

Overview

In this unit your students should:

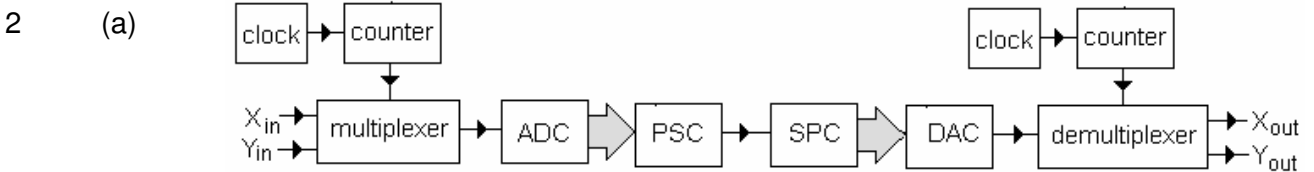
- meet the use of time division multiplexing to allow several channels to share one link
- understand how to use multiplexers and demultiplexers for t.d.m.
- appreciate the need to synchronise the receiver and transmitter

This should not require more than 3 hours of class time.

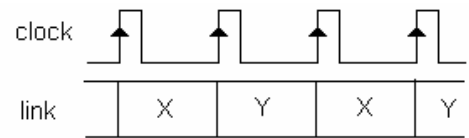
Hour	Suggested Activity
1	Set your students straight on to the Time sharing practical. They are unlikely to get beyond step 6 in this session. Ask them to answer questions 1 and 2 of the Synchronous transmission exercises before the next session.
2	Discuss their answers to questions 1 and 2 of the Synchronous transmission exercises before letting them continue with the Time sharing practical. Step 13 is extension work. Ask them to answer question 1 on page 159 of the textbook for the next session.
3	Students should use this session to answer question 2 on page 159 of the textbook, followed by the last two questions of the Synchronous transmission exercises. Ask them to study 8.3 for the next session.

Model Answers

- 1 (a) Time-division multiplexing allows many different signals to use a single transmission link by allowing each signal onto the link for a short time many times a second.
- (b) Each message requires $6\,800 \times 7 = 47\,600$ bits per second.
 There are 128 different messages multiplexed onto the fibre, so the overall bit rate is $47\,600 \times 128 = 6\,092\,800 \text{ s}^{-1}$. The bandwidth will be half this, 3.0 MHz, ignoring the synchronisation signals which will be required.



- (b) At each rising edge of the clock, the multiplexer connects a different input signal to the ADC and PSC. Before the next rising edge of the clock these two blocks sample the signal and send it down the link in serial form.



- At the other end of the link the SPC reassembles the word from the bits as they arrive and the DAC presents the corresponding voltage to the demultiplexer for feeding to the appropriate output.
- (c) The maximum signal frequency is 16 kHz, so the sampling rate needs to be at least $2 \times 16 = 32$ kHz. Since each signal is sampled every other clock pulse, the clock speed needs to $2 \times 32 = 64$ kHz.
- (d) The receiver has to know exactly which bit of which word is on the line at any instant, otherwise it will get the process of reconversion wrong. The receiver relies on its clock for all timing, so both clocks must stay in step for the system to operate. This can be done by using crystal oscillators for the clocks and transmitting separate synchronisation pulses from one clock to the other, perhaps at the end of each frame.