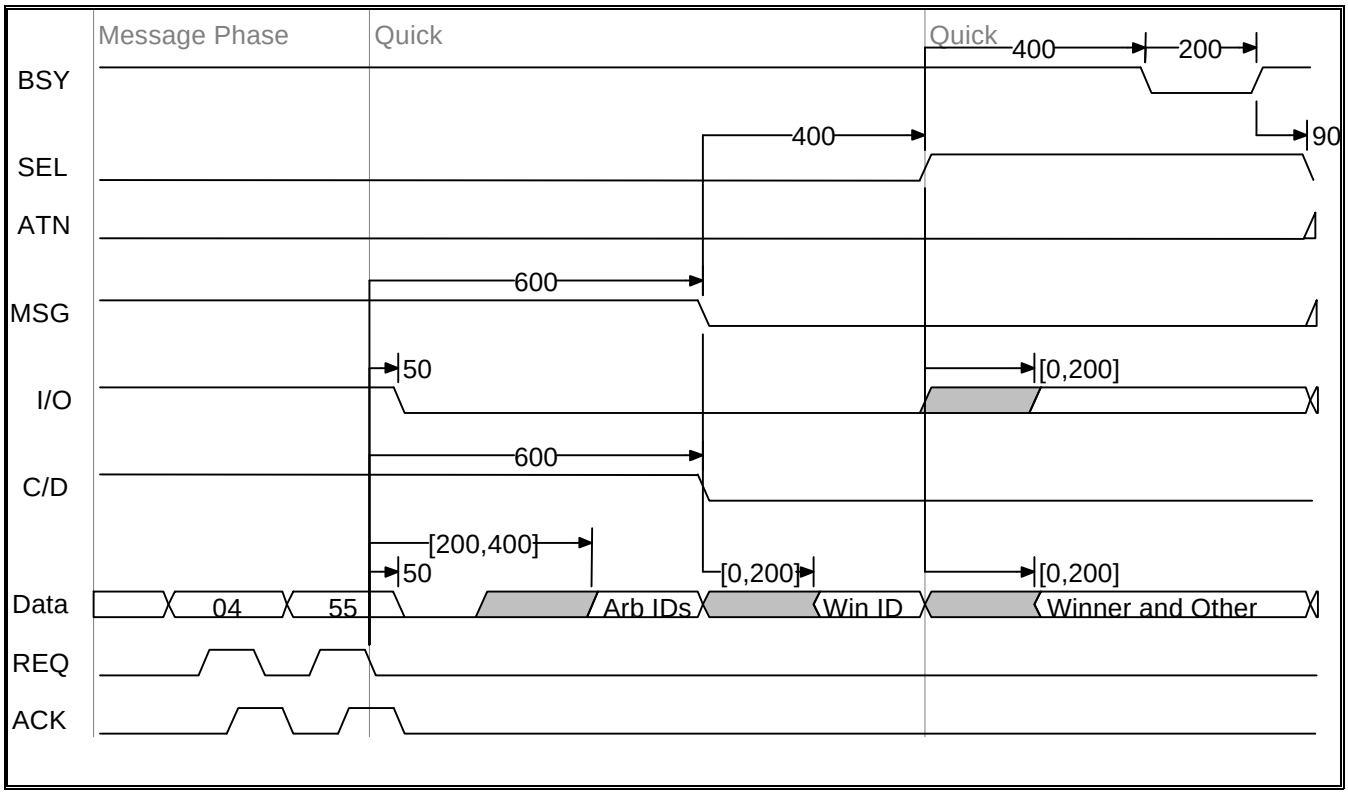

Figure 1 - QAS Protocol

Figure 2 is an example of the QAS protocol for the case where no QAS devices are ready for the bus.

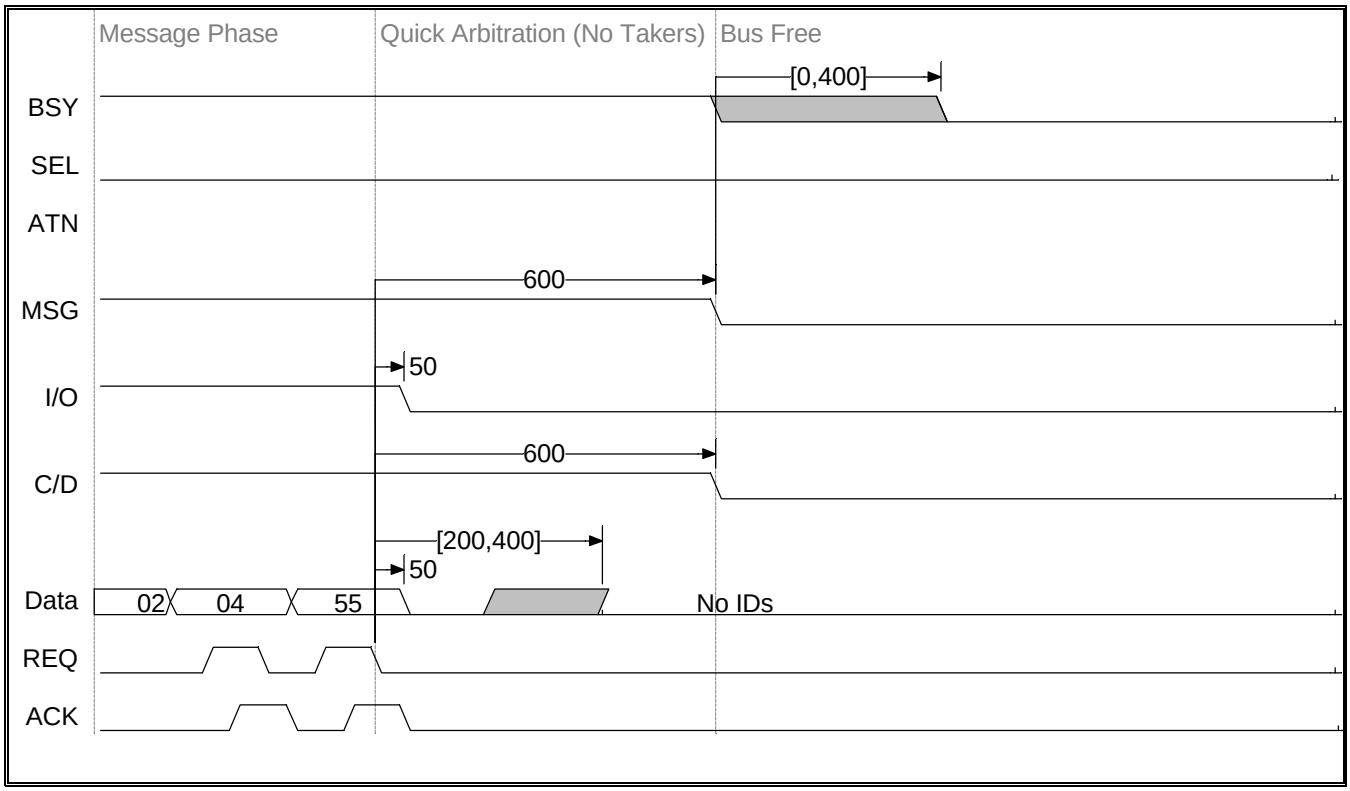

Figure 2 - QAS with no takers

3.1 QAS Initiator Preemption

An initiators may preempt the QAS protocol by asserting the ATN signal along with it's SCSI ID during QAS protocol. A target seeing the ATN signal asserted removes it's SCSI ID from the bus. QAS continues with only initiators participating.

Figure 3 illustrates QAS initiator preemption protocol.

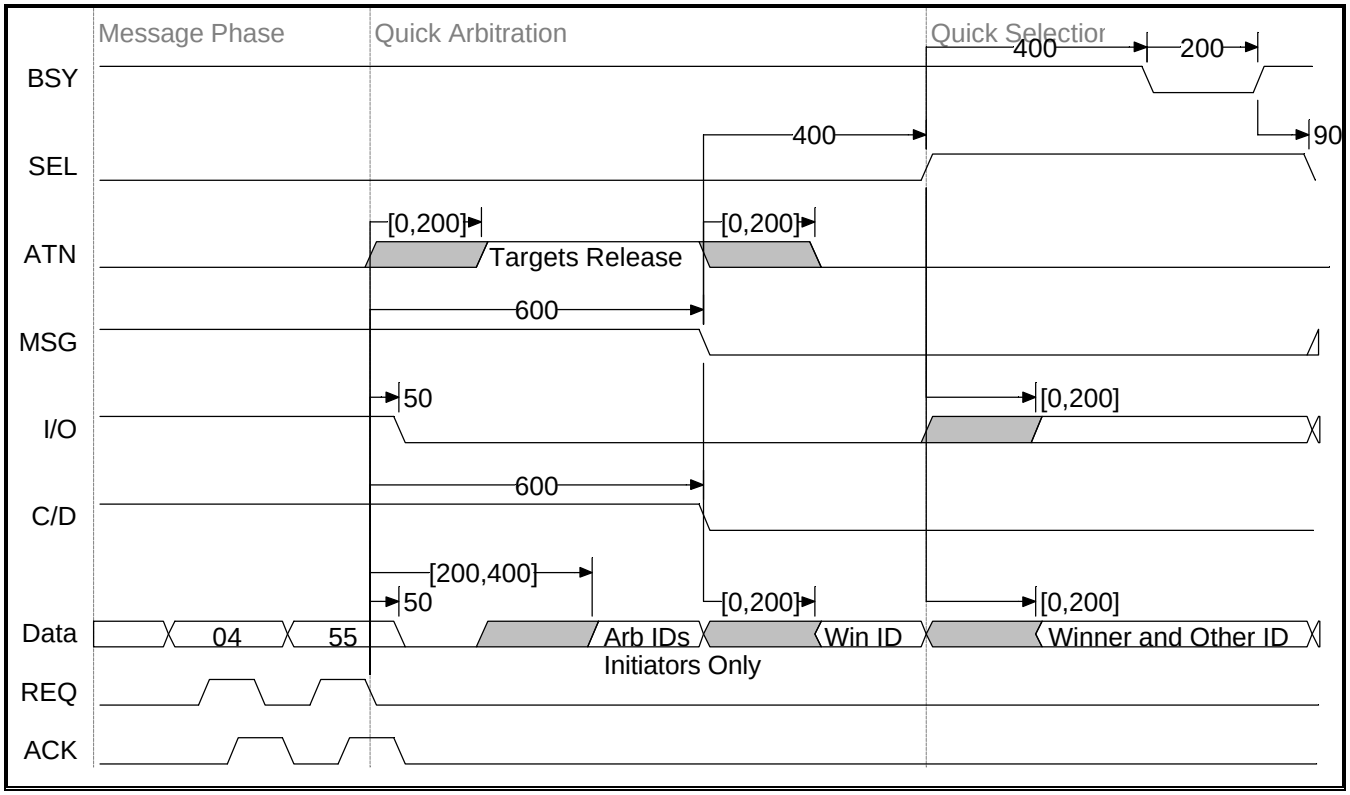

Figure 3 - QAS with initiator preemption